

*Channel and Class Modifications [Upgrades] by Applications*, 8 FCC Rcd 4735 (1993).

**DATES:** Effective August 14, 2002.

**FOR FURTHER INFORMATION CONTACT:** Kathleen Scheuerle, Media Bureau, (202) 418-2180.

**SUPPLEMENTARY INFORMATION:** This is a summary of the Commission's Report and Order, adopted July 31, 2002, and released August 2, 2002. The full text of this Commission decision is available for inspection and copying during regular business hours at the FCC Reference Information Center, Portals II, 445 12th Street, SW., Room CY-A257, Washington, DC, 20554. This document may also be purchased from the Commission's duplicating contractor, Qualex International, Portals II, 445 12th Street, SW., Room CY-B402, Washington, DC 20554, telephone 202-863-2893, facsimile 202-863-2898, or via e-mail [qualexint@aol.com](mailto:qualexint@aol.com).

#### List of Subjects in 47 CFR Part 73

Radio, Radio broadcasting.

Part 73 of title 47 of the Code of Federal Regulations is amended as follows:

#### PART 73—RADIO BROADCAST SERVICES

1. The authority citation for part 73 continues to read as follows:

**Authority:** 47 U.S.C. 154, 303, 334 and 336.

##### § 73.202 [Amended]

2. Section 73.202(b), the Table of FM Allotments under Hawaii, is amended by removing Channel 284C2 and adding Channel 284C at Lanai City.

3. Section 73.202(b), the Table of FM Allotments under Iowa, is amended by removing Channel 273C and adding Channel 273C0 at Des Moines.

4. Section 73.202(b), the Table of FM Allotments under Missouri, is amended by removing Channel 223A and adding Channel 223C3 at Poplar Bluff.

5. Section 73.202(b), the Table of FM Allotments under Tennessee, is amended by removing Channel 299C3 and adding Channel 299C2 at Henderson.

6. Section 73.202(b), the Table of FM Allotments under Texas, is amended by removing Channel 252A and adding Channel 252C3 at Pecos and by removing Channel 276C3 and adding Channel 276C2 at Pittsburg.

7. Section 73.202(b), the Table of FM Allotments under Wyoming, is amended by removing Channel 297C2 and adding Channel 297C1 at Kemmerer.

Federal Communications Commission.

**John A. Karousos,**

*Assistant Chief, Audio Division, Media Bureau.*

[FR Doc. 02-20597 Filed 8-13-02; 8:45 am]

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## DEPARTMENT OF THE INTERIOR

### Fish and Wildlife Service

#### 50 CFR Part 17

##### RIN 1018-A119

#### Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Tumbling Creek Cavesnail

**AGENCY:** Fish and Wildlife Service, Interior.

**ACTION:** Final rule.

**SUMMARY:** We, the Fish and Wildlife Service (Service), determine the Tumbling Creek cavesnail (*Antrobia culveri*) to be an endangered species under the Endangered Species Act of 1973, as amended (Act). This species is known to occur in one cave in Missouri. The distribution of this species in Tumbling Creek has decreased by 90 percent since 1974. Although cavesnail numbers fluctuated seasonally and annually between 1996 and 2000, the species was not found in the monitored section of the cave stream during six surveys in 2001 and two surveys in 2002. Small numbers of individuals continue to exist in other portions of the cave stream. Because the sudden population decline demonstrates a significant and imminent risk to the well-being of the Tumbling Creek cavesnail, we find that listing this species is necessary to provide Federal protection pursuant to the Act.

**DATES:** This final rule is effective August 14, 2002.

**ADDRESSES:** The complete file for this rule is available for inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Columbia Field Office, 608 E. Cherry St., Room 200, Columbia, MO 65201-7712.

**FOR FURTHER INFORMATION CONTACT:** Paul McKenzie, Ph.D., Columbia Field Office (see **ADDRESSES**) (telephone: 573-876-1911, ext. 107; e-mail: [paul\\_mckenzie@fws.gov](mailto:paul_mckenzie@fws.gov); facsimile: 573-876-1914). Individuals who are hearing-impaired or speech-impaired may call the Federal Relay Service at 1-800-877-8337 for TTY assistance.

**SUPPLEMENTARY INFORMATION:**

## Background

The Tumbling Creek cavesnail (*Antrobia culveri*) was described as a new species by Hubricht (1971) from specimens taken by David Culver, Thomas Aley, and Leslie Hubricht in 1969 and 1970. *Antrobia culveri* is the type species for the genus *Antrobia*, also described new to science in 1971 by Hubricht. Hershler and Hubricht (1988) examined specimens of *A. culveri* and confirmed the taxonomic placement of this species in the subfamily Littoridininae of the Gastropod family Hydrobiidae. They also noted the similarity of the genus *Antrobia* to, but distinguished it from, the genus *Fontigens*, which contains cave-adapted snails found in other caves and springs of the Ozark Plateau in Missouri and Arkansas. The Tumbling Creek cavesnail is a small, white, blind, aquatic snail. Hubricht (1971) provided the following measurements of the type specimen: height 2.3 millimeters (mm) (0.09 inches (in)); diameter 2.0 mm (0.08 in); aperture height 1.2 mm (0.05 in); aperture diameter 1.1 mm (0.04 in); with a small, conical, well-rounded, pale-yellow shell containing about 3.5 whorls (Hubricht 1971). The Tumbling Creek cavesnail is restricted to a single cave stream in Tumbling Creek Cave in Taney County, southwestern Missouri.

Greenlee (1974) provided the first information on the habitat of the species. He reported that the species was found primarily on "3 inch gravel substrate" (presumably meaning small stones or cobble of 3-inch (7.5 cm) diameter), with a few individuals observed using the recesses of a solid rock stream bottom. Greenlee's use of a Surber Sampler, however, may have biased his survey to search for rocks smaller than 25 cm (10 in) in diameter (Julian J. Lewis, J. Lewis & Associates, Clarksville, IN; *in litt.*, January 27, 2002). Greenlee (1974) did not note whether the snails used the upper or lower surface of the 3-inch gravel he observed them on, or whether the species was ever observed using larger rocks within the cave stream. Subsequent surveyors, however, have failed to document *A. culveri* using a solid rock bottom, and the species is usually observed on the undersurface of rocks and gravel of various sizes (Ashley unpub. data; McKenzie *in litt.*, September 16, 1996; Ashley and McKenzie, pers. obs.). Although Greenlee (1974) stated that the Tumbling Creek cavesnail was absent from areas of the stream that contained bat guano, subsequent observers (Ashley 2001a; Ashley and McKenzie, pers. obs.) have noted *A. culveri* in portions of

Tumbling Creek where bat guano occurs. Greenlee (1974) noted that the species appears to prefer areas of the stream that lack silt, but Ashley (2000) found no significant differences in snail populations between habitats having silt and those lacking silt. There is insufficient data currently available to determine if silt is detrimental to the Tumbling Creek cavesnail. Tom and Cathy Aley suggested (pers. comm., August 30, 2001) that silt deposition in recent years in the stream has "cemented" smaller rocks to the stream bottom making their undersurface unavailable to cavesnails. This hypothesis is supported by observations made by researchers while conducting cavesnail surveys (e.g., Ashley and McKenzie, pers. obs.).

Although little is known regarding the biology of this cavesnail, Greenlee (1974) postulated that the species feeds on aquatic microfauna. Because Tumbling Creek cavesnails have been concentrated in sections of Tumbling Creek Cave that are usually adjacent to large deposits of bat guano, it has been postulated that *Antrobia culveri* is indirectly dependent upon these deposits for food (Greenlee 1974). Other life history aspects of this species, including its reproductive behavior, are unknown. Although nothing is known about the longevity or movements of this species, some limited information is available on the frequency of shell sizes within the population across different seasons. Ashley (2000) examined shell length data collected between 1996 and 2000 and noted that the average length of *A. culveri* shells exhibited a slight peak during summer months but further noted that the difference was not statistically significant. Ashley (2000) also analyzed the frequency distribution of cavesnail shell lengths from fall data collected between 1997 and 2000 and noted a decrease in the frequency of smaller shells over that period. Ashley (2000) concluded that both fewer snails and fewer smaller snails in the younger age classes were observed in the more recent fall visits conducted from 1997 through 2000. This suggests that there has been a reduction in recruitment of younger age classes into the population between 1997 and 2000.

The fauna of Tumbling Creek Cave is highly diverse (Thomas Aley, Ozark Underground Laboratory (OUL), *in litt.* 1978; Cecil Andrus, USDI, *in litt.* 1980). In addition to one species included in the Missouri Department of Conservation's (MDC) *Checklist of Species of Conservation Concern* (Missouri Natural Heritage Program 2001) (*i.e.*, a cave millipede (*Scotterpes dendropus*)), *Antrobia culveri* is

associated with at least three, and possibly as many as six, species that are new to science but have not yet been formally described: a millipede (*Chaetaspis* sp.), a terrestrial isopod (*Caucasonethes* sp.), an amphipod (*Stygobromus* sp.), a dipluran (*Plusiocampa* sp.), a phalangodid harvestman (*Phalangium* sp.), and a cave spider (*Islandiana* sp.). Tumbling Creek Cave also provides habitat for a large maternity colony of federally listed gray bats (*Myotis grisescens*), with a recent estimated breeding population of 12,400 in 1998 (Dr. William Elliott, MDC, *in litt.* October 9, 2001). Historically, the gray bat breeding population included an estimated 50,000 individuals (MDC 1992, Missouri Natural Heritage Program 2000). The Gray Bat Recovery Plan lists Tumbling Creek Cave as a "Priority 1" cave. Priority 1 gray bat caves have the highest level of biological significance for a gray bat maternity site (*i.e.*, a cave deemed to be "absolutely essential" in preventing the extinction of the endangered gray bat) (U.S. Fish and Wildlife Service 1982). There have also been historical observations of a very small hibernating population of the federally listed Indiana bat (*Myotis sodalis*). However, the Indiana bat has not been documented at the site since 1989 (Missouri Natural Heritage Program 2000).

Tumbling Creek Cave is owned by Tom and Cathy Aley of Protem, MO. Because of its rich cave fauna, the large maternity colony for the endangered gray bat, and its diverse physical features, Tumbling Creek Cave was designated as a National Natural Landmark and approved for inclusion on the National Registry of Natural Landmarks under the authority of the Historic Sites Act of 1935 (49 Stat. 666; 16 U.S.C. 461 *et seq.*) (Cecil Andrus, USDI, *in litt.*, 1980; 48 FR 8693). Tumbling Creek Cave and approximately 395 acres surrounding the cave were embodied in the designation, including about 140 surface acres owned by the Aleys and about 255 surface acres owned by two adjacent property owners.

#### Status and Distribution

*Antrobia culveri* is known only from Tumbling Creek Cave in Taney County, southwestern Missouri. In an extensive survey of publicly and privately owned Missouri caves, no additional populations of this cavesnail were discovered (Gardner 1986). Recent surveys conducted in nearby caves and springs by Dr. David Ashley of Missouri Western State College, St. Joseph, MO, have also failed to locate this species at

any other sites (David Ashley, *in litt.* November 2001). The fact that no additional populations were found in springs in close proximity to Tumbling Creek Cave supports the long-held contention that Tumbling Creek cave is the only location where this species occurs.

*Antrobia culveri* was historically known from an estimated area of 1,016 square meters (m<sup>2</sup>) (10,900 square feet (ft<sup>2</sup>) or 0.25 acres) of Tumbling Creek along approximately 229 meters (m) (750 feet (ft)) of the stream in the middle one-third of the lower stream passage in Tumbling Creek Cave (Greenlee 1974). Based on a survey of approximately 630 m<sup>2</sup> (6,800 ft<sup>2</sup>) of suitable habitat within the 457 m (1,500 ft) of human-accessible cave-stream habitat, Greenlee (1974) estimated the population of Tumbling Creek cavesnails at 15,118 individuals.

In 1995, we reviewed the status of the species, including the survey methodology originally established by Greenlee (1974), and determined that an inadequate description of the survey methods made it difficult to determine the number of plots taken. Our lack of knowledge on the number of plots sampled by Greenlee made it difficult to interpret his population estimates and impossible to duplicate his survey methods. Therefore, we concluded that a new and more rigorous statistical survey design would be necessary to establish population trends for the species. Following meetings with Dr. Pam Haverland of the U.S. Geological Survey, Columbia Environmental Research Center in Columbia, MO, and Mr. Tom Aley, President of Ozark Underground Laboratory (OUL) and owner of Tumbling Creek Cave, a sampling protocol was established within an approximate 75 m (247 ft) section of Tumbling Creek that was known to be inhabited by *Antrobia culveri* but that would minimize any potential impacts to the federally endangered gray and Indiana bats.

Following the establishment of sampling stations within Tumbling Creek Cave, and an initial September 1996 survey using those stations (McKenzie, *in litt.* 1996), we contracted Dr. David Ashley, of Missouri Western State College, St. Joseph, MO, to monitor population trends of the Tumbling Creek cavesnail. Ashley completed 19 separate monitoring trips between September 3, 1997, and March 23, 2002 (Ashley 2000, 2001a, 2001b, 2001c, 2002). Ashley (2000, 2001a, 2001b, 2001c, 2002) determined that population estimates of *Antrobia culveri* within the monitoring stations fluctuated both seasonally and annually, and ranged from a high of 1,166

individuals on September 3, 1997, to a low of 0 individuals on January 11, March 17, May 8, July 16, August 31, and November 2, 2001, and January 9 and March 23, 2002. Ashley concluded that a significant decrease in the numbers of cavesnails had occurred between September 9, 1996, and March 23, 2002 (Ashley 2002).

Although the 2001 and 2002 surveys failed to document the presence of any cavesnails within the established monitoring stations, 40 individuals were discovered upstream of the sampling stations in March 2001. During March 16–18, 2001, Ashley and others surveyed the entire human-accessible 457 m (1,500 ft) of Tumbling Creek, including a small tributary that has approximately 9 additional meters (30 ft) of accessible habitat. A total of 39 person-hours was expended in searching a total of 1,054 rocks in the 466 m (1,530 ft) of available habitat. A total of 39 cavesnails were located in a 14-m (45-ft) section of the stream upstream from the monitoring stations, and another cavesnail was found in the tributary (Ashley 2001a). Subsequent surveys in May, July, September, and November, 2001, and January, 2002, documented the presence of cavesnails only in this 14-m section upstream of the established sampling stations. The small tributary stream was not searched during those subsequent surveys. A more thorough search was not conducted in either the tributary or the area upstream from the sampling stations in order to minimize disturbance to cavesnails in those areas. Observations made between September 1997 and March 2002 suggest that the numbers of *Antrobia culveri* have declined significantly from estimates obtained by Greenlee (1974); however, differing sampling methods make it impossible to directly compare Ashley's estimates with those of Greenlee.

In addition to Greenlee's 1974 survey and the standardized surveys conducted between 1996 and 2002, other attempts have been made to monitor the species' status and derive estimates of its abundance. A June 1991 survey conducted by Tom Aley, Paul McKenzie (Service, Columbia, MO), and Dennis Figg (MDC, Jefferson City, MO) located 42 individuals after a 9 person-hour search (McKenzie, pers. obs.). A June 1993 survey conducted by Monty Holder (a high school biology instructor) of Sedalia, MO, and three assistants located 21 individuals during 6 person-hours of search effort (Tom Aley, *in litt.* 1993), but the number of plots sampled is unknown. On August 29, 1995, Paul McKenzie and Cathy Aley searched for the species and attempted to estimate

the number of cavesnails discovered per 0.3 m<sup>2</sup> (1 ft<sup>2</sup>) plot. This survey yielded 6 cavesnails in 22 plots or 0.27 cavesnails per plot (McKenzie, unpubl. data). This compares to an estimated 2.16 cavesnails per plot observed by Greenlee (1974) when equivalent plot sizes were calculated for analysis purposes. Although it is impossible to determine the exact number of plots sampled by Greenlee (1974), he did record the average number of snails per plot, and this can be compared to the same variable measured in 1995. A decrease from 2.16 cavesnails per plot to 0.27 cavesnails per plot would represent an approximate 88 percent decrease in the species' density over the 22-year period between 1974 and 1995.

#### Previous Federal Action

On January 6, 1989, the Service published an Animal Notice of Review (54 FR 54554–54579) which included the Tumbling Creek cavesnail as a category 2 candidate species for possible future listing as threatened or endangered. Category 2 candidates were those taxa for which information contained in the Service's files indicated that listing may be appropriate but for which additional data were needed to support a listing proposal. On November 21, 1991, the Service published an Animal Candidate Notice of Review (56 FR 58804–58836), which elevated the Tumbling Creek cavesnail to category 1 status. Category 1 candidates were those taxa for which the Service had on file sufficient information on biological vulnerability and threats to support preparation of listing proposals. In the subsequent February 28, 1996, Candidate Notice of Review (61 FR 7596–7613), we indicated that the category 2 candidate species list was being discontinued, and that henceforth the term "candidate species" would be applied only to those taxa that would have earlier fit the definition of the former category 1 candidate taxa, that is, those species for which we had on hand sufficient information to support a listing proposal. *Antrobia culveri* was retained as a candidate species in that notice.

In 1996, we initiated a 5-year set of standardized surveys designed to better assess and quantify the decline in the species' population that was apparent from the earlier data. In January 2001, Ashley (pers. comm. January 14, 2001) notified the Service that no cavesnails were observed within the established monitoring stations during the January 11 survey. He further reported that an analysis of 5 years of data collected between September 1996 and March 2001 indicated that the population of

the species had exhibited an alarming decline (Ashley 2001b). Based on this information, the Service determined that it was necessary to more closely monitor the species by having surveys conducted once every two months. Surveys conducted every two months between March 2001 and March 2002 have yielded the same results—no cavesnails have been found within the established sampling section of Tumbling Creek (Ashley 2002).

Recognizing the need for prompt additional conservation actions for the species, on January 30, 2001, Region 3 of the Service recommended changing the listing priority number for the Tumbling Creek cavesnail from 7 to 1 based upon the mid-January monitoring that failed to locate any cavesnails (Service 2001). Region 3 also recommended pursuing an emergency listing of the species and simultaneously publishing a proposal for long-term listing as endangered under the Act as soon as funding became available. On October 30, 2001, we published an updated Candidate Species Notice of Review (66 FR 54808) that formally changed the listing priority number for *Antrobia culveri* from 7 to 1, reflecting our increased concern for the survival of the species.

On August 29, 2001, the U.S. Department of the Interior reached an agreement with several conservation organizations regarding a number of listing actions that had been delayed by court-ordered critical habitat designations and listing actions for other species. That agreement was subsequently approved by the U.S. District Court for the District of Columbia. Under the agreement, the Service and the organizations agreed to significantly extend the existing court-approved deadlines for the actions on the other species, thereby making funds available for a number of listing actions judged to be higher priority by the Service. Those higher priority listing actions included the emergency listing of the Tumbling Creek cavesnail.

On December 27, 2001 (66 FR 66803), we listed *Antrobia culveri* on an emergency basis for 240 days through August 26, 2002. On the same date (66 FR 66868), we published a proposal to list the Tumbling Creek cavesnail as an endangered species under the standard listing provisions of the Act, and solicited comments on the proposed rule. The comment period was opened for 60 days and closed February 25, 2002.

### Summary of Peer Review and Public Comments

In the December 27, 2001, proposed rule, we requested all interested parties to submit factual reports or information that might contribute to the development of a final rule. We also provided a notice indicating that a request for a public hearing could be made by February 11, 2002. We contacted appropriate Federal and State agencies, county governments, scientific organizations, and interested parties and requested their comments. We published notices inviting public comment in the Springfield, MO, News Leader and the Branson, MO, Tri-Lakes Daily News. In accordance with our July 1, 1994, Interagency Policy on Peer Review (59 FR 34270), we requested the expert opinions of independent specialists regarding pertinent scientific or commercial data and assumptions relating to the supportive biological and ecological information in the proposed rule. The purpose of such review is to ensure that the listing decision is based on scientifically sound data, assumptions, and analyses, including input of appropriate experts and specialists.

We requested scientific peer review of our proposed endangered listing from four invertebrate zoologists who possess expertise on the cavesnail or other invertebrates, and also solicited comments from one research fisheries biologist who has expertise on the potential impacts of contaminants on aquatic invertebrates. We received a written response and comments from all five of these experts; we also received comments from five private land owners within the recharge area for Tumbling Creek Cave during the open comment period. No requests for a public hearing were received. All species experts and private landowners strongly supported the listing proposal and agreed that this species is in need of Federal protection as an endangered species. Four of the five peer reviewers commented that the data on changes in cavesnail numbers were very thorough and that there was clear scientific evidence for listing the species as endangered. The fifth peer reviewer did not comment on adequacy of the data.

#### A. Technical and Editorial Comments

Several technical and editorial comments and corrections were provided by two peer reviewers. Clarification of biological terminology, enhanced explanations of information cited from several references, and the inclusion of additional literature citations to strengthen Factors A

through D, discussed below, were recommended. We have incorporated the majority of the recommended changes, as appropriate. In a few cases, suggested changes were not made if we determined that incorporating the change in text would not improve the clarity of the discussion.

#### B. Suggestions Related to Recovery Actions

Three peer reviewers and two private land owners suggested various recovery actions that could benefit the cavesnail or its habitat. We will prepare a recovery plan for the cavesnail following the publication of the final rule, and these comments will be considered for incorporation into the recovery plan at that time. They are not discussed in this document, because they are not germane to this listing decision.

#### C. Specific Comments

All peer reviewers commented on the possible reasons for the recent decline in cavesnail numbers. With the exception of the introduction of a few new suggestions discussed below, most of the reasons provided by the peer reviewers are identical to those outlined in the December 27, 2001, emergency rule. All peer reviewers reaffirmed the supposition that siltation from erosion problems, overgrazing, poor land management, deforestation, or the sudden appearance and population explosion of limpets probably contributed to the decline in the species. Other reasons presented by peer reviewers that were previously provided in the Service's emergency rule were: eutrophication or nutrient runoff from livestock operations within the recharge area; disease; depressed dissolved oxygen levels; and degraded water quality from various waterborne contaminants. Two private landowners also believed that silt deposited into Tumbling Creek cave was a major contributor to habitat loss of the species. Newly suggested reasons given by peer reviewers for the decline in cavesnail numbers that were not addressed in the emergency rule were: residual toxins in the surrounding substrate that could adversely affect the water quality of the cave stream and cause changes in water chemistry (e.g., change in pH or imbalances in the anion/cation exchange).

Four of the five private landowners who provided comments stated their belief that the listing of Tumbling Creek cavesnail as an endangered species would not impact their property rights. The fifth landowner did not comment on this issue. Two respondents

indicated that the declining population of *Antrobia culveri* served as a barometer on the quality of water important to area land owners and further noted that listing the species was important in preserving the rich biological diversity of the Ozarks on esthetic and ecological grounds. One peer reviewer and two land owners recommended that the entire recharge area of Tumbling Creek cave be designated as critical habitat. Comments related to the issue of critical habitat for this species are addressed below.

### Summary of Factors Affecting the Species

After a thorough review and consideration of all information available, we determine that the Tumbling Creek cavesnail should be classified as an endangered species. We followed procedures found in section 4 of the Act (16 U.S.C. 1533) and regulations (50 CFR part 424) promulgated to implement the listing provisions of the Act. We may determine a species to be endangered or threatened due to one or more of the five factors described in section 4(a)(1) of the Act. These factors and their application to the Tumbling Creek cavesnail (*Antrobia culveri*) are as follows:

#### A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

*Antrobia culveri* has exhibited a large decline in numbers since the first estimate was made by Greenlee (1974) (see Status and Distribution, above). Systematic sampling within various sections of Tumbling Creek was initiated in 1996 (McKenzie *in litt.* 1996). Placement of sampling quadrats was done by inspecting the area within each of the sampling sections and arbitrarily placing the sampling squares approximately equidistant along each section. Ashley reported a statistically significant decline in the snail population over the period between 1996 and the first quarter of 2002 (Ashley 2001c, 2002). Additionally, no cavesnails have been located at established monitoring stations during the last eight surveys (Ashley 2001a, 2001b, 2001c, 2002).

We also have documented a large reduction in the portion of the cave stream occupied by the cavesnail. *Antrobia culveri* was historically known from an estimated 229 m (750 ft) of Tumbling Creek (Greenlee 1974). The 229 m of occupied habitat in 1974 constituted 50 percent of the 457 m (1,500 ft) of human-accessible cave-stream habitat that is believed to be

suitable for the cavesnail. The entire accessible 457 m (1,500 ft) of Tumbling Creek, including a small tributary that has approximately 9 additional meters (30 ft) of accessible suitable habitat, was surveyed in March 2001. Cavesnails were found solely in one small (14-m) (45-ft) section of the stream and in the small tributary (Ashley 2001a). Observations between March and August 2001 suggest that *A. culveri* is now restricted to 23 m of available stream habitat or approximately 5 percent of the 457 m of accessible suitable habitat. These figures indicate that distribution of this species in Tumbling Creek Cave has decreased by 90 percent.

Species such as the Tumbling Creek cavesnail, which spend all of their life cycle in subterranean waters, are highly vulnerable to changes in the quality and quantity of that water. In turn, the quality and quantity of the subsurface water is highly dependent upon conditions and human activities on the land surface. Water feeds into losing streams and sinkholes that drain into underground karst conduits. Surface water moves into the subsurface system by a number of mechanisms, including sinkholes, percolation through sandy or gravelly soils and stream bottoms, and seepage and flowage into crevices. As water moves from the surface to the subsurface system, it carries the chemicals and particulate matter from the surface (Gines and Gines 1992). The land surface that feeds water into a particular cave stream is referred to as the "recharge area" for that cave stream. Because recharge areas may be large and may consist of all or parts of several surface watersheds, it is critically important to accurately determine the boundaries of the recharge area with reliable hydrogeological methods. Only when the recharge area is accurately delineated can water quality threats be successfully addressed (Aley and Aley 1991).

The recharge area that feeds water into Tumbling Creek Cave has been recently delineated by the cave owner, Mr. Thomas Aley of the OUL, who is also a recognized cave specialist and expert karst hydrogeologist (Aley and Aley 2001). Pending the results of additional recharge delineation studies currently being conducted by Aley on a tract of land recently purchased by him and Cathy Aley (Tom Aley, pers. comm., September 24, 2001), he estimated the recharge area to be approximately 2,349 hectares (5,804 acres or 9.07 square miles). Land ownership based on current data within the recharge area is: (1) Tom and Cathy Aley own approximately 1,550 acres, or

25 percent of the total; (2) employees of Ozark Underground Laboratory and other private individuals, who manage their property to protect water quality and benefit the species, own approximately 1,268 acres or 22 percent; (3) an estimated 1,300 acres or 23 percent is within Mark Twain National Forest; (4) the U.S. Army Corps of Engineers (CE) owns an estimated 100 acres or 2 percent; and (5) other private landowners, whose land use practices and knowledge of the cavesnail are currently unknown to us, own approximately 1,636 acres or 28 percent. Thus, within the delineated recharge area for Tumbling Creek Cave, roughly 4,168 acres or approximately 72 percent is either in public or private ownership by entities who can be expected to manage their land to benefit the species. This includes 920 acres recently purchased by Tom and Cathy Aley, or about 22 percent of the total conservation ownership. However, most of this recently purchased land was subject to land use practices (e.g., overgrazing and removal of riparian vegetation) by the previous owner that resulted in heavy soil erosion that probably continues to contribute to deteriorating water quality in Tumbling Creek Cave. Remediation and restoration of these lands are planned and will require considerable funds, effort, and time.

The Tumbling Creek cavesnail is likely threatened by habitat degradation through diminished water quality from upstream locations within the unprotected or improperly managed areas within the cave's delineated recharge zone. The dramatic decrease in the population and area occupied by this species is probably attributable to degraded water quality from these sources. In recent years, there has been a noticeable increase in water turbidity in Tumbling Creek; the increased turbidity has probably had an adverse effect on the water quality in the cave's stream (Tom and Cathy Aley, pers. comm., August 30, 2001). Increased silt loads within Tumbling Creek could adversely affect the cavesnail by hampering reproduction and recruitment by suffocating juvenile cavesnails (Ashley 2000). Several authors (e.g., Poulson 1996, Elliott 2000, Taylor *et al.* 2000) have noted that high sediment loads usually have a negative impact on aquatic species. Tom and Cathy Aley have also observed that clay particles within deposited silt have settled between gravel and rocks and cemented them together and to the stream bottom (Tom and Cathy Aley, pers. comm., August 2001). Such

cementing decreases habitat available to cavesnails, especially interstitial areas, because the species is generally restricted to the undersurface of gravel and rocks. Coineau and Boutin (1992) demonstrated that interstitial habitats are critically important to the dispersal capabilities of animals with limited movements. Comacho (1992) suggested that the size, porosity, and compaction of sediment grains (e.g., clay vs. sand) was a limiting factor in the availability of interstitial habitats to aquatic cave organisms. Interestingly, Ashley (2000) determined that some Tumbling Creek cavesnails use silt-covered substrates. This is different from the observations made by Greenlee (1974) who noted that cavesnails were not observed in areas of the stream where fine silt was deposited. Ashley's observations may be due to a reduction in the amount of silt-free substrates preferred by cavesnails which could force the species to use less favorable habitats. Although silt has been a component of Tumbling Creek since Greenlee's initial survey in 1974, it has apparently increased since that date (Tom and Cathy Aley, pers. comm., August 2001).

Silt could also be harmful to *Antrobia culveri* indirectly due to the interrelationship between various harmful bacteria or viruses and some sediment mediums. Taylor and Webb (2000) reported that the survival of some bacteria and viruses may increase when they become attached to the surface of silt and clay particles and organic matter. Additionally, they noted that such harmful bacteria as coliform and fecal coliform bacteria "may persist and reach much higher concentrations in aquatic sediments (especially in the presence of organic nutrients) than in the water column." Consequently, an increase of silt into Tumbling Creek could exacerbate the potential problems from bacteria and viruses originating from livestock wastes entering Tumbling Creek. Additional research is needed to determine the degree of silt deposition within Tumbling Creek and if the deposition of silt into the cave is adversely impacting the species, especially smaller and younger individuals (Ashley 2000).

Potential sources of silt within the cave's recharge area have been identified on the two tracts recently purchased by Tom and Cathy Aley, including an earthen dam that burst, as well as severely degraded and eroded pastureland due to overgrazing. In the latter case, soil erosion has been exacerbated in the last six years by the removal of nearly all vegetation by bulldozing equipment within the riparian corridors of all semi-permanent

and intermittent streams on one of those parcels. Tree removal activities associated with pasture expansion have increased soil erosion and resulted in the subsequent movement of silt into the cave system (Aley, Ashley, and McKenzie, pers. obs.). Harvey (1980) concluded that "accelerated erosion and sediment transport" was a problem within drainage basins that have "excessive slopes," and identified "timber cutting and land clearing for raising livestock, extending urban sprawl, and highway building" as potential sources of "accelerated erosion." In addition to these sources, the construction of fire lanes associated with controlled burning on Forest Service property within the recharge area may increase the threat of soil erosion with a resulting decrease in water quality in Tumbling Creek.

Other factors within the recharge area of Tumbling Creek Cave that could contribute to the deterioration of the water quality of Tumbling Creek include: (1) Nutrient enrichment from livestock feedlots or from fertilizers used for crop production or pasture improvement within the recharge area that could reduce dissolved oxygen levels in Tumbling Creek or become toxic to aquatic organisms at high concentrations; (2) chemicals used for highway maintenance or from accidental spills; (3) contaminants from different types of trash or hazardous waste materials deposited into sinkholes, ravines, and depressions; and (4) contamination from hormones, antibiotics, disinfectants, or other chemicals found in human and livestock wastes (Koplin *et al.* 2002). Contaminants presumably from crop fertilizers were detected at levels high enough in cave streams within the Perryville Karst Region of southeastern Missouri to be detrimental to aquatic life (Vandike 1985; Burr *et al.* 2001). Contamination of groundwater has occurred due to spills associated with traffic accidents in the Mammoth Cave area of Kentucky (U.S. Department of Interior 1983; U.S. Fish and Wildlife Service 1988; Taylor *et al.* 2000). Because portions of Routes 160 and 125 occur within the recharge area for Tumbling Creek Cave, accidental spills resulting from traffic accidents could potentially occur. Taylor and Webb (2000) summarized the deleterious effects of various inorganic ions on the distribution and abundance of different aquatic cave isopods and amphipods. Taylor *et al.* (2000) suggested that several parameters, including depressed oxygen levels, improper pH levels, and the presence of metals, pesticides, and

harmful bacteria may all contribute to the persistence or decline of aquatic cave organisms. Burr *et al.* (2001) reported that "no less than one-half of sinkholes in Perry County, MO, contain anthropomorphic refuse, ranging from household cleansers and sewage to used pesticide and herbicide containers." Some unidentified point source pollution that was apparently dumped accidentally into Running Bull Cave in Perry County, MO, resulted in a mass mortality of cave-dwelling grotto sculpin (Burr *et al.* 2001). Elliott (2000) summarized the documented impact of various chemical pollutants into cave systems including sewage, contaminants from old batteries, nitric acid, leaks from petroleum products, brine pollution, herbicides, pesticides, solvents, fertilizers, milk, cream, tobacco waste products, and medical waste. Kolpin *et al.* (2002) sampled 139 streams across 30 States, including Missouri, and documented the presence of human and livestock antibiotics, human prescription and nonprescription drugs, steroid compounds including several biogenic and synthetic reproductive compounds, and 30 different organic wastewater contaminants in 80 percent of the streams sampled. Although there are no waste water treatment facilities within the recharge area for Tumbling Creek cave, livestock antibiotics, hormones, and chemical treatments for controlling insect pests could originate from livestock facilities that occur within the cave's recharge area. The extent to which any of these factors have contributed to the decline of the Tumbling Creek cavesnail remains to be determined. Refer to Factor E for further discussion of these potential threats.

#### *B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes*

Because access to Tumbling Creek Cave is controlled by the cave owners, all collection of and research on *Antrobia culveri* is strictly controlled. Consequently, there is no evidence, and very little likelihood, of overutilization of this species for commercial, recreational, scientific, or educational purposes. There is also no evidence that disturbance associated with conducting regular surveys is adversely affecting the species. Rocks that are examined for cavesnails are carefully replaced in the location from which they were removed, any specimens discovered are disturbed as little as possible and kept moist to reduce stress, and only a small percentage of the available habitat is sampled during each survey.

#### *C. Disease or Predation*

The direct effect of disease on the Tumbling Creek cavesnail is not known and such risks to the species have not been determined. Because the Tumbling Creek cavesnail is known to inhabit only a single location, disease must be considered a potential significant threat to the survival of the species. Certain species of salamanders have been shown to be adversely impacted by the bacterium *Acinetobacter* that flourished due to increasing levels of nitrogen associated with the overstocking of livestock (Worthylake and Hovingh 1989). Similarly, Lefcort *et al.* (1997) and Kiesecker and Blaustein (1997) found that amphibians exposed to high levels of silt are susceptible to infection by different species of water mold of the genus *Saprolegnia*. *Saprolegnia* spp. are widespread in natural waters and commonly grow on dead organic material (Wise *et al.* 1995). Speer (1995) stated that some species of *Saprolegnia* are parasitic on aquatic invertebrates such as rotifers, nematodes, diatoms, and arthropods. High nitrogen and silt levels from overgrazing or other agricultural or urban runoff may increase the cavesnail's susceptibility to disease and may act synergistically with other risk factors (e.g., competition from limpets, discussed below) to jeopardize the survival of the remaining individuals. Whether the Tumbling Creek cavesnail is being adversely affected by bacteria or water molds associated with increased loads of nitrogen or silt into Tumbling Creek is unknown but warrants further investigation.

During the December 6, 1997, survey, a few individuals of an unknown species of limpet (*Ferrissia* sp.) were discovered for the first time on the same substrates used by *Antrobia culveri* within the established monitoring stations (Ashley, pers. comm., September 10, 2001). Limpets were not observed again until the January 11, 2001, survey, after which their numbers began to increase. By the August 31, 2001, survey, limpet numbers had increased explosively, and the presence of many small limpets, as well as larger limpets with visible, developing embryos, indicated that reproduction was taking place (Ashley, pers. comm., September 10, 2001; McKenzie pers. obs.) The reasons that caused these organisms to appear and increase in numbers within Tumbling Creek are unknown; it is also unknown whether they compete with the cavesnails for food, breeding substrates, or other necessary resources. Dr. Julian J. Lewis documented that the disappearance of

the rare isopod crustacean *Caecidotea rotunda* coincided with the appearance of limpets in a cave in southern Indiana (J. Lewis, *in litt.*, January 27, 2002). Numerous investigations by David Culver and others (e.g., Culver 1970, 1975) have demonstrated that interspecific competition between aquatic cave invertebrates may reduce the availability of important niche habitats. Other cave invertebrates (e.g., a troglobitic isopod, *Caecidota antricola*; a troglobitic amphipod, *Stygobromus* sp.; and a troglomorphic amphipod, *Gammarus* sp.) coexist with *A. culveri*, often on the same rocks, but it is unknown if these species compete with the cavesnail in any way. Additional research is needed to determine if local environmental changes have provided a competitive advantage for one or more of these species over the Tumbling Creek cavesnail.

#### D. The Inadequacy of Existing Regulatory Mechanisms

The primary cause of the decline of the Tumbling Creek cavesnail is unknown but is believed to be associated with factors within the 2,349-hectare (5,804-acre) delineated recharge area that have adversely affected the water quality of Tumbling Creek. Federal, State, and local laws have not been sufficient to prevent past and ongoing impacts to areas within the cave's delineated recharge area. *Antrobia culveri* is listed as critically imperiled globally (G1) by The Nature Conservancy, as well as critically imperiled in the State (S1) on the *Missouri Species of Conservation Concern Checklist* (Missouri Natural Heritage Program 2001). The designation as G1/S1 on this checklist, however, provides no legal protection, but is simply utilized for planning and communication purposes (Missouri Natural Heritage Program 2001). Nonetheless, the species currently receives some protection under the *Wildlife Code of Missouri* (Wildlife Code) (Missouri Department of Conservation 2001) as a "biological diversity element" (Missouri Natural Heritage Program 2001). "Biological diversity elements" are protected under the following general prohibitions of chapter 4 of the Wildlife Code (3CSR10-4.110): "(1) No bird, fish, amphibian, reptile, mammal or other form of wildlife, including their homes, dens, nests and eggs in Missouri shall be molested, pursued, taken, hunted, trapped, tagged, marked, enticed, poisoned, killed, transported, stored, served, bought, imported, exported or liberated to the wild in any manner, number, part, parcel or quantity, at any

time, except as specifically permitted by these rules and any laws consistent with Article IV, sections 40-46 of the *Constitution of Missouri*. (2) Except as otherwise provided in this Code, wildlife may be taken only by holders of the prescribed permits and in accordance with prescribed methods. (3) No person, corporation, municipality, county, business or other public or private entity shall cause or allow any deleterious substance to be placed, run or drained into any of the waters of this State in quantities sufficient to injure, stupefy or kill fish or other wildlife which may inhabit such waters."

Under the Section 6 Cooperative Agreement between MDC and the Service, if a species is listed as endangered under the Act, the Conservation Commission of Missouri shall list the species as State endangered. The protection of all species in Missouri is outlined in Chapter 4 of the Wildlife Code, and regulations pertaining to endangered species are listed in section 3CSR10-4.111. Under the Wildlife Code, citizens can possess (but not sell or purchase) up to five individuals of any species without a permit and when not specifically protected elsewhere in the code (3CSR10-9.110). However, when a species is listed as endangered, citizens cannot possess any individuals and cannot import, transport, purchase, or take the species without a scientific collecting or special use permit. Although the term "refuge" is not defined under the Wildlife Code, there is also a provision that enables MDC's Director to establish refuges not to exceed 1 square mile for not more than 60 days to provide essential protection to endangered species. Furthermore, the Wildlife Code states that a species' "home" is protected. The term "home" is not defined in this statute and may provide limited or no protection for the cavesnail's habitat. For instance, the creek where the cavesnail resides and the cave's recharge area would probably not be considered a home and thus receive no protection under the Wildlife Code (Bob White, MDC, Protection Division Chief, pers. comm., October 2, 2001).

The Federal Cave Resources Protection Act of 1988 (18 U.S.C. 4301-4309; 102 Stat. 4546) was passed to "secure, protect, and preserve significant caves on Federal lands" and to "foster increased cooperation and exchange of information between governmental authorities and those who utilize caves located on Federal lands for scientific, educational, or recreational purposes." Although this statute and a final rule to implement the

Federal Cave Resources Protection Act on Forest Service land (59 FR 31152; June 17, 1994) provide protection for caves located on property owned by the Forest Service, they do not provide protection for caves whose recharge areas are within Forest Service boundaries if the caves themselves are under private lands, as is the case with Tumbling Creek Cave.

Under Section 578.215 of the Missouri Cave Resources Act (Missouri Department of Conservation 2002), the following actions are prohibited: "A person shall not purposely introduce into any cave, cave system, sinkhole, or subsurface waters of the state any substance that will or could violate any provision of the Missouri clean water law as set forth in chapter 204, RSMo (Revised Statutes of Missouri), or any water quality standard or effluent limitation promulgated pursuant thereto." Although this statute is intended to prevent harmful chemicals from being placed into a cave, it is rarely enforced, and an individual prosecuted for a violation of this measure can be convicted of no more than a Class A misdemeanor; therefore, it is largely ineffective at providing protection for aquatic animals within a cave stream (Bill Elliott, Cave Biologist, Missouri Department of Conservation, Jefferson City, MO, pers. comm., March 15, 2002).

The protection afforded *Antrobia culveri* from the statutes mentioned above is limited, does not provide adequate protections to its habitat, and includes no provisions to protect areas within the delineated recharge area for Tumbling Creek Cave. Therefore, we conclude the most likely threats to the species cannot be addressed by existing regulatory mechanisms.

#### E. Other Natural or Manmade Factors Affecting Its Continued Existence

Several other potential factors, including point and non-point pollution, threats from residential and commercial development, and recent changes to the hydrological cycle within the 2,349-hectare (5,804-acre) delineated recharge area supporting Tumbling Creek Cave may have negative effects on the species. It is possible that the recent decline in cavesnail numbers is attributable to some yet to be identified point or non-point source pollution within the cave's recharge area. Because the Tumbling Creek cavesnail occupies a permanent, flowing stream, it will likely come in contact with any deleterious chemical or other material that enters the cave's recharge system. Silt deposition has been identified as a potential problem, especially to younger

cohorts of the cavesnail's population, but additional research is needed to determine if other contaminants are potentially involved. (See Factor A above.)

Non-point source pollution may be a problem in a significant portion of the recharge area that feeds Tumbling Creek Cave. Potential sources of pollution include the drainage of barnyard and feedlot wastes and the discharge of treated sewage into sinkholes and losing streambeds within the cave's recharge area. The water quality of Tumbling Creek may also be threatened due to accidental spills into sinkholes or losing stream valleys feeding Tumbling Creek Cave from State and county highways passing through the recharge area. Such sources of pollution have been identified as potential problems for ground water in the Springfield-Salem Plateaus of southern Missouri (including the watershed that encompasses Tumbling Creek and its identified recharge zone) (Harvey 1980). The decline in numbers of the Tumbling Creek cavesnail may be due to one or several sources of pollution that have resulted in a deterioration of water quality within the recharge area for Tumbling Creek as outlined in Factor A. In comparing the quality of groundwater sites within the Ozark Plateaus (including southwestern Missouri) with other National Water-Quality Assessment Program (NAWQA) sites, Petersen *et al.* (1998) documented that: (1) Nitrate concentrations in parts of the Springfield Plateau aquifer were higher than in most other NAWQA drinking-water aquifers, and (2) volatile organic compounds were detected more frequently in drinking-water aquifers within the Ozark Plateaus than in most other drinking-water aquifers. Tumbling Creek Cave is within the NAWQA study boundaries; consequently, the cavesnail could be threatened from these contaminants. Peck (1998) concluded that all aquatic cave species were especially vulnerable to karst groundwater pollution. Elliott (2000) summarized numerous examples of cave systems being contaminated by a wide range of pollutants that are directly or indirectly dumped into cave streams and further suggested that reduced biotic diversity correlated with degraded water quality in three caves in Tennessee. Although no detailed water analyses have yet been performed on Tumbling Creek, an instrumentation package to measure water quality parameters will be installed in Tumbling Creek Cave during the summer of 2002.

Aley (pers. comm., Jan. 19, 2001) postulated that the decline in cavesnail

numbers may actually be because of too much gray bat guano that could deplete oxygen levels in Tumbling Creek, especially during periods of reduced flows as occurred during 1999–2001. Vandike (1982) and Elliott (2000) reported on a massive die-off of the Salem cave crayfish (*Cambarus hubrichti*) and the southern cavefish (*Typhlichthys subterraneus*) when a large quantity of liquid fertilizer containing ammonium nitrate and urea accidentally spilled into a losing stream and significantly lowered dissolved oxygen levels in Meramec Spring, which is 21 km (13 mi) downstream from the spill. What importance gray bat guano plays in the life history requirements of the Tumbling Creek cavesnail is yet to be tested experimentally. The instrumentation package mentioned above will provide data on dissolved oxygen levels once it is installed.

Tumbling Creek Cave is approximately 45 km (28 mi) southeast of Branson, MO, which is one of the most rapidly expanding areas in the State due to tourism, outdoor recreation, and entertainment developments. If recent trends continue, it has been projected that the number of visitors attracted to this area would increase from an estimated level of 6 million in 1992 to 11 million by the year 2015. The accompanying growth in entertainment- and recreation-related activities will place even greater demands on this area of the State (Mullen and Keith 1992). Tumbling Creek Cave is about 4 km (2.5 mi) northwest of Bull Shoals Lake which is also undergoing additional real estate development. Consequently, it is likely that sections of the recharge zone for Tumbling Creek Cave will be adversely affected by real estate development and related construction and land management activities. Elliott (2000) provided multiple examples of how various land development activities have adversely impacted important karst resources in the eastern United States.

Another potential threat to the species results from the close hydrologic association of Tumbling Creek with nearby Bull Shoals Lake. Occasional high water levels in this CE reservoir are believed to cause water to backup into the cave stream, threatening roosting bats and the cavesnail (Aley, pers. comm., July 16, 2000). The CE is considering raising the conservation pool of the reservoir by 10 feet, which will likely increase the frequency and duration of the backup events in Tumbling Creek Cave. Lewis (1994) reported that the habitat of the subterranean hydrobiid snail

*Antroselates spiralis* in Mammoth Cave, KY, was reduced significantly due to ponding of the adjacent Green River by a dam downstream of the cave. The back-flooding created a siltation problem that fragmented previously occupied areas into disjunct islands of habitat (J. Lewis *in litt.*, January 27, 2002).

Climatic changes, especially recent periods of drought, may also be a contributing factor to the decline of the cavesnail. The National Oceanic and Atmospheric Administration's (NOAA) Palmer Drought Severity Index provides a widely recognized and accepted standard measurement of moisture conditions (NOAA 2001). The Index varies roughly from -6.0 (extreme drought) to +6.0 (extremely wet), with -0.49 to 0.49 indicating near normal conditions. Since the 1974 survey by Greenlee, there have been 4 periods in Southwest Missouri where the Index was below normal for 6 months or longer and was below an Index value of -2.0 (moderate drought) for some part of that period. These events occurred in 2-year cycles: 1980–1981; 1991–1992; 1995–1996; and 1999–2000. The 1980–1981 drought was the most prolonged and severe, with the Index reaching -5.0 (extreme drought). We further analyzed a 6-year period between 1995 and 2000, which is the approximate period that Ashley conducted his cavesnail monitoring. The Index was below normal for 6 months or more for 4 of these 6 years. The years, number of months the Index was below normal, and the averages for the negative indices are: 1995, 6 months, average Index -1.54; 1996, 7 months, average Index -1.2; 1999, 6 months, average Index -1.29; 2000, 10 months, average Index -1.65. Preliminary data on NOAA's Web site indicate that below-normal moisture (negative Palmer Index) occurred in this region during the early part of 2001, but precipitation levels are now near normal.

According to these climatic data, in 2 recent periods (1995–1996 and 1999–2000) precipitation within the recharge area for Tumbling Creek Cave was below normal for an extended period. The direct or indirect impacts of these droughts on the cavesnail are unknown. Reduced flows in the cave stream, especially when combined with other threats, could hamper essential life history requirements (*e.g.*, reproduction, food availability, water temperature); decrease the flushing of silt, guano, and harmful contaminants from the stream; and create an environment more favorable for competitors (*e.g.*, limpets, isopods, and amphipods).



The small population size and endemism (*i.e.*, restricted to a single site) of *Antrobia culveri* makes it vulnerable to extinction due to genetic drift, inbreeding depression, and random or chance changes to the environment (Smith 1990) that can significantly impact cavesnail habitat. Inbreeding depression can result in death, decreased fertility, smaller body size, loss of vigor, reduced fitness, and various chromosome abnormalities (Smith 1990). Despite any evolutionary adaptations for rarity, habitat loss and degradation increase a species' vulnerability to extinction (Noss and Cooperrider 1994). Numerous authors (*e.g.*, Noss and Cooperrider 1994, Thomas 1994) have indicated that the probability of extinction increases with decreasing habitat availability. Although changes in the environment may cause populations to fluctuate naturally, small and low-density populations are more likely to fluctuate below a minimum viable population (*i.e.*, the minimum or threshold number of individuals needed in a population to persist in a viable state for a given interval; Gilpin and Soule 1986, Shaffer 1981, Shaffer and Samson 1985). Current threats to the habitat of the Tumbling Creek cavesnail may exacerbate potential problems associated with its low population numbers and increase the chances of this species going extinct.

### Conclusion

Tumbling Creek cavesnail is known from a single cave in Taney County, southwestern Missouri. The distribution of this species has decreased in Tumbling Creek by 90 percent since 1974. Analysis of survey data collected at established sampling points between September 9, 1996, and March 23, 2002, indicates that numbers of the species have decreased significantly, and the cavesnail is vulnerable to extinction. This decline has continued to the point that cavesnails are no longer present in portions of Tumbling Creek where they had always been found prior to 2001 using the same monitoring methodology. The Tumbling Creek cavesnail is likely threatened by habitat degradation through diminished water quality from upstream locations within the unprotected or improperly managed areas within the cave's delineated recharge zone. The dramatic decrease in the population and area occupied by this species is probably attributable to degraded water quality from one or a number of the following sources: siltation from poor land management practices within the cave's recharge area; contamination from numerous chemicals associated with point or non-

point source pollution; or imbalances in dissolved oxygen, pH, or cation/anion exchange. The species may also be threatened with competition from limpets or from changes in the cave's normal hydrological cycles due to recent droughts. Because the sudden population decline and high magnitude of threats demonstrates a significant and imminent risk to the well-being of the Tumbling Creek cavesnail, we find that listing this species as endangered is appropriate.

In making this determination, we have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by the Tumbling Creek cavesnail. From the discussion under Factor D of this section, it is clear that currently applicable Federal, State, and local laws, regulations, and ordinances, individually and collectively, do not provide adequate protection for the Tumbling Creek cavesnail or its habitat or assure that the species will continue to survive.

We believe that the survival of the Tumbling Creek cavesnail now depends on protecting the delineated recharge area of Tumbling Creek Cave from further degradation and restoring and rehabilitating areas within the recharge area to improve the water quality in Tumbling Creek. The small remaining population is vulnerable to extinction from ongoing threats, as well as from random natural or human-caused events unless sufficient habitat is protected, water quality improves, and the current small population greatly increases in size. The recent rapid population decline makes it clear that this cavesnail is on the brink of extinction. By listing the Tumbling Creek cavesnail as an endangered species, we believe the additional protection, funding, and recognition that immediately become available to the species will greatly increase the likelihood that extinction can be prevented and the species ultimately recovered.

We are making this rule effective immediately in order to ensure there is no gap in the protection provided by the Act to the Tumbling Creek cavesnail. The temporary protection that was provided by our emergency listing of the species on December 27, 2001, ends on August 26, 2002. This final rule results in no change to the temporary protection and regulatory authority that was provided by the emergency listing, so there is no overriding need for a delayed effective date in order to provide adequate time to notify individuals, agencies, and organizations of new regulations that may affect them.

### Critical Habitat

Critical habitat is defined in section 3 of the Act as: (i) The specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. "Conservation" means the use of all methods and procedures needed to bring the species to the point at which listing under the Act is no longer necessary.

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12) require that, to the maximum extent prudent and determinable, we designate critical habitat at the time the species is determined to be endangered or threatened. However, our budget for listing and critical habitat activities is currently insufficient to allow us to immediately complete all of the listing actions required by the Act. Listing the Tumbling Creek cavesnail without designation of critical habitat will allow us to concentrate our limited resources on other listing actions that must be addressed, while allowing us to invoke protections needed for the conservation of this species without further delay. This is consistent with section 4(b)(6)(C)(i) of the Act, which states that final listing decisions may be issued without critical habitat designations when it is essential that such determinations be promptly published. The legislative history of the 1982 Act amendments also emphasized this point: "The Committee feels strongly, however, that, where biology relating to the status of the species is clear, it should not be denied the protection of the Act because of the inability of the Secretary to complete the work necessary to designate critical habitat. \* \* \* The committee expects the agencies to make the strongest attempt possible to determine critical habitat within the time period designated for listing, but stresses that the listing of species is not to be delayed in any instance past the time period allocated for such listing if the biological data is clear but the habitat designation process is not complete." (H.R. Rep. No. 97-567 at 20 (1982)). If prudent and determinable, we will prepare a critical habitat proposal in the future at such time as our

available resources and other listing priorities under the Act will allow.

#### Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness and conservation actions by Federal, Tribal, State, and local agencies, private organizations, and individuals. The Act provides for possible land acquisition and cooperation with the State and requires that recovery actions be carried out for all listed species. The protection required of Federal agencies and the prohibitions against certain activities involving listed species are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened, and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. If a species is listed on an emergency basis, or is listed under a non-emergency listing proposal, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal agency action may adversely affect a listed species or adversely modify its designated critical habitat, the responsible Federal agency must initiate formal consultation with the Service. Section 7(a)(4) of the Act requires Federal agencies to confer with us on any action that is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat. Federal agency actions that may affect the Tumbling Creek cavesnail and may require consultation with the Service include, but are not limited to, those within the jurisdiction of the U.S. Forest Service, U.S. Army Corps of Engineers, Natural Resources Conservation Service, Environmental Protection Agency, and Federal Highway Administration.

The Act and its implementing regulations found at 50 CFR 17.21 set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to

take (including harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or attempt any such conduct), import or export, ship in interstate or foreign commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to Service agents and those of State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered wildlife under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22 and 17.23. For endangered species, such permits are available for scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities.

As published in the **Federal Register** on July 1, 1994 (59 FR 34272), it is the Service's policy to identify, to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of the listing on proposed and ongoing activities within a species' range.

We believe that, based on the best available information, the following actions are not likely to result in a violation of section 9, provided these actions are carried out in accordance with any existing regulations and permit requirements:

(1) Possession of a Tumbling Creek cavesnail legally acquired prior to the effective date of this rule;

(2) Actions that may affect the Tumbling Creek cavesnail that are authorized, funded, or carried out by a Federal agency, when the action is conducted in accordance with an incidental take statement issued by the Service under section 7 of the Act;

(3) Actions that may affect the Tumbling Creek cavesnail that are not authorized, funded, or carried out by a Federal agency, when the action is conducted in accordance with an incidental take permit issued by the Service under section 10(a)(1)(B) of the Act. Applicants design a Habitat Conservation Plan (HCP) and apply for an incidental take permit. These HCPs are developed for species listed under section 4 of the Act and are designed to minimize and mitigate impacts to the species to the greatest extent practicable; and

(4) Actions that may affect the Tumbling Creek cavesnail that are

conducted in accordance with the conditions of a section 10(a)(1)(A) permit for scientific research or to enhance the propagation or survival of the species.

We believe that the following actions could result in a violation of section 9; however, possible violations are not limited to these actions alone:

(1) Unauthorized possession, collecting, trapping, capturing, killing, harassing, sale, delivery, or movement, including interstate and foreign commerce, or harming, or attempting any of these actions, of Tumbling Creek cavesnails without a permit (research activities where cavesnails are collected will require a permit under section 10(a)(1)(A) of the Endangered Species Act);

(2) Illegal discharges or dumping of toxic chemicals, silt, or other pollutants (point source and non-point source pollution) within the recharge area of Tumbling Creek Cave that alters or degrades the water quality of Tumbling Creek to the point that it results in death or injury to individuals of the species or results in degradation of cavesnail-occupied habitat;

(3) Intentional release of exotic species (including, but not limited to, fish and crayfish) into Tumbling Creek that adversely affect the cavesnail;

(4) Unlawful destruction or alteration of the species' occupied habitat (e.g., vandalism to Tumbling Creek); and

(5) Violation of any discharge or water withdrawal permit within Tumbling Creek.

We will review other activities not identified above on a case-by-case basis to determine whether they are likely to result in a violation of section 9 of the Act. We do not consider these lists to be exhaustive and provide them as information to the public.

Questions regarding whether specific activities will constitute a violation of section 9 should be directed to the Field Supervisor of the Columbia, Missouri Field Office (**see FOR FURTHER INFORMATION CONTACT**).

Requests for copies of the regulations regarding listed species and inquiries regarding prohibitions and permits may be addressed to the U.S. Fish and Wildlife Service, Endangered Species Permits, Bishop Whipple Federal Building, 1 Federal Dr., Fort Snelling, MN 55111-4056 (612/713-5343, facsimile 612/713-5292).

#### National Environmental Policy Act

The Service has determined that an Environmental Assessment, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with

regulations adopted pursuant to section 4(a) of the Endangered Species Act, as amended. The Service published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

**Paperwork Reduction Act**

This rule does not contain any collections of information that require additional Office of Management and Budget (OMB) approval under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* An information collection related to the rule pertaining to permits for endangered and threatened species has OMB approval and is assigned control number 1018-0094, which expires on July 31, 2004. This rule does not alter that information collection requirement. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid control number. For additional information concerning permits and associated requirements for endangered wildlife, see 50 CFR 17.21 and 17.22.

**Effective Date**

This rule is effective upon publication. The Administrative

Procedures Act provides Federal agencies a means under 5 U.S.C. (d)(3) for making rules effective less than 30 days following publication in the **Federal Register** for "good cause." We believe that we have good cause for making this rule effective upon publication. The emergency listing rule for the Tumbling Creek cavesnail was published in the **Federal Register** on December 27, 2001 (66 FR 66803). That rule listed the Tumbling Creek cavesnail as endangered on an emergency basis for 240 days through August 26, 2002. We are now publishing a final rule to the proposed rule (66 FR 66868) that we published on the same day as the emergency listing rule. To continue to provide this species the protections of the Act originally provided under the emergency rule, we must make this final rule effective upon publication.

**References Cited**

A complete list of all references cited in this rulemaking is available upon request from the Field Supervisor, Columbia Field Office (see **ADDRESSES**).

**Author**

The primary author of this proposed rule is Paul M. McKenzie, Ph.D., U.S.

Fish and Wildlife Service, Columbia Field Office (see **ADDRESSES**).

**List of Subjects in 50 CFR Part 17**

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

**Regulation Promulgation**

For the reasons given in the preamble, we amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

**PART 17—[AMENDED]**

1. The authority citation for part 17 continues to read as follows:

**Authority:** 16 U.S.C. 1361-1407; 16 U.S.C. 1531-1544; 16 U.S.C. 4201-4245; Pub. L. 99-625, 100 Stat. 3500, unless otherwise noted.

2. Amend § 17.11(h) by adding the following, in alphabetical order under SNAILS, to the List of Endangered and Threatened Wildlife:

**§ 17.11 Endangered and threatened wildlife.**

\* \* \* \* \*  
(h) \* \* \*

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*	*	*
SNAILS							
*	*	*	*	*	*	*	*
Cavesnail, Tumbling Creek	<i>Antrobia culveri</i> .....	U.S.A. (MO) .....	NA .....	E	731	NA	NA
*	*	*	*	*	*	*	*

Dated: July 26, 2002.  
**Steve Williams,**  
*Director, Fish and Wildlife Service.*  
 [FR Doc. 02-20339 Filed 8-13-02; 8:45 am]  
**BILLING CODE 4310-55-P**

**DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
**50 CFR Part 660**

[Docket No. 020430101-2101-01; I.D. 080202E]

**Fisheries Off West Coast States and in the Western Pacific; West Coast Salmon Fisheries; Inseason Action 7-Adjustment of the Commercial Fishery from the U.S.-Canada Border to Cape Falcon, OR**

**AGENCY:** National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

**ACTION:** Adjustment; request for comments.

**SUMMARY:** NMFS announces that the commercial fishery for all salmon except coho in the area from the U.S.-Canada Border to Cape Falcon, OR, was modified to reopen on July 26 and close at midnight, August 5, 2002, with a vessel limit of 500 chinook salmon for the 11-day open period. The Northwest Regional Administrator, NMFS (Regional Administrator), determined that available catch and effort data indicated that these management measures should be implemented to provide fishers greater access to the chinook and coho quotas. This action was necessary to conform to the 2002 management goals.