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Endangered and Threatened Wildlife and Plants; Endangered Status for Grotto Sculpin and Designation of Critical Habitat; Proposed Rule

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R3–ES–2012–0065; 4500030113]

RIN 1018–AY16

Endangered and Threatened Wildlife and Plants; Endangered Status for Grotto Sculpin and Designation of Critical Habitat

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service, propose to list the grotto sculpin (*Cottus* sp. nov.) as an endangered species under the Endangered Species Act of 1973, and propose to designate critical habitat for the species. In total, all underground aquatic habitat underlying approximately 94 square kilometers (36 square miles) plus 31 kilometers (19.2 miles) of surface stream are being proposed for designation as critical habitat. The proposed critical habitat is located in Perry County, Missouri. If adopted, the effect of these regulations is to conserve grotto sculpin and its habitat under the Endangered Species Act.

DATES:

Written Comments: We will accept comments received or postmarked on or before November 26, 2012. Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES** section, below) must be received by 11:59 p.m. Eastern Time on the closing date. We must receive requests for public hearings, in writing, at the address shown in the **FOR FURTHER INFORMATION CONTACT** section by November 13, 2012.

Public Meeting: To better inform the public of the implications of the proposed listing and proposed critical habitat, and to answer any questions regarding this proposed rule, we plan to hold a public meeting on Tuesday, October 30 from 5–8 p.m. at the Perryville Higher Education Center, 108 South Progress Drive, Perryville, MO 63775.

ADDRESSES: *Written Comments:* You may submit comments by one of the following methods:

(1) *Electronically:* Go to the Federal eRulemaking Portal: *http://www.regulations.gov.* In the Search box, enter Docket No. FWS–R3–ES–2012–0065, which is the docket number for this rulemaking. Then, click the Search button. You may submit a comment by clicking on ''Comment Now!.'' If your comments will fit in the provided comment box, please use this feature of *http://www.regulations.gov,* as it is most compatible with our comment review procedures. If you attach your comments as a separate document, our preferred file format is Microsoft Word. If you attach multiple comments (such as form letters), our preferred format is a spreadsheet in Microsoft Excel.

(2) *By hard copy:* Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R3–ES–2012–0065; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

We request that you send comments only by the methods described above. We will post all comments on *http://www.regulations.gov.* This generally means that we will post any personal information you provide us (see the *Information Requested* section below for more information).

The coordinates or plot points or both from which the critical habitat maps are generated are included in the administrative record for this rulemaking and are available at *http://www.fws.gov/midwest/Endangered, www.regulations.gov* at Docket No. FWS–R3–ES–2012–0065, and at the Columbia Missouri Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**). Any additional tools or supporting information that we may develop for this rulemaking will also be available at the Fish and Wildlife Service Web site and Field Office set out above, and may also be included in the preamble and/or at *www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT: Amy Salveter, Field Supervisor, U.S. Fish and Wildlife Service, Columbia Missouri Ecological Services Field Office, 101 Park De Ville Drive, Suite A, Columbia, MO 65203; by telephone 573–234–2132; or by facsimile 573–234–2181. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION: This document consists of: (1) A proposed rule to list the grotto sculpin as an endangered species; and (2) a proposed critical habitat designation for the grotto sculpin.

Executive Summary

Why we need to publish a rule. A species may warrant protection through listing under the Endangered Species Act (Act) if it meets the definition of an endangered or threatened species throughout all or a significant portion of its range. This species has been a candidate for listing since 2002, but was precluded from listing by other higher priority actions. The grotto sculpin currently is afforded no protection under the Act, and, because of continued threats, it warrants the protections afforded by listing under the Act. We are proposing to list the grotto sculpin as an endangered species. Listing a species as an endangered species or threatened species and designating critical habitat can only be done by issuing a rule.

The basis for our action. Under the Act, we can determine that a species is an endangered or threatened species based on any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We have determined the threats to the species include:

- Habitat loss and degradation of aquatic resources, including such things as illegal waste disposal, chemical leaching, contaminated groundwater, vertical drains, urban development, sedimentation, and industrial sand mining.
- Predation by nonnative predators.
- Inadequate existing regulatory mechanisms that allow significant threats such as water contamination and exploitation of sinkholes.
- Other natural or manmade factors, including loss of genetic diversity, natural environmental variability, and climate conditions such as drought.

This rule proposes to designate critical habitat for the species. If prudent and determinable, we must designate critical habitat for endangered or threatened species. We are required to base the designation on the best available scientific data after taking into consideration economic and other impacts. We can exclude an area from critical habitat if the benefits of exclusion outweigh the benefits of designation, unless the exclusion will result in the extinction of the species. We are proposing to designate critical habitat in Perry County, Missouri, as follows:

- Two units comprised of all underground aquatic habitat underlying approximately 94 km^2 (36.28 mi^2).
- Two units that include approximately 31 kilometers (19.2 miles) of surface stream.

We are preparing an economic analysis. To ensure that we consider the economic impacts, we are preparing an economic analysis of the proposed designation.

We will seek peer review. We are seeking comments from independent specialists to ensure that our listing determination and critical habitat designation are based on scientifically sound data and analyses. We will invite these peer reviewers to comment, during the comment period, on our proposed listing and critical habitat designation. Because we will consider all comments and information received during the comment period, our final determination may differ from this proposal.

Information Requested

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from other concerned governmental agencies, Native American tribes, the scientific community, industry, or any other interested parties concerning this proposed rule. We particularly seek comments concerning:

(1) The species' biology, range, and population trends, including:

(a) Habitat requirements for feeding, breeding, and sheltering;

(b) Genetics and taxonomy;

(c) Historical and current range including distribution patterns;

(d) Historical and current population levels, and current and projected trends; and

(e) Past and ongoing conservation measures for the species, its habitat or both.

(2) The factors that are the basis for making a listing determination for a species under section 4(a) of the Act (16 U.S.C. 1531 *et seq.*), which are:

(a) The present or threatened destruction, modification, or curtailment of its habitat or range;

(b) Overutilization for commercial, recreational, scientific, or educational purposes;

(c) Disease or predation;

(d) The inadequacy of existing regulatory mechanisms; or

(e) Other natural or manmade factors affecting its continued existence.

(3) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to this species and existing regulations that may be addressing those threats;

(4) Additional information concerning the historical and current status, range, distribution, and population size of this species, including the locations of any additional populations of this species;

(5) The reasons why we should or should not designate habitat as ''critical habitat'' under section 4 of the Act (16 U.S.C. 1531 *et seq.*), including whether there are threats to the species from human activity, the degree of which can be expected to increase due to the designation, and whether that increase in threats outweighs the benefit of designation such that the designation of critical habitat is not prudent.

(6) Specific information on:

(a) The amount and distribution of grotto sculpin and its habitat,

(b) What may constitute ''physical or biological features essential to the conservation of the species,'' within the geographical range currently occupied by the species;

(c) Where these features are currently found,

(d) Whether any of these features may require special management considerations or protection;

(e) What areas, that were occupied at the time of listing (or are currently occupied) and that contain features essential to the conservation of the species, should be included in the designation and why,

(f) What areas not occupied at the time of listing are essential for the conservation of the species and why;

(7) Land use designations and current or planned activities in the areas occupied by the species or proposed to be designated as critical habitat, and possible impacts of these activities on this species and proposed critical habitat;

(8) Information on the projected and reasonably likely impacts of climate change on the grotto sculpin and proposed critical habitat;

(9) Any foreseeable economic, national security, or other relevant impacts that may result from designating any area that may be included in the final designation. We are particularly interested in any impacts on small entities, and the benefits of including or excluding areas from the proposed designation that are subject to these impacts;

(10) Whether our approach to designating critical habitat could be improved or modified in any way to provide for greater public participation and understanding, or to assist us in accommodating public concerns and comments;

(11) The likelihood of adverse social reactions to the designation of critical habitat and how the consequences of such reactions, if likely to occur, would relate to the conservation and regulatory benefits of the proposed critical habitat designation.

Please note that submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is a threatened or endangered species must be made ''solely on the basis of the best scientific and commercial data available.''

You may submit your comments and materials concerning this proposed rule by one of the methods listed in the **ADDRESSES** section. We request that you send comments only by the methods described in the **ADDRESSES** section.

If you submit information via *http://www.regulations.gov,* your entire submission—including any personal identifying information—will be posted on the Web site. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *http://www.regulations.gov.* Please include sufficient information with your comments to allow us to verify any scientific or commercial information you include.

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *http://www.regulations.gov,* or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Columbia Missouri Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Public Meeting: We have scheduled a public meeting to be held on Thursday, October 11, 2012 at the Perryville Higher Education Center, 108 South Progress Drive, Perryville, MO 63775. Any interested individuals or potentially affected parties seeking additional information on the public meeting should contact the Columbia Missouri Ecological Services Field Office (See **FOR FURTHER INFORMATION CONTACT**). The U.S. Fish and Wildlife Service is committed to providing access to this event for all participants. Please direct all requests for interpreters, close captioning, or other accommodation to the Columbia Missouri Ecological Services Field Office (See **FOR FURTHER INFORMATION CONTACT**) by 5 p.m. on October 4, 2012.

Previous Federal Actions

We first identified the grotto sculpin as a candidate species in a notice of review published in the **Federal Register** on June 13, 2002 (67 FR 40657). Candidate species are assigned listing priority numbers (LPNs) based on the immediacy and magnitude of threats, as well as taxonomic status. The lower the LPN, the higher priority that species is for us to determine appropriate action using our available resources. The grotto sculpin was assigned an LPN of 2 due to imminent threats of a high magnitude. On May 11, 2004, we received a petition dated May 4, 2004, from The Center for Biological Diversity to list 225 candidate species, including the grotto sculpin. From 2004 through 2011, notices of review published in the **Federal Register** (69 FR 24876, 70 FR 24870, 71 FR 53756, 72 FR 69034, 73 FR 75176, 74 FR 57804, 75 FR 69222, 76 FR 66370) continued to maintain an LPN of 2 for the species.

Status Assessment for Grotto Sculpin

Background

Species Description

The grotto sculpin (*Cottus* sp. nov.) is a cave-dwelling fish that exhibits characteristics typical of troglomorphic (adapted to living in constant darkness) organisms, including greatly reduced or absent eyes and skin pigmentation (Burr *et al.* 2001, p. 286). The grotto sculpin is moderately-sized relative to other species in the genus; the largest specimen examined by Adams *et al.* (unpub. data) was 104 millimeters (mm) (4.1 inches (in)) standard length (SL).

Taxonomy

The grotto sculpin belongs to the family Cottidae (Pflieger 1997, p. 253) and until recently was considered to be a member of the banded sculpin (*Cottus carolinae*) complex. The banded sculpin occurs in streams and rivers in adjacent watersheds; however no other *Cottus* overlaps the geographic range of the grotto sculpin. Burr *et al.* (2001, p. 293) demonstrated that hypogean (underground) grotto sculpin found in Perry County, Missouri, are morphologically distinct from the epigean (above ground) forms of banded sculpin found outside the Cinque Hommes Creek drainage in that they exhibit obvious troglomorphic characteristics and other unique anatomical variations. Although the occurrence of banded sculpin in subterranean waters is well known, none of these sculpin shows evidence of cave adaption exhibited by grotto sculpin, and none is known to be a permanent cave resident. Grotto sculpin are distinguished from all other *Cottus* species, except banded sculpin, by the complete lateral line terminating near the base of the caudal fin and lack of connection between dorsal fins (Adams *et al.* unpub. data). The grotto sculpin is distinct from the banded sculpin based on a reduction in eye size and an increase in cephalic lateralis pore size (Adams *et al.* unpub. data). Morphology of brain structures in hypogean individuals also differs significantly from that of epigean banded sculpin, including reduced optic and olfactory lobes and enlarged inferior lobe of the hypothalamus, eminentia granularis, and crista cerebellaris (Adams 2005, pp. 17–18).

Population genetics of *Cottus* sculpin in southeast Missouri also have been analyzed. Adams *et al.* (unpub. data) conducted a population genetics study of sculpin from the Bois Brule drainage in Perry County, the Greasy Creek in Madison County, and the Current River in Ripley County. Unique evolutionary lineages for each of the three areas, based on distinct nuclear haplotypes, were identified and supported. A single nuclear haplotype was identified among sampled individuals throughout the Bois Brule drainage (Mystery Cave, Running Bull Cave, Rimstone River Cave, Crevice Cave, Moore Cave, and Cinque Hommes Creek), a second from Greasy Creek, and a third from the Current River. Adams *et al.* (unpub. data) is in the process of formally describing the grotto sculpin as a taxonomically distinct species based on the combination of morphologic and genetic uniqueness. Morphological data alone are not definitive in supporting a unique taxonomic unit; however, morphological data augmented by the results of genetic analyses by Adams *et al.* (unpub. data) support the divergence of grotto sculpin from other *Cottus* species.

Life History and Habitat

Grotto sculpin occupy cave streams, resurgences (also known as ''spring branches'') (Vandike 1985, p. 10), springs, and two surface streams (Adams 2012, pers. comm.; Burr *et al.* 2001, p. 284). Resurgences refer to the point of emergence of a cave stream from the cave system and are an interface between strictly subterranean habitats (caves) and streams that flow only on the surface. Age-class distribution of grotto sculpin between cave and surface habitats shifts throughout the year, but in general, adults make up a higher percentage of overall grotto sculpin abundance in caves, whereas juveniles comprise a higher percentage of overall abundance on the surface (Gerken 2007, p. 14). Adults increase in abundance at resurgence sites in October, peak in December, and disappear from resurgence sites in January (Adams *et al.* 2008, p. 5). Such seasonal changes in adult abundance might be indicative of a subterranean migration for spawning (Adams 2005, p. 50).

The appearance of grotto sculpin young-of-year in spring and early summer suggests late winter and early spring spawning (Day 2008, p. 18). The distance grotto sculpin travel upstream in caves is unknown, but a nest has been observed 0.6 meters (m) (2 feet (ft)) inside the cave portal at Thunderhole Resurgence, indicating they might stay close to surface habitats (Adams *et al.* 2008, p. 8). Five nests, with approximately 200 eggs each, were discovered within a 100-m (328-ft) area in Mystery Cave in December 1998, suggesting synchronous spawning within the cave (Adams 2005, p. 10). Nests were adhered to the underside of rocks in flowing water with a temperature of 14 °C (57 °F). Reproduction could occur as late as February or March in Cinque Hommes Creek, based on the observation of yolk-sac larvae and a single nest (Adams *et al.* unpub. data). Spawning could be tied to water temperature, with temperatures reaching optimum levels in caves as early as 2 to 3 months before surface habitats, explaining why spawning was not observed concurrently in those habitats (Adams 2005, pp. 10–11). Males remain present at nests and guard rocks to which nests are attached (Adams *et al.* unpub. data).

Young-of-year abundance increases between March and May at resurgence sites, and between April and May in caves (Adams *et al.* 2008, p. 5). That increase, coupled with decreased recaptures, likely is a result of young-of-year recruitment into the population. Adams *et al.* (2008, p. 7) classified grotto sculpin 30 mm (1.2 in) or less in length to be juveniles. At this size they can be tagged but are still susceptible to predation by adult sculpin as well as invasive fish. Grotto sculpin are cannibalistic, with the young providing a potential food source for adults in an otherwise forage-limited environment (Adams *et al.* 2008, p. 7). Seasonal decreases in abundance of young-of-year and juveniles likely are the result of spring and summer predation and cannibalism in addition to other causes of mortality. Epigean fishes, such as green sunfish (*Lepomis cyanellus*), bluegill (*L. macrochirus*), and channel catfish (*Ictalurus punctatus*), can access caves through sinkholes and are

potential predators on eggs and juveniles (Burr *et al.* 2001, p. 284).

Resurgences are used by juvenile grotto sculpin as nursery areas, where the juveniles maximize growth before migrating upstream into caves to reproduce or downstream to surface streams (Day 2008, p. 18). As juveniles grow, the potential for cannibalism decreases and mortality rates stabilize, resulting in increased recapture rates in caves. Both growth rate and metabolism are lower in caves versus resurgence sites (Adams 2005, p. 61; Adams *et al.* 2008, p. 8). However, fish in both habitats reach comparable lengths, alluding to greater longevity of fish in caves (Adams *et al.* 2008, p. 8).

Grotto sculpin tend to occur singly or in small aggregations of 2 to 3 individuals and can be found in the open water or hidden under rocks (Burr *et al.* 2001, p. 284). They occupy pools and riffles with moderate flows and variable depths (4 to 33 centimeters (cm) (1.6 to 13 in)) (Burr *et al.* 2001, p. 284). Although grotto sculpin have been documented to occur over a variety of substrates (for example, silt, gravel, cobble, rock rubble, and bedrock), the presence of cobble or pebble is necessary for spawning (Burr *et al.* 2001, p. 284; Adams *et al.* unpub. data). Gerken (2007, p. 16) examined habitat use by grotto sculpin in Mystery and Running Bull caves, Cinque Hommes Creek, and Thunderhole Resurgence. Grotto sculpin tend to be associated with a high availability of invertebrate prey, deeper cave pools, substrate containing cobble, and some level of sustained water flow (Gerken 2007, pp. 16–17). Use of surface habitat by grotto sculpin is most influenced by an abundance of amphipods and isopods. When surface streams with fewer prey items were used, available habitat was more than 23 percent clay. Grotto sculpin in caves occupied deeper pools where cobble comprised at least 10 percent of available habitat, and where amphipods and isopods were in greater abundance. Lower abundances of grotto sculpin were found in shallow cave pools where the substrate consisted of silt deposits deeper than 1.9 cm (0.8 in) (Gerken 2007, p. 16). Silt covered more overall area of available cave habitat, and silt also was deeper in caves compared to surface sites (Gerken and Adams 2007, p. 76).

Within and among caves and streams, sculpin typically move 0 to 50 m (0 to 164 ft) (Adams *et al.* 2008, p. 6). Over multiple sampling trips, substantial migrations greater than 200 m (656 ft) have been observed (range 0 to 830 m (0 to 2,723 ft)). The largest single movement of sculpin observed between two subsequent sampling trips (October to December 2007) was 610 m (2,001 ft) in Mystery Cave (Adams *et al.* 2008, p. 8). Such movements are seasonal and likely related to spawning and avoidance behavior of juveniles to escape predation by adult sculpin (Adams *et al.* 2008, p. 7). In May 2008, an individual that was tagged previously in Running Bull Cave was recaptured in Thunderhole Resurgence, evidencing the physical and biological connection of these two systems (Adams *et al.* 2008, p. 8).

Species Distribution and Status

The grotto sculpin was first documented in 1991 (Adams 2005, p. 11). Burr *et al.* (2001, pp. 280, 284) explored caves in five states that had extensive areas of karst to delineate the geographic range of the grotto sculpin, but found them to exist only in Missouri. Nine karst areas in Perry County, Missouri, were searched because sculpin (*Cottus* sp.) were previously known to be present in those areas, and the karst geology in those nine areas could provide suitable habitat for the grotto sculpin. Based on that study, the grotto sculpin is currently restricted to two karst areas (limestone regions characterized by sink holes, abrupt ridges, caves, and underground streams) in Perry County, Missouri: Central Perryville and Mystery-Rimstone (Burr *et al.* 2001, p. 283). Cave systems such as these that form beneath a sinkhole plain provide substantial organic input and an abundance of invertebrates. Such systems might be the only habitats that provide sufficient food and sustained water flow to support grotto sculpin populations (Burr *et al.* 2001, p. 291; Day 2008, pp. 16–17). Peck and Lewis (1978, pp. 43–53) documented an abundance of potential prey items in the karst region of southeast Missouri, including isopods, amphipods, flatworms, and snails.

The grotto sculpin is restricted to Blue Spring Branch (from the Moore Cave System resurgence to the confluence with Bois Brule Creek) and the Cinque Hommes Creek drainage, including underlying caves and Cinque Hommes Creek, its tributaries, resurgences, and springs. Within the Cinque Hommes Creek drainage, populations have been documented in five cave systems: Moore Cave, Crevice Cave, Mystery Cave, Rimstone River Cave, and Running Bull Cave (Adams *et al.* unpub. data; Adams 2012, pers. comm.). Within these cave systems, grotto sculpin occur in cave streams and associated resurgences and springs. Cinque Hommes Creek and Blue Spring Branch are the only surface streams where grotto sculpin have been found. Cinque Hommes Creek is the primary resurgence stream for caves in the Mystery-Rimstone Karst and Crevice Cave in the Central Perryville Karst, whereas Blue Spring Branch is the resurgence stream for the Moore Cave System (Burr *et al.* 2001, p. 284). To date, over 153 additional caves in Arkansas, Illinois, Indiana, Missouri, and Tennessee have been searched for grotto sculpin and epigean or hypogean forms of banded sculpin. Of these, banded sculpin was documented in 25 caves, but only fish in the Central Perryville and Mystery-Rimstone karst areas exhibited the cave adaptations characteristic of grotto sculpin (Burr *et al.* 2001, p. 284). The full extent of the species' range is unknown because not all reaches in occupied cave systems can be accessed and not all potential, suitable caves, springs, and surface streams have been surveyed (for example, Keyhole Spring; Moss and Pobst 2010, p. 152). We consider the geographic range of the grotto sculpin to be the extent of the Central Perryville and Mystery-Rimstone karst areas, which encompass approximately 222 km^2 (89 mi^2) (Service 2012 calculations based on Burr *et al.* 2001, p. 282 and Vandike 1985, p. 1).

There are no total population estimates for the grotto sculpin. Mystery (MC) and Running Bull (RBC) caves and their associated resurgence streams, Mystery Resurgence (MR) and Thunderhole Resurgence (TR), respectively, apparently have the largest populations of grotto sculpin (Adams *et al.* 2008, p. 4). A study conducted from August 2005 to October 2008 yielded a total of 6,265 captures (4,218 individuals) at those four sites (Day 2008, p. 12). The 2,684 (43 percent) captures in caves represented 1,642 individuals, whereas 3,581 (57 percent) captures in resurgences represented 2,576 individuals (Day 2008, pp. 13, 15). Of the captured fish, 2,986 (MC–894, RBC–154, MR–376, TR–1562) were tagged for a mark-recapture study. Mean recapture was higher in caves (46 percent) than resurgences (18 percent) (Day 2008, p. 13). Grotto sculpin densities were significantly lower in caves (0.037/m^2 (0.398/ft^2)) compared to resurgence streams (0.225/m^2 (2.42/ft^2)) (Day 2008, p. 13). Density at Thunderhole Resurgence was significantly higher (0.610/m^2 (6.57/ft^2)) than any other site surveyed (MC 0.036/m^2 (0.388/ft^2), RBC 0.113/m^2 (1.22/ft^2), MR 0.032/m^2 (0.344/ft^2)).

Capture success, recapture rates, and population density differ seasonally. The greatest number of grotto sculpin has been captured in summer, followed

by spring, fall, and winter (Adams *et al.* 2008, p. 5; Day 2008, p. 12). Overall recapture rates were highest in fall and winter (32 percent each) and lower in spring (25 percent) and summer (15 percent). Overall recapture rates also were significantly lower at resurgence sites than caves, regardless of season. Recapture rates at caves were highest in winter (52 percent) and lowest in fall (44 percent). Recapture rates at resurgence sites were highest in spring (15 percent) and lowest in winter (7 percent). Similar patterns of seasonal changes in density were observed in caves and resurgences. In both habitats, densities were highest in summer, nearly equal in fall and spring, and lowest in winter (Adams *et al.* 2008, p. 5).

Two mass mortalities of grotto sculpin have been documented in Perry County. The first occurred in Running Bull Cave in 2001, when the population was completely lost (Burr *et al.* 2001, p. 294; Adams 2005, p. 40). The second occurred in Mystery Cave in August 2005, and affected the uppermost 690 m (2,264 ft) of cave stream (Adams *et al.* 2008, p. 6). Both events were thought to have been caused by point-source pollution (Burr *et al.* 2001, p. 294; Adams *et al.* 2008, p. 6). Both caves were recolonized following the die-offs, and grotto sculpin were captured 2 years after the mortality event in Running Bull Cave (Adams *et al.* 2003, p. 7). Surveys were conducted as part of a research study immediately following the die-off in Mystery Cave (Adams *et al.* 2008, p. 6). From August 2005 through March 2006, no grotto sculpin were captured in the upstream sections of Mystery Cave. The first capture of a grotto sculpin after the die-off occurred in May 2006. The first recaptures of three individuals from three different stream sections (540, 560, and 570 m (1772, 1837, and 1870 ft)) occurred in July 2006. Stream sections that supported the earliest recolonization of grotto sculpin in the upper sections (0 to 690 m (0 to 2264 ft)) of Mystery Cave were the most downstream portion of the stream in which the die-off occurred (sections farthest away from the source of contamination). The grotto sculpin population in Mystery Cave increased over the next 3 years to more than 60 individuals in 2007 (Adams *et al.* 2008, p. 8).

Summary of Factors Affecting the Species

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on any of the following five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above threat factors, singly or in combination. Each of these factors is discussed below.

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

The grotto sculpin is a cave-adapted species that is endemic to karst habitats that provide consistent water flow, high organic input, and connection to surface streams, which allow for seasonal migrations to complete its life cycle. Nearly all of the land within the known range of the grotto sculpin is privately owned. Two exceptions are Ball Mill Resurgence Natural Area (19.5 ac (7.9 ha)) and Keyhole Spring and Resurgence near Blue Spring Branch; both properties are owned by the L–A–D Foundation (a private foundation dedicated to sustainable forest management and protection of natural and cultural areas in Missouri (*http://pioneerforest.org*) and managed by the Missouri Department of Conservation (MDC)). The municipality of Perryville is in the Central Perryville Karst Area and is within the recharge area of Crevice Cave. Thirty-six percent (15.6 km² (6.02 mi²)) of Perryville's total area of 43 km² (16.6 mi²) lies within the karst area, whereas 24 percent (10.4 km² (4.02 mi²)) lies within the southern portion of the recharge area of Crevice Cave (recharge area defined by Moss and Pobst 2012, pp. 151–152).

The karst in Perry County is characterized by thousands of sinkholes (Vandike 1985, p. 1) and over 700 caves (Fox *et al.* 2009, p. 5). Water quality in karst areas is highly vulnerable and can severely decline with rapid transmission of contaminants from the surface to the aquifer (Panno and Kelly 2004, p. 230). Moss and Pobst delineated recharge areas for known and potential grotto sculpin caves (2010, pp. 146–160) and evaluated the vulnerability of groundwater in the recharge areas to contamination (2010, pp. 161–190). Because the grotto sculpin is dependent not only on caves, but uses surface habitat in addition to caves, Moss and Pobst (2010, p. 161) evaluated hazards within and adjacent to recharge areas to best characterize impairment of cave and surface streams. They found all the recharge areas to be highly vulnerable and contain hazards from historical sinkhole dumps, agricultural practices without universal application of best management practices, ineffective private septic systems, and roads with contaminated runoff (Burr *et al.* 2001, p. 294; Moss and Pobst 2010, p. 183). They noted additional hazards in the recharge area for Crevice Cave not found elsewhere, such as hazardous waste generators, wastewater outflows, storm water outflows, and underground storage tanks for hazard waste, that compound potential threats to groundwater and drinking water (Moss and Pobst 2010, p. 184). Impacts to groundwater are not proportional to the area impacted in such a highly vulnerable landscape—a localized pollution event can impact all aquatic habitats downstream.

There are approximately 2 sinkholes per km² (6 per mi²) in Perry County and 7 sinkholes per km² (17 per mi²) in the Central Perryville and Mystery-Rimstone karst areas (Missouri Department of Natural Resources 2010, unpaginated). Recharge areas around grotto sculpin caves contain up to four times the number of sinkholes compared to other parts of the county or other karst areas. Cave recharge areas in the Central Perryville Karst contain an average of 8 sinkholes per km² (22 per mi²), whereas those in the Mystery-Rimstone Karst contain an average of 4 per km² (11 per mi²) (Missouri Department of Natural Resources 2010, unpaginated). Water flow in Perry County karst systems occurs by way of surface features, such as sinkholes and losing streams, as well as connectivity to the underlying aquifer (Aley 1976, p. 11; Fox *et al.* 2009, p. 5). Without adequate protection, sinkholes can funnel storm-runoff directly into cave systems in a short period of time (Aley 1976, p. 11; White 2002, p. 88; Fox *et al.* 2010, p. 8838).

Illegal Waste Disposal and Chemical Leaching—At least half of the sinkholes in Perry County have been or are currently used as dump sites for anthropogenic waste (Burr *et al.* 2001, p. 294). Although it is illegal to dump waste in open sites in Missouri, the practice continues today—sinkholes continue to be used as dump sites for household wastes, tires, and occasionally dead livestock (*http://dnr.mo.gov/env/swmp/dumping/enf_instruct.htm;* Pobst 2012, pers. comm). Moss and Pobst (2010, p. 169) observed that most historical farms in the sinkhole plain had at least one sinkhole that contained household and

farm waste. Waste material found in sinkholes includes, but is not limited to, household chemicals, sewage, and pesticide and herbicide containers (Burr *et al.* 2001, p. 294). Fox *et al.* (2010, p. 8838) found that Perry County cave streams were contaminated by a mixture of organic pollutants that included both current-use and legacy-use pesticides and their degradation products. They found high concentrations of heptachlor epoxide and trans-chlordane, which are degradation products of the legacy-use pesticides heptachlor and chlordane (Fox *et al.* 2010, p. 8839). Heptachlor and chlordane were banned in 1988, but can persist in the environment through storage in sediments above or below ground or leaking containers in sinkholes (ATSDR 1994a, unpaginated; ATSDR 2007a, unpaginated). In water, heptachlor readily undergoes hydrolysis to a compound, which is then readily processed by microorganisms into heptachlor epoxide (ATSDR 2007b, p. 98). Heptachlor and chlordane are highly persistent in soils, are almost insoluble in water, and will enter surface waters primarily though drift and surface run-off (ATSDR 1994a, unpaginated; ATSDR 2007a, unpaginated). Although not specifically tested on the grotto sculpin, both heptachlor and chlordane are highly toxic to most fish species tested, including warm-water species such as bluegill (*Lepomis macrochirus*) and fathead minnow (*Pimephales promelas*) (Johnson and Finley 1980, pp. 19, 43–44). Heptachlor caused degenerative liver lesions, enlargement of the red blood cells, inhibited growth, and mortality in bluegill (Andrews *et al.* 1966, pp. 301–305). Heptachlor, heptachlor epoxide, and chlordane have been shown to bioaccumulate in aquatic organisms such as fish, mollusks, insects, plankton, and algae (ATSDR 1994b, p. 172; ATSDR 2007b, p. 89).

Chemical leaching in sinkholes likely is a major contributor to the occurrence of legacy-use pesticides, such as dieldrin, in aquatic habitats (Fox *et al.* 2010, p. 8840). Dieldrin, a domestic pesticide used in the past to control corn pests and cancelled by the U.S. Department of Agriculture (USDA) in 1970 (ATSDR 2002, unpaginated), was found at levels that exceeded ambient water quality criterion by 17 times in Mertz Cave and Thunderhole Resurgence (Mystery-Rimstone Karst Area) (Fox *et al.,* p. 8839). Dieldrin is a known endocrine disruptor that bioaccumulates in animal fats, especially those animals that eat other animals and, therefore, is a concern for the grotto sculpin because it is the top predator in its cave habitat (ATSDR 2002, unpaginated; Fox *et al.* 2010, p. 8839). The grotto sculpin depends on several species of cave amphipods, including *Gammarus* sp. (Gerken 2007, pp. 16–17; Fox *et al.* 2010, p. 8839). Dieldrin has been detected in the amphipod *G. troglophilus* through tissue bioassays (Taylor *et al.* 2000, p. 10). Tarzwell and Croswell (1957, pp. 253–255) found that dieldrin was toxic to fathead minnow, bluegill, and green sunfish (*Lepomis cyanellus*). Whereas the species exhibited differences in susceptibility, individuals of all species tested ultimately experienced loss of equilibrium followed by death (Tarzwell and Croswell 1957, p. 255).

Sinkholes have also been used as disposal sites for dead livestock (Fox *et al.* 2009, p. 6; Moss and Pobst 2010, p. 170). Animal carcasses dumped into sinkholes and cave entrances are potentially diseased and could carry pathogens that could be unintentionally introduced into the groundwater system. Decomposing animals in source water for cave streams also can lower the dissolved oxygen and negatively impact aquatic organisms. One of two documented mass mortalities of the grotto sculpin was likely caused by a dead cow in the surface stream above Mystery Cave (Adams 2012, pers. comm.).

Contaminated Water—In cave streams sampled by Fox *et al.* (2010, p. 8838), time-weighted average (TWA) water concentrations of 20 chemicals were at levels above method detection limits (MDLs); 16 of the 20 chemicals originated from agricultural pest management activities. Acetochlor, diethatyl-ethyl, atrazine, and desethylatrazine (DEA) were detected at all sites during both May and June sampling periods. Pyrene, metolachlor, DEET, and pentachloroanisole were detected at all sites during sampling periods (Fox *et al.* 2010, p. 8838). There is a long list of potential impacts of these chemicals on fish, including reductions in olfactory sensitivity, immune function, and sex hormone concentrations; endocrine disruption; and increased predation and mortality due to adverse effects to behavior (Alvarez and Fuiman 2005, pp. 229, 239; Rohr and McCoy 2010, p. 30). The ubiquitous presence of current-use pesticides, such as atrazine, was not surprising based on the extensive agricultural land use in Perry County. Atrazine has been the most frequently detected herbicide in ground and surface waters in Perry County (Fox *et al.* 2010, p. 8838) and in a similar karst and agricultural landscape in Boone County, Missouri (Lerch 2011, p. 107); levels of corn production were similar in the two counties. Even at concentrations below U.S. Environmental Protection Agency (EPA) criteria for protection of aquatic life, atrazine has been shown to reduce egg production and cause gonadal abnormalities in fathead minnows (Tillett *et al.* 2010, pp. 8–9). Sex steroid biosynthesis pathways and gonad development in male goldfish (*Carassius auratus*) were impacted by atrazine in concentrations as low as 1 nanogram per liter (ng/L) (Spano *et al.* 2004, pp. 367–377). Concentrations of atrazine in Perry County ranged from 20 to 130 ng/L (Fox *et al.* 2010, p. 8838). Li *et al.* (2009, pp. 90–92) showed that environmentally relevant concentrations of acetochlor can decrease circulating thyroid hormone levels, decrease expression of thyroid hormone-related genes, affect normal larval development, and affect normal brain development. Pyrene is known to cause anemia, neuronal cell death, and peripheral vascular defects in larval fish (Incardona *et al.* 2003, p. 191). Wan *et al.* (2006, pp. 57–58) considered metolachlor to be slightly to moderately toxic to freshwater amphibians, crustaceans, and salmonid fishes. Wolf and Moore (2010, pp. 457, 464–465) demonstrated that sublethal concentrations of metolachlor adversely affected the chemosensory behavior of crayfish and likely impacted its ability to locate prey. These researchers also noted that this herbicide also caused physiological impairment that likely impacted locomotory behavior and predator avoidance responses. Due to the importance of chemosensory organs to the grotto sculpin, the presence of metolachlor in occupied streams may impact this fish's ability to locate prey.

Additional potential adverse effects to grotto sculpin from contaminants include increased susceptibility to fish disease (Arkoosh *et al.* 1998, p. 188), increased immunosuppression (Arkoosh *et al.* 1998, p. 188), disruption of the nervous system by inhibition of cholinesterase (Hill 1995, p. 244), and an increase in acute or chronic stress resulting in reduced reproductive success, alterations in blood and tissue chemistry, diuresis, osmoregulatory dysfunction, and reduction in growth (Wedemeyer *et al.* 1990, pp. 452–453). As a result, potential water contamination from various sources of point and non-point source pollution poses a significant, ongoing threat to the grotto sculpin.

Vertical Drains—Potential contaminant problems with sinkholes are further exacerbated by the presence and continued installation of vertical

drains across the agricultural landscape in Ste. Genevieve and Perry Counties (Perry County Soil and Water Conservation District (PCSWCD) 2012, unpaginated). Vertical drains are also known as ''stabilized sinkholes'' and are defined by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) as ''a well, pipe, pit, or bore in porous, underground strata into which drainage water can be discharged without contaminating groundwater resources'' (NRCS 2006, p. 1). This conservation practice is meant to reduce erosion by facilitating drainage of surface or subsurface water. Vertical drains often result in more land available to the farmer. As of 2012, the recharge areas for known and potential grotto sculpin habitat in the Central Perryville and Mystery-Rimstone karst areas contained an average of 2.5 vertical drains per km^2 (7 per mi^2), with the highest concentrations in the recharge areas for Keyhole Spring, Ball Mill Spring, and Mystery Cave (PCSWCD 2012, unpaginated). New vertical drains continue to be installed on the landscape at a rate consistent with the installation rate that occurred in the 1990s, with approximately 40 new vertical drains installed at 15 properties in Perry County in 2011 (PCSWCD 2012, unpaginated).

The NRCS (2006, p. 2) noted that ''significant additions to subsurface water sources may raise local water tables or cause undesirable surface discharges down-gradient from the vertical drain.'' The impact of vertical drains on groundwater has been studied on a limited basis and studies have directly linked groundwater and drinking water contamination with vertical drains (EPA 1999, unpaginated). According to the conditions set by the NRCS, this practice can only be applied when it will not contaminate groundwater or affect instream habitat by reducing surface water flows (NRCS 2010b, p. 1). The NRCS provides a cost-share of up to 75 percent for installation of vertical drains to stop erosion (NRCS 2010b; 2011; 2012) and has conservation practice and construction standards that include secure placement of the standpipe, appropriate fill material around the drainage pipe, and a filter system around the drain (NRCS 2006a, pp. 1–2; 2006b, pp. 1–3). Without implementation of the suite of standards, vertical drains might allow contaminated water to flow directly into caves without naturally occurring filtration (Pobst and Taylor 2007, p. 69). Vertical drains act as conduits for all surface water, contaminants, and sediment directly from the surface through the bedrock into underground caves, streams, and karst voids (Pobst and Taylor 2007, p. 69). Although USDA requires landowners to install a minimum of 7.62 m (25 ft) of grassed buffer around vertical drains to minimize erosion and the migration of nutrients and contaminants into the groundwater system, this guideline is not strictly followed (Moss and Pobst 2010, p. 170). Because vertical drains are potential targets for illegal dumpling of liquid hazardous wastes (Fox *et al.* 2010, p. 8839) and there is an absence of adequate buffers around some vertical drains, the migration of sediment and contaminants is easily facilitated (Moss and Pobst 2010, p. 171). Such a scenario is supported by Fox *et al.*'s (2010, pp. 8835–8840) contaminant study in the karst region of Perry County. The long list of harmful chemicals detected in the Fox *et al.* (2010, pp. 8835–8840) study is likely due to the migration of these contaminants directly from surface fields into the underground karst system through vertical drains and sinkholes.

Urbanization and Development—In addition to contamination from point sources of pollution and improper trash disposal, water quality of sculpin habitats is negatively impacted by urban growth of Perryville, located in the recharge area for Crevice Cave (Moss and Pobst 2010, p. 164). Crevice Cave had the lowest amount of cropland and grassland within its recharge and the most chemical detections. In contrast, Mystery Cave had the most cropland and grassland and fewest chemical detections (Fox *et al.* 2010, p. 8840). The only hazardous waste facility in the Central Perryville and Mystery-Rimstone karst areas is located in Perryville. The facility is permitted by the Missouri Department of Natural Resources as a large-volume hazardous waste generator. Additional hazards in Perryville include four other hazardous waste generators; nine underground storage tanks that could leak petroleum products; two National Pollutant Discharge Elimination System (NPDES) permits for wastewater outfalls; and seven NPDES permits for storm water discharge, leaking sewer lines, or lines that remain plumbed into the caves below (Missouri Department of Natural Resources (MDNR) 2010, unpaginated).

Most of the runoff water in areas that recharge aquatic habitats for the grotto sculpin moves quickly into the groundwater system with ineffective natural filtration, and the same is true for waste waters from septic systems (Aley 2012, pers. comm.). Contamination of groundwater by septic systems in karst areas has been documented on multiple occasions (Simon and Buikema 1997, pp. 387, 395; Panno *et al.* 2006, p. 60) because septic tank systems are poorly suited to karst landscapes (Aley 1976, p. 12). Panno and Kelly (2004, p. 229) listed septic systems as potential contributors of excess nitrogen to streams in the karst region of southern Illinois. Septic systems in the sinkhole plain can be direct conduits for introduction of septic effluent directly into the shallow karst aquifer (Panno *et al.* 2001, p. 114). In a karst area in southwest Missouri, poorly designed sewage treatment lagoons were allowing effluent from a small, rural school to seep into the only known location for the federally listed Tumbling Creek cavesnail (*Antrobia culveri*) (Aley 2003, unpaginated).

Most of the rural residents in the Central Perryville and Mystery-Rimstone karst areas employ on-site septic systems (for example, in the Mystery Cave area) (Aley 1976, p. 12). Failure of septic systems occurs in karst areas of southeast Missouri, such as those in Perry County, but detections are problematic because most failures are not obvious from the surface, but instead occur underground into the groundwater system (Aley 2012, pers. comm.). One instance of a septic system failure was observed by Aley (1976, p. 12) near Mystery Cave. Sewage was being discharged to a septic field within 100 ft (30.5 m) of the cave entrance and was contaminating the waters of the Mystery Cave system. Water samples collected by the Missouri Department of Conservation within the range of the grotto sculpin indicated the presence of *Escherichia coli* at high levels, which might correspond to high inputs of phosphorus from septic systems (Pobst 2010, pers. comm.). Taylor *et al.* (2000, pp. 13–16) found that fecal contamination of karst groundwater is a serious problem in southeast Missouri. Among sampling locations in southeast Missouri, water samples were taken from streams and springs in Perry County that included sites within the range of the grotto sculpin (Mertz Cave, Running Bull Cave, Thunderhole Resurgence, and Cinque Hommes Creek) (Taylor *et al.* 2000, pp. 48–49). High fecal bacterial loads were found in groundwater of grotto sculpin habitats and can be a combination of both human and animal wastes (Taylor *et al.* 2000, p. 14).

No animal feeding operations (AFOs) or concentrated animal feeding operations (CAFOs) are present in the recharge areas of grotto sculpin habitat (MDNR 2010), but there are smaller livestock feeding areas that are in sinkholes or near sinkhole drainage

points (Aley 1976, p. 12; Moss and Pobst 2010, p. 166). Large amounts of manure can be flushed through sinkholes and carry associated bacteria and pathogens into cave streams. Waste from mammalian sources, including humans and livestock, can increase nutrient loads and lower dissolved oxygen in the groundwater (Simon and Buikema 1997, p. 395; Panno *et al.* 2006, p. 60). Hypoxia resulting from eutrophication due to increases in nutrient load (especially phosphorus) can lead to mortality and sublethal effects by reducing the availability of oxygen needed by fish for locomotion, growth, and reproduction (Kramer 1987, p. 82; Gould 1989–1990, p. 467), Barton and Taylor (1996, p. 361) reported that low dissolved oxygen levels can cause changes in cardiac function, increased respiratory and metabolic activity, alterations in blood chemistry, mobilization of anaerobic energy pathways, upset in acid-base balance, reduced growth, and decreased swimming capacity of fish.

Sedimentation—Concerns with sedimentation (actual deposition of sediment, not the transport) and wash load (portion of the sediment in transport that is generally finer than the sediment) (as defined by Biedenharn *et al.* 2006, pp. 2–6) relative to impacts to grotto sculpin habitat are primarily the transport of contaminants and the deposition of excessive amounts of sediment in cave streams. Soils in the Central Perryville and Mystery-Rimstone karst areas are dominated by highly erosive loess. Sediment transported into the karst groundwater can include agricultural chemicals that are bound to soil particles as evidenced by findings of Fox *et al.* (2010, p. 8840). Fox *et al.* (2010, p. 8840) determined that turbidity of streams in grotto sculpin caves in Perry County was positively correlated with total chemical and DEA concentrations. Additionally, Gerken and Adams (2007, p. 76) noted that siltation was a major problem in grotto sculpin sites and postulated that silt likely reduced habitat available to this fish.

Excessive siltation in aquatic systems can be problematic for fish because it can change the overall structure of the habitat (Berkman and Rabeni 1986, pp. 291–292). Silt can fill voids in rock substrate that are integral components of habitat for reproduction and predator avoidance. The grotto sculpin occurs in habitats with some level of sediment deposition (Gerken 2007, pp. 16–17, 23–25). However, siltation beyond what occurred historically could limit the amount of suitable habitat available (Gerken 2007, pp. 27–28; Gerken and Adams 2007, p. 76), and the threshold of siltation that renders cave habitat unsuitable for grotto sculpin has not yet been determined.

Industrial Sand Mining—Industrial sand is also known as ''silica,'' ''silica sand,'' and ''quartz sand,'' and includes sands with high silicon dioxide content. Silica sand production in the United States was 29.3 million metric tons (Mt), an increase of 5.3 Mt from 2009 to 2010 (U.S. Geological Survey (USGS) 2012, p. 66.6). The Midwest leads the Nation in industrial sand and gravel production, accounting for 49 percent of the annual total (USGS 2012, p. 66.1). One end-use of silica sand is as a propping agent for hydraulic fracturing. Higher production of silica sand in 2010 was primarily attributable to an increasing demand for hydraulic fracturing sand because of continuing exploration and production of natural gas throughout the United States. Conventional natural gas sources have become less abundant, leading drilling companies to turn to deep natural gas and shale gas. Of the 29.3 Mt of silica sand sold or used in the United States, 12.1 Mt (41 percent) was used for hydraulic fracturing in the petroleum industry (USGS 2012, p. 66.10). As of 2010, the price per ton for industrial silica sand was $45.24 in the United States (USGS 2012, p. 66.11). In addition to new facilities, existing hydraulic fracturing sand operations increased production capacity to meet the surging demand for sand.

Mining for silica sand in Missouri occurs in the St. Peter Sandstone in Jefferson, Perry, and St. Louis Counties (USGS 2011, p. 27.2). The St. Peter Sandstone formation is directly adjacent to (to the west) the Joachim Dolomite formation that forms the karst habitat for the grotto sculpin in Perry County. The interface between these two formations generally comprises the western borders of the Central Perryville and Mystery-Rimstone karst areas. Four companies in Missouri produced 0.9 Mt of high-purity sand from the St. Peter Sandstone formation (USGS 2011, p. 27.2). The existing operation in Perry County lies 5.6 km (3.5 mi) northwest of Perryville and involves open pit mining on 101 ha (250 acres). This producer specializes in 40 to 70 and 70 to 140 size-grades that were used by the oil and gas well-servicing industry as a hydraulic fracture propping agent in shale formations (USGS 2010, p. 27.2).

Sand mining is typically accomplished using open pit or dredging methods with standard mining equipment and without the use of chemicals. Sand can be mined from outcrops or by removing overburden to reach subsurface deposits. Environmental impacts of sand mining are primarily limited to disturbance of the immediate area. The current operation in Perry County is partially within the Joachim Dolomite formation and at the western edge of the sinkhole plain with approximately four sinkholes occurring in the immediate vicinity. Erosion of soil and disturbed overburden could occur and increase the sediment loads in adjacent surface waters and cave streams via runoff. For example, a portion of the existing mining operation is within the Bois Brule watershed. Sediment-laden runoff could enter Blue Spring Branch, one of the surface streams occupied by the grotto sculpin. As described above, sedimentation can change the structure of grotto sculpin habitat and negatively impact reproduction and predator avoidance. Presence of the current facility, only 0.5 km (0.3 mi) and 1.6 km (1 mi) from the Central Perryville Karst and Crevice Cave recharge area, respectively, shows that such operations can and do occur in the Joachim Dolomite formation and immediately adjacent to grotto sculpin habitat. We currently are unaware of any plans for new facilities or expansions of current facilities. However, based on the presence of one existing operation, the occurrence of St. Peter Sandstone in Perry County, as well as recent growth of the hydraulic fracturing industry and associated increased demand for silica sand, it is likely that increased sand mining activity will occur in the future in areas where the grotto sculpin occurs. We consider sand mining to be a potentially significant threat to the species in the future.

Summary of Factor A

All of the recharge areas for caves occupied by the grotto sculpin are highly vulnerable and contain hazards from historical sinkhole dumps, agricultural practices without universal application of best management practices, ineffective private septic systems, and degraded runoff from roads. Hazardous waste facilities, outfalls for waste and storm water, and underground storage tanks are found in the recharge area for Crevice Cave that are not found in other parts of the species' range. Cave recharge areas in the Central Perryville Karst contain an average of 23 sinkholes per km^2 (58 per mi^2), whereas those in the Mystery-Rimstone Karst contain an average of 11 per km^2 (27 per mi^2). Water contamination from various sources of point and non-point source pollution poses a significant, ongoing threat to the grotto sculpin. Water flow in karst systems occurs by way of surface

features, such as sinkholes and losing streams, as well as connectivity to the underlying aquifer. Sinkholes can funnel storm-runoff that carries contaminants directly into cave systems in a short period of time and severely degrades water quality.

At least half of the sinkholes in Perry County have been, or are currently used as, dump sites for anthropogenic waste including household chemicals, sewage, pesticide and herbicide containers, and animal carcasses. Cave streams in Perry County are contaminated with current-use and legacy-use pesticides that enter cave systems through storm runoff or via leaching in sinkholes. The majority of chemicals that have TWAs at levels above MDLs originated from agricultural pest management activities and included acetochlor, diethatyl-ethyl, atrazine, and desethylatrazine (DEA), pyrene, metolachlor, DEET, and pentachloroanisole. Atrazine has been the most frequently detected herbicide in ground and surface waters in Perry County. Even at concentrations below EPA criteria for protection of aquatic life, atrazine has been shown to reduce egg production and cause gonadal abnormalities in fish.

Potential contaminant problems with sinkholes are further exacerbated by the presence and continued installation of vertical drains across the agricultural landscape. This practice, meant to reduce erosion by facilitating drainage of surface or subsurface water, results in more land available to the farmer. As of 2010, the recharge areas for known and potential grotto sculpin habitat in the Central Perryville and Mystery-Rimstone karst areas contain an average of 2.4 vertical drains per km^2 (6.2 per mi^2). Vertical drains have been linked directly to contamination of groundwater and water used for human consumption. Vertical drains also act as attractive nuisances because, like sinkholes, they are potential targets for illegal dumping of hazardous waste.

Risk from agricultural land use and point sources of pollution, such as sinkhole dumps, are not the only concern on the Perry County landscape. The recharge area for Crevice Cave contains the city of Perryville. Urban growth and hazards, such as hazardous waste facilities, underground storage tanks, wastewater discharges, and poorly maintained septic systems, in and around the city are threats to water quality in the range of the grotto sculpin. Potential threats in more rural areas of Perry County include introduction of manure and associated bacteria and pathogens into sinkholes from small livestock feeding areas. Such contaminants can increase nutrient loads and lower dissolved oxygen in the groundwater.

Concerns with sedimentation and wash load are primarily the transport of contaminants and the deposition of sediment in cave streams. Turbidity of cave streams is positively correlated with chemical concentrations, indicating that chemicals can bind to sediment particles and be transported by surface runoff. Siltation beyond what occurred historically could limit the amount of suitable habitat available; abnormally high deposition of sediment in cave systems can be problematic for aquatic life as it can fill voids in rock substrate that are integral components of grotto sculpin habitat.

Industrial sand mining is occurring in Perry County just outside the range of the grotto sculpin, but within the Bois Brule watershed. The mining operation near Perryville lies in the interface between the St. Peter Sandstone and Joachim Dolomite formations. Current mining operations could exacerbate erosion and sedimentation problems in the sinkhole plain and negatively impact grotto sculpin habitat. Furthermore, anticipated expansions of current operations or development of new operations to meet increasing demand of silica sand could pose a more serious threat in the future.

Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Although some specimens of the grotto sculpin have been taken for scientific investigations, we do not consider such collection activities to be at a level that poses a threat to the species. We do not have records of any individuals being taken for commercial, recreational, or educational purposes.

Factor C. Disease or Predation

Predation by invasive, epigean fish poses a threat to eggs, young-of-year, and juvenile grotto sculpin. Farm ponds are human-made features, as opposed to natural aquatic habitats, that often are stocked with both native and nonnative fishes for recreational purposes. Fish from farm ponds enter cave systems through sinkholes when ponds are unexpectedly drained (Burr *et al.* 2001, p. 284) or after high-precipitation events. Predatory fish were documented to occur in all of the caves occupied by the grotto sculpin, and include common carp (*Cyprinus carpio*), fathead minnow (*Pimephales promelas),* yellow bullhead (*Ameiurus natalis*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), and channel catfish (*Ictalurus punctatus*) (Burr *et al.* 2001, p. 284).

The migration and persistence of invasive, epigean fish species into cave environments poses an ongoing and pervasive threat to the grotto sculpin because of unnatural levels of predation on eggs, young-of-year, and juveniles. Predation beyond what occurs naturally among adult and juvenile grotto sculpin can reduce population levels to an unsustainable level and may render a population unrecoverable in the face of an unexpected mass mortality.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

The primary causes of the grotto sculpin's decline are degradation of aquatic resources from illegal waste disposal in sinkhole dumps, chemical leaching, urban development, and sedimentation. Existing Federal, State, and local laws have not been able to prevent impacts to the grotto sculpin and its habitat, and the existing regulatory mechanisms are not expected to prevent causes of grotto sculpin decline in the future.

The grotto sculpin is not protected under the Missouri State Endangered Species Law (MO ST 252.240) because it has not been formally recognized as a distinct species, but is afforded some recognition by the Missouri Department of Conservation as a Missouri Species of Conservation Concern. All species in the State of Missouri are protected as biological diversity elements such that no harvest is permitted unless a method of legal harvest is described in the permissive Wildlife Code. No method of legal harvest is permitted for the grotto sculpin.

The Missouri Department of Natural Resources establishes water quality and solid waste standards that are protective of aquatic life. The Missouri Clean Water Law of 1972 (MO ST 644.006–644.141) addresses pollution of the waters of the State to prevent threats to public health and welfare; wildlife, fish and aquatic life; and domestic, agricultural, industrial, recreational, and other legitimate uses of water. It is unlawful for any person: (1) To cause pollution of any waters of the State or to place or cause or permit to be placed any water contaminant in a location where it is reasonably certain to cause pollution of any waters of the State; (2) to discharge any water contaminants into any waters of the State which reduce the quality of such waters below the water quality standards established by the commission; or (3) to violate any regulations regarding pretreatment and toxic material control, or to discharge any water contaminants into any waters of the State which exceed effluent regulations or permit provisions as

established by the commission or required by any Federal water pollution control act (MO ST 644.051). Based on documented levels of contaminants present in the cave streams of Perry County (Fox *et al.* 2010, pp. 8835–8841), the Missouri Clean Water Law of 1972 is insufficient to prevent water degradation in grotto sculpin habitat.

According to the Missouri State Waste Management Law of 1972 (MO ST 260.210), it is illegal to dump waste materials into sinkholes. Regulations under the Federal Clean Water Act of 1972 (CWA; 33 U.S.C. 1251 *et seq.*) would apply if a point-source for the pollution could be determined. Discrete pollution events that impact cave systems are problematic even if a point-source can be determined because it can be extremely difficult to assess damages to natural resources such as troglobitic biota that live underground. Cave systems are recharged by surface water and groundwater that typically travel several miles before resurfacing from cave openings and spring heads (Vandike 1985, p. 3).

Once a sinkhole has been modified to function as a vertical drain, it becomes a Class V Injection Well (alternatively known as an ''agricultural drainage well'' (ADW)) as defined by the EPA (1999, unpaginaged). The Safe Drinking Water Act of 1974 (42 U.S.C. 300f *et seq.*) and later amendments established the Federal Underground Injection Control (UIC) Program. The State of Missouri has obtained primacy from the UEPA for the UIC program, and the Class V Injection Well program derives its authorities from Missouri Clean Water Law (MO ST 644) (MDNR 2006, p. 2). By definition, ADWs can receive ''excess surface and subsurface water from agricultural fields, including irrigation tailwaters and natural drainage resulting from precipitation, snowmelt, floodwaters, etc. ADWs may also receive animal yard runoff, feedlot runoff, dairy runoff, or runoff from any other agricultural operation'' (USEPA 1999). In addition to potential threats from permitted injectants, ADWs are vulnerable to spills from manure lagoons and direct discharge from septic tanks, as well as release of agricultural substances, such as motor oil and pesticides (USEPA 1999). Data from water sampling indicate that nitrate is a primary constituent in ADW injectate and likely exceeds health standards (USEPA 1999). Other constituents that also have exceeded primary or secondary drinking water standards or health advisory levels are boron, sulfate, coliforms, pesticides (cyanazine, atrazine, alachlor, aldicarb, carbofuran, 1,2-dichloropropane, and dibromochloropropane), total dissolved solids, and chloride (USEPA 1999). Furthermore, studies have documented that ADWs contribute to, or cause, contamination of groundwater. Nitrate contamination of groundwater in agricultural areas has been documented, as has contamination from direct discharge of septic tanks (USEPA 1999). As noted above, Class V injection wells are covered under the Missouri Clean Water Law of 1972, but the existing regulations are inadequate to prevent deposition of contaminants documented in occupied grotto sculpin habitats of Perry County, as evidenced by the results of Fox *et al.* (2010, pp. 8835–8841).

There are no water quality ordinances in effect in Perry County beyond minimum State standards in the Code of State Regulations (19 CSR 20–3.015) and, therefore, no limitations for onsite septic construction as long as septic systems are built on properties greater than 1.2 ha (3 ac) and the system is at least 3.1 m (10 ft) from the property line. A more protective ordinance has been adopted in Monroe County, Illinois, where the soils and topography are very similar to Perry County (Monroe County Zoning Code 40–5–3, chapter 40–4–29). The ordinance in Monroe County prohibits placement of any substances or objects in sinkholes, alteration of sinkholes, and development in sinkholes. The stated purpose of the ordinance is, ''to reduce the frequency of structural damage to public and private improvements by sinkhole collapse or subsidence and to protect, preserve and enhance sensitive and valuable potable groundwater resource areas of karst topography, thus protecting the public health, safety and welfare and insuring orderly development within the County.'' Greene County, Missouri, also is in a sinkhole plain and has adopted special regulations relative to construction of onsite septic systems. They require that systems are constructed above the sinkhole flooding area, which is defined as ''the area below the elevation of the lowest point on the sinkhole rim or the areas inundated by runoff from a storm with an annual exceedance probability of 1 percent (100-year storm) and a duration of 24 hours (8 inches of rain in Green County)'' (Green County 2003, p. 3–9). The minimum standards in the Code of State Regulations (19 CSR 20–3.015) for water quality standards in Missouri are not protective enough to prevent the deposition of silt and contaminants into occupied grotto sculpin habitats, as reported by Gerken and Adams (2007, p. 76) and Fox *et al.* (2010, pp. 8835–8841).

Summary of Factor D

Despite some existing regulatory mechanisms that provide protection for the grotto sculpin and its habitat, the grotto sculpin continues to decline due to the effects of a wide array of threats (see Factors A, C, and E). Existing Federal and State water quality laws and State waste management law can be applied to protect water quality in surface and cave streams occupied by the grotto sculpin; however these laws have not been sufficient to prevent continued habitat degradation and population declines. Although harvest of grotto sculpin is not permitted in the Missouri Wildlife Code, the species has not been protected under Missouri Endangered Species Law because it has not been formally recognized as a distinct species. The existing regulatory mechanisms provide little direct protection of water quality in grotto sculpin habitat, which is the most significant threat to the species, and are inadequate to address threats to the species throughout its range. We have no information to indicate that the aforementioned regulations, which currently do not offer adequate protection to the grotto sculpin, will be revised or implemented in such a manner so that they would be adequate to provide protection for the species in the future.

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

Small, Isolated Populations—The existing grotto sculpin populations are small in size and range and its distribution is restricted to short stream reaches in two watersheds. The grotto sculpin's small population size makes it extremely susceptible to extirpation from a single catastrophic event (such as a toxic chemical spill or storm event that destroys its habitat), thus reducing the ability to recover from the cumulative effects of smaller chronic impacts to the population and habitat such as progressive degradation from water contamination.

Environmental stressors, such as habitat loss and degradation, can exacerbate potential problems associated with the species' endemism (*i.e.,* restricted to five cave systems in one county) and overall small population size, increasing the species' vulnerability to localized or rangewide extinction (Crnokrak and Roff 1999, p. 262; Hedrick and Kalinowski 1999, pp. 142–146). The isolation of subpopulations of the grotto sculpin

make it vulnerable to extinction and loss of genetic diversity caused by genetic drift, inbreeding depression, and stochastic events (Willis and Brown 1985, p. 316). Small, isolated populations are more susceptible to genetic drift, possibly leading to fixation where all except one allele is lost, and population bottlenecks leading to inbreeding (Frankham *et al.* 2002, pp. 178–187). Inbreeding depression can result in death, decreased fertility, smaller body size, loss of vigor, reduced fitness, various chromosome abnormalities, and reduced resistance to disease (Hedrick and Kalinowski 1999, pp. 139–142). Even though some populations fluctuate naturally, small and low-density populations are more likely to fluctuate below a minimum viable population (the minimum or threshold number of individuals needed in a population to persist in a viable state for a given interval) if they are influenced by stressors beyond those under which they have evolved (Shaffer 1981, p. 131; Shaffer and Samson 1985, pp. 148–150; Gilpin and Soule 1986, pp. 25–33). For example, grotto sculpin in Running Bull Cave exhibit the most distinct morphological adaptations to the cave environment and are the only individuals in the Cinque Hommes Creek drainage to have a rare genetic haplotype (Adams 2005, p. 49). One of the two known mass mortalities caused by a pollution event occurred in Running Bull Cave and temporarily eliminated grotto sculpin from the site. Grotto sculpin eventually recolonized the cave, but recolonization did not necessarily occur through local recruitment, but possibly through immigration by individuals from connected populations. Running Bull Cave might serve as either a primary site of population connectivity or interaction and act as a connecting stream between otherwise isolated localities (Mystery and Rimstone River Caves) (Day 2008, p. 52). Even though haplotype diversity post-extirpation was comparable to that previously measured (Day 2008, p. 54), it is possible that previously undocumented haplotypes were lost and will not be recovered. Day (2008, p. 54) notes that extirpation events of longer duration or greater severity could negatively impact overall genetic diversity. Furthermore, this scenario is illustrative of the potential for extirpation of entire subpopulations and the cascading effects on connected subpopulations.

Climate Change—Our analyses under the Act include consideration of ongoing and projected changes in climate. The terms ''climate'' and ''climate change'' are defined by the Intergovernmental Panel on Climate Change (IPCC). ''Climate'' refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term ''climate change'' thus refers to a change in the mean or variability of one or more measures of climate (for example, temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative, and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (for example, habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change. As is the case with all stressors that we assess, even if we conclude that a species is currently affected or is likely to be affected in a negative way by one or more climate-related impacts, it does not necessarily follow that the species meets the definition of an ''endangered species'' or a ''threatened species'' under the Act. If a species is listed as an endangered or threatened species, knowledge regarding the vulnerability of the species to, and known or anticipated impacts from, climate-associated changes in environmental conditions can be used to help devise appropriate strategies for its recovery.

The impact of climate change on the grotto sculpin is uncertain. The species is totally dependent on an adequate water supply and has specific habitat requirements (water depth and connectivity of caves and surface sites); we expect that climate change could significantly alter the quantity and quality of grotto sculpin habitat and thus impact the species in the future. This species relies on surface water for energy input into the cave system, recharge of groundwater, and availability of surface streams. Potential adverse effects from climate change include increased frequency and duration of droughts (Rind *et al.* 1990, p. 9983; Seager *et al.* 2007, pp. 1181–1184; Rahel and Olden 2008, p. 526) and changes in water temperature, which likely serves as a cue for reproduction in grotto sculpin (Adams 2005, pp. 10–11). Climate warming might also decrease groundwater levels (Schindler 2001, p. 22) or significantly reduce annual stream flows (Moore *et al.* 1997, p. 925; Hu *et al.* 2005, p. 9). In the Missouri Ozarks, it is projected that stream basin discharges may be significantly impacted by synergistic effects of changes in land cover and climate change (Hu *et al.* 2005, p. 9), and similar impacts are anticipated in the karst regions of Perry County, Missouri. Grotto sculpin require deep pools in caves, which could decrease in availability under drought conditions. Overall, shallower water or reduced flows could further concentrate contaminants present and lower dissolved oxygen in cave habitats.

Summary of Factor E

The small size and isolation of grotto sculpin populations, loss of genetic diversity, and effects from climate change could exacerbate other factors negatively affecting the species. These additional factors are particularly detrimental when combined with other factors, such as habitat and water quality degradation, and predation by invasive fish, which has a greater cumulative impact than would any of those factors acting independently (for example, compromised health from poor water quality might increase predation risk).

Proposed Determination

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the grotto sculpin. Numerous major threats, acting individually or synergistically, continue today (see *Summary of Factors Affecting the Species*). The most substantial threats to the species come from the present or threatened destruction, modification, or curtailment of its habitat (Factor A). Although no clear estimates of historical population numbers for the grotto sculpin exist in order to determine whether or not dramatic population declines have occurred in the past, two mass mortalities have been documented since the early 2000s. Both mortality events are thought to have been caused by point-source pollution of surface waters that recharge cave streams occupied by the grotto sculpin.

The known factors negatively affecting the grotto sculpin have continued to impact the species' habitat since it was elevated to candidate status in 2002 (67 FR 40657; June 13, 2002). All of the recharge areas for known grotto sculpin habitat are considered

vulnerable. It is believed that the primary threats to the species are habitat destruction and modification from water quality degradation and siltation. In particular, documentation that a suite of chemicals and other contaminants is continuously entering the groundwater above levels that can be harmful to aquatic life is especially concerning. Potential sources and vehicles for introduction of pollution likely are industrialization, contaminated agricultural runoff, sinkhole dumps, and vertical drains installed without appropriate best management practices.

A variety of current- and legacy-use pesticides from agricultural runoff and sinkhole leaching, evidence of human waste from ineffective septic systems, and animal waste from livestock operations have been detected in grotto sculpin streams. These not only negatively affect the grotto sculpin directly but also the aquatic ecosystems and aquifer underlying the Perry County sinkhole plain.

Siltation beyond historical levels affects the grotto sculpin in a variety of ways, such as eliminating suitable habitat for all life stages, reducing dissolved oxygen levels, increasing contaminants (that bind to sediments), and reducing prey populations. Predation on eggs, larvae, and juveniles by nonnative epigean fish can further reduce population numbers and will be a more prominent threat if siltation continues to degrade cave habitats to the point where refugia from predatory fish are no longer available to the grotto sculpin.

The Act defines an endangered species as ''any species which is in danger of extinction throughout all or a significant portion of its range'' and a threatened species as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' The grotto sculpin's endemism and isolated populations make it particularly susceptible to multiple, continuing threats and stochastic events that could cause substantial population declines, loss of genetic diversity, or multiple extirpations, leading ultimately to extinction of the species. Temporary extirpations of two of five known populations have occurred in the recent past. Recolonization after such mortality events is dependent on the presence and accessibility of source populations. Continued threats to the species not only impact individual populations, but also decrease the viability of source populations, and the likelihood that areas where the species has been extirpated will be recolonized. Furthermore, existing regulatory mechanisms provide little direct protection of water quality in grotto sculpin habitat, which is the most significant threat to the species. In addition to the individual threats, primarily those discussed under Factors A and E, each of which is sufficient to warrant the species' listing, the cumulative effect of Factors A, C, D, and E is such that the influence of threats on the grotto sculpin are significant throughout its entire range.

Overall, impacts from increasing threats, operating singly or in combination, are likely to result in the extinction of the species. Because these threats are placing the species in danger of extinction now and not only at some point in the foreseeable future, we determined it is endangered and not threatened. Therefore, on the basis of the best available scientific and commercial information, we propose listing the grotto sculpin as an endangered species in accordance with sections 3(6) and 4(a)(1) of the Act.

Under the Act and our implementing regulations, a species may warrant listing if it is threatened or endangered throughout all or a significant portion of its range. The grotto sculpin proposed for listing in this rule is highly restricted in its range and the threats occur throughout its range. Therefore, we assessed the status of the species throughout its entire known range. The threats to the survival of the species occur throughout the species' range and are not restricted to any particular significant portion of that range. Accordingly, our assessment and proposed determination applies to the species throughout its entire range.

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 by Federal, State, Tribal, and local agencies, private organizations, and individuals. The Act encourages cooperation with the States and requires that recovery actions be carried out for all listed species. The protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Subsection 4(f) of the Act requires the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning includes the development of a recovery outline shortly after a species is listed, and preparation of a draft and final recovery plan. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery plan identifies site-specific management actions that set a trigger for review of the five factors that control whether a species remains endangered or may be downlisted or delisted, and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams (comprised of species experts, Federal and State agencies, nongovernment organizations, and stakeholders) are often established to develop recovery plans. When completed, the recovery outline, draft recovery plan, and the final recovery plan will be available on our Web site (*http://www.fws.gov/endangered*), or from our Columbia Missouri Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribal, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (e.g., restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their range may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and Tribal lands.

If this species is listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, under section 6 of the Act, the State of Missouri would be eligible for Federal funds to implement management actions that promote the protection and recovery of the grotto sculpin. Information on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants.*

Although the grotto sculpin is only proposed for listing under the Act at this time, please let us know if you are interested in participating in recovery efforts for this species. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act 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 designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

Federal agency actions within the species habitat that may require conference or consultation or both as described in the preceding paragraph include management and any other landscape-altering activities on Federal lands administered by the Department of Defense, U.S. Fish and Wildlife Service, and U.S. Forest Service; issuance of section 404 Clean Water Act permits by the U.S. Army Corps of Engineers; construction and management of gas pipeline and power line rights-of-way by the Federal Energy Regulatory Commission; and construction and maintenance of roads or highways by the Federal Highway Administration.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. The prohibitions of section 9(a)(2) of the Act, codified at 50 CFR 17.21 for endangered wildlife, in part, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these), import, export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. Under the Lacey Act (18 U.S.C. 42–43; 16 U.S.C. 3371–3378), it is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22 for endangered species, and at 17.32 for threatened species. With regard to endangered wildlife, a permit must be issued for the following purposes: for scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities.

It is our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), 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 a proposed listing on proposed and ongoing activities within the range of species proposed for listing. The following activities could potentially result in a violation of section 9 of the Act; this list is not comprehensive:

(1) Unauthorized discharge of chemicals, waste, or fill material into any waters in which the grotto sculpin is known to occur, or into any sinkholes or vertical drains that recharge waters in which the grotto sculpin is known to occur;

(2) Unauthorized modification of the channel or water flow of any surface stream, cave stream, or spring in which the grotto sculpin is known to occur; and

(3) Introduction of nonnative fish species that compete with or prey upon the grotto sculpin.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Columbia Missouri Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**). Requests for copies of the regulations concerning listed animals and general inquiries regarding prohibitions and permits may be addressed to the U.S. Fish and Wildlife Service, Endangered Species Permits, 5600 American Boulevard West, Suite 990, Bloomington, MN 55437–1458 (telephone 612–713–5343; facsimile 612–713–5292).

If the grotto sculpin is listed under the Act, the State of Missouri's Endangered Species Act (MO ST 252.240) is automatically invoked, which would also prohibit take of these species and encourage conservation by State government agencies. Further, the State may enter into agreements with Federal agencies to administer and manage any area required for the conservation, management, enhancement, or protection of endangered species (MO ST 252.240). Funds for these activities could be made available under section 6 of the Act (Cooperation with the States). Thus, the Federal protection afforded to this species by listing it as an endangered species will be reinforced and supplemented by protection under State law.

Critical Habitat Designation for the Grotto Sculpin

Background

It is our intent to discuss below only those topics directly relevant to the designation of critical habitat for the grotto sculpin in this section of the proposed rule.

Critical habitat is defined in section 3 of the Act as:

(1) The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the Act, on which are found those physical or biological features:

(a) Essential to the conservation of the species; and

(b) Which may require special management considerations or protection; and

(2) Specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Conservation, as defined under section 3 of the Act, means to use and the use of all methods and procedures that are necessary to bring an endangered or threatened species to the

point at which the measures provided pursuant to the Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Critical habitat receives protection under section 7 of the Act through the requirement that Federal agencies ensure, in consultation with the Service, that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of critical habitat. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Such designation does not allow the government or public to access private lands. Such designation does not require implementation of restoration, recovery, or enhancement measures by non-Federal landowners. Where a landowner requests Federal agency funding or authorization for an action that may affect a listed species or critical habitat, the consultation requirements of section 7(a)(2) of the Act would apply, but even in the event of a destruction or adverse modification finding, the obligation of the Federal action agency and the landowner is not to restore or recover the species, but to implement reasonable and prudent alternatives to avoid destruction or adverse modification of critical habitat.

Under the first prong of the Act's definition of critical habitat, areas within the geographical area occupied by the species at the time it is listed are included in a critical habitat designation if they contain physical or biological features (1) essential to the conservation of the species and (2) which may require special management considerations or protection. For these areas, critical habitat designations identify, to the extent known using the best scientific and commercial data available, those physical or biological features that are essential to the conservation of the species (such as space, food, cover, and protected habitat). In identifying those physical and biological features within an area, we focus on the principal biological or physical constituent elements (primary constituent elements such as roost sites, nesting grounds, seasonal wetlands, water quality, tide, soil type) that are essential to the conservation of the species. Primary constituent elements are those specific elements of the physical or biological features that provide for a species' life-history processes and are essential to the conservation of the species.

Under the second prong of the Act's definition of critical habitat, we can designate critical habitat in areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. For example, an area currently occupied by the species but that was not occupied at the time of listing may be essential to the conservation of the species and may be included in the critical habitat designation. We designate critical habitat in areas outside the geographical area occupied by a species only when a designation limited to its range would be inadequate to ensure the conservation of the species.

Section 4 of the Act requires that we designate critical habitat on the basis of the best scientific data available. Further, our Policy on Information Standards Under the Endangered Species Act (published in the **Federal Register** on July 1, 1994 (59 FR 34271)), the Information Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554; H.R. 5658)), and our associated Information Quality Guidelines, provide criteria, establish procedures, and provide guidance to ensure that our decisions are based on the best scientific data available. They require our biologists, to the extent consistent with the Act and with the use of the best scientific data available, to use primary and original sources of information as the basis for recommendations to designate critical habitat.

When we are determining which areas should be designated as critical habitat, our primary source of information is generally the information developed during the listing process for the species. Additional information sources may include the recovery plan for the species, articles in peer-reviewed journals, conservation plans developed by States and counties, scientific status surveys and studies, biological assessments, other unpublished materials, or experts' opinions or personal knowledge.

Habitat is dynamic, and species may move from one area to another over time. We recognize that critical habitat designated at a particular point in time may not include all of the habitat areas that we may later determine are necessary for the recovery of the species. For these reasons, a critical habitat designation does not signal that habitat outside the designated area is unimportant or may not be needed for recovery of the species. Areas that are important to the conservation of the species, both inside and outside the critical habitat designation, will continue to be subject to: (1) Conservation actions implemented under section 7(a)(1) of the Act, (2) regulatory protections afforded by the requirement in section 7(a)(2) of the Act for Federal agencies to ensure their actions are not likely to jeopardize the continued existence of any endangered or threatened species, and (3) the prohibitions of section 9 of the Act if actions occurring in these areas may affect the species. Federally funded or permitted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. These protections and conservation tools will continue to contribute to recovery of this species. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, habitat conservation plans (HCPs), or other species conservation planning efforts if new information available at the time of these planning efforts calls for a different outcome.

Prudency Determination

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, the Secretary designate critical habitat at the time the species is determined to be an endangered or threatened species. Our regulations (50 CFR 424.12(a)(1)) state that the designation of critical habitat is not prudent when one or both of the following situations exist: (1) The species is threatened by taking or other human activity, and identification of critical habitat can be expected to increase the degree of threat to the species, or (2) such designation of critical habitat would not be beneficial to the species.

There is currently no imminent threat of take attributed to collection or vandalism under Factor B for grotto sculpin. In the absence of finding that the designation of critical habitat would increase threats to a species, if there are any benefits to a critical habitat designation, then a prudent finding is warranted. The potential benefits include: (1) Triggering consultation under section 7 of the Act, in new areas

for actions in which there may be a Federal nexus where it would not otherwise occur because, for example, it is or has become unoccupied or the occupancy is in question; (2) focusing conservation activities on the most essential features and areas; (3) providing educational benefits to State or county governments or private entities; and (4) preventing people from causing inadvertent harm to the species.

The primary regulatory effect of critical habitat is the section 7(a)(2) requirement that Federal agencies refrain from taking any action that destroys or adversely modifies critical habitat if there is a Federal nexus (Federal funds are involved or a Federal permit is required) involving actions that could adversely impact water quality parameters for this species. Various conservation measures or actions initiated and implemented under section 7(a)(1) of the Act may be useful in improving the water quality of aquatic habitats occupied by this species. In the case of the grotto sculpin, these aspects of critical habitat designation would potentially benefit the conservation of the species. Therefore, as we have determined that the designation of critical habitat will not likely increase the degree of threat to the species and may provide some measure of benefit, we find that designation of critical habitat is prudent for the grotto sculpin.

Critical Habitat Determinability

Having determined that designation is prudent, under section 4(a)(3) of the Act we must find whether critical habitat for the grotto sculpin is determinable. Our regulations at 50 CFR 424.12(a)(2) state that critical habitat is not determinable when one or both of the following situations exist:

(i) Information sufficient to perform required analyses of the impacts of the designation is lacking, or

(ii) The biological needs of the species are not sufficiently well known to permit identification of an area as critical habitat.

When critical habitat is not determinable, the Act allows the Service an additional year to publish a critical habitat designation (16 U.S.C. 1533(b)(6)(C)(ii)).

We reviewed the available information pertaining to the biological needs of the species and habitat characteristics where this species is located. This and other information represent the best scientific data available and led us to conclude that the designation of critical habitat is determinable for the grotto sculpin.

Physical or Biological Features

In accordance with section 3(5)(A)(i) and 4(b)(1)(A) of the Act and regulations at 50 CFR 424.12, in determining which areas within the geographical area occupied by the species at the time of listing to designate as critical habitat, we consider the physical or biological features that are essential to the conservation of the species which may require special management considerations or protection. These include, but are not limited to:

(1) Space for individual and population growth and for normal behavior;

(2) Food, water, air, light, minerals, or other nutritional or physiological requirements;

(3) Cover or shelter;

(4) Sites for breeding, reproduction, or rearing (or development) of offspring; and

(5) Habitats that are protected from disturbance or are representative of the historical, geographic, and ecological distributions of a species.

We derive the specific physical or biological features required for the grotto sculpin from studies of this species' habitat, ecology, and life history. The physical and biological features required for the grotto sculpin are derived from biological needs of the species as described in the Background section of this proposal, and based on published literature (Burr *et al.* 2001, pp. 279–276; Gerken and Adams 2008, pp. 74–78), unpublished reports, and professional opinions by recognized experts. While little is known of the specific habitat requirements for this species, the best available information shows that the species requires adequate water quality, water quantity, water flow, a stable stream channel, minimal sedimentation, organic input into caves during rain events, and a sufficient prey base for juveniles (Burr *et al.* 2001, pp. 291, 294–295; Gerken and Adams 2008, pp. 74–76). Due to the complex nature of the multiple karst regions in Perry County, diverse hydrologic components will be essential to the conservation of grotto sculpin; these include cave streams, resurgences, springs, surface streams, and surface and subterranean interconnected or interspatial habitats (Vandike 1985, pp. 1–10; Day 2008, pp. 22–24). To identify the physical and biological features essential to the grotto sculpin, we have relied on current conditions at locations where the species survives and the information available on this species.

Space for Individual and Population Growth and for Normal Behavior

The specific space requirements for the grotto sculpin are unknown, but given the mixture of habitats used by different life stages of this fish (Burr *et al.* 2001, p. 284; Gerken and Adams 2008, p. 76), space is not likely a limiting factor; however, silt and various pollutants may affect the species' overall distribution and abundance (Burr *et al.* 2001, p. 294; Gerken and Adams 2008, p. 76). Grotto sculpin occupy cave streams, resurgences (also known as ''spring branches''; Vandike 1985, p. 10), springs, and surface streams (Adams 2012, pers. comm.; Burr *et al.* 2001, p. 284). They occupy pools and riffles with moderate flows and variable depths (4 to 33 centimeters (cm) (1.6 to 13 in)) (Burr *et al.* 2001, p. 284). Although grotto sculpin have been documented to occur over a variety of substrates (for example, silt, gravel, cobble, rock rubble, and bedrock), the presence of cobble or pebble is necessary for spawning (Burr *et al.* 2001, p. 284; Adams *et al.* unpub. data). Grotto sculpin tend to be associated with high availability of invertebrate prey, deeper cave pools, substrate containing cobble, and some level of sustained water flow (Gerken 2007, pp. 16–17). Surface habitat used by grotto sculpin is characterized by an abundance of amphipods and isopods. In caves, grotto sculpin occupy deeper pools with cobble, and with a relatively high abundance of amphipods and isopods. Although usually in lower abundance, grotto sculpin also occupy shallow cave pools where the substrate consists of silt deposits deeper than 1.9 cm (0.8 in) (Gerken 2007, p. 16). Resurgences are used by juvenile grotto sculpin as nursery areas, where they maximize growth before migrating upstream into caves to reproduce or downstream to surface streams (Day 2008, p. 18).

Habitat conditions described above provide space, cover, shelter, and sites for foraging, breeding, reproduction, and growth of offspring for the grotto sculpin. These habitats are found in caves streams, resurgences, springs, and surface streams; therefore, we identify those elements as physical or biological features essential to the conservation for grotto sculpin. Additionally, interconnected karst areas and interstitial spaces that allow for the free flow of water between occupied surface and subsurface habitats are primary components of essential physical and biological features for the grotto sculpin.

Food, Water, Air, Light, Minerals, or Other Nutritional or Physiological Requirements

Although the specific food items of grotto sculpin have not been determined, they are likely similar to the diet of banded sculpin. Prey items of the banded sculpin include ephemeropterans, dipterans, chronomids, gastropods, amphipods, isopods, fish, spiders, aquatic oligochaetes, caddisflies, damselfly larvae, ostracods, stoneflies, beetles, crayfish, and salamanders (Phillips and Kilambi 1996, pp. 69–72; Pflieger 1997, p. 253; Tumlinson and Cline 2002, pp. 111–112; Niemiller *et al.* 2006, p. 43). Prey availability is related to the organic input that is transported with sediment and other organic materials via sinkholes into stream habitats (Burr *et al.* 2001, p. 291). An abundance of aquatic invertebrates is necessary to support a viable population of grotto sculpin (Niemiller *et al.* 2006, p. 43; Gerken and Adams 2008, p. 75). Therefore, based on this information, we identify the availability of appropriate organic input supporting the aquatic invertebrate prey base to be a primary component of the essential physical and biological features for the grotto sculpin.

The grotto sculpin occurs in pools and riffles of cave streams, resurgences, springs, and surface streams (Burr *et al.* 2001, pp. 280–284; Adams 2012, pers. comm.). It can occur over multiple substrates including sand, silt, gravel, pebble, cobble, breakdown, and bedrock, although the association with silt might be due to the prevalence of sediment within occupied habitat rather than a preference for such substrates (Vandike 1985, p. 38; Burr *et al.* 2001, p. 284; Gerken 2007, pp. 13, 22–25; Gerken and Adams 2008, pp. 76–77).

Optimum water temperature, flow rates, and water depth in occupied streams have not been established for grotto sculpin and vary widely depending on life stage and location (*e.g.,* pools of cave streams versus flowing water in resurgences or surface streams) (Gerken 2007, pp. 20–27). Water depth varied, but ranged between 4 and 33 cm (1.6 and 13.0 in) and flow rates were between .05 and 6.67 cm/sec (0.2 and 2.6 in/sec) (Burr *et al.* 2001, p. 284; Gerken 2007, p. 17).

Occupied cave streams, resurgences, springs, surface streams, interconnected karst areas, and interstitial spaces should have reduced levels of silt, sustained water flows, high dissolved oxygen levels, and reduced amounts of organic and inorganic contaminants. Interconnected karst areas and interstitial spaces should be free of debris and have reduced levels of silt to allow for free flow of water between occupied habitats. Water quality standards for contaminants should follow guidelines established by the EPA, except for ammonia and copper. Water quality criteria for ammonia and copper should follow minimum levels reported by Wang *et al.* (2007, pp. 2048–2055) and established for juvenile freshwater mussels (less than 4.6 parts per billion copper per liter and less than 370 parts per billion ammonia expressed as nitrogen per liter).

Optimum water quality parameters have not been determined for the grotto sculpin. Habitat information for other species that inhabit cave streams and springs in Missouri (such as the endangered Tumbling Creek cavesnail) may be used as suitable surrogates for the grotto sculpin. In the absence of information specific to the grotto sculpin's water quality needs, we believe the criteria established for the Tumbling Creek cavesnail are also suitable for the grotto sculpin. Therefore, we recommend the following water quality parameters for the grotto sculpin: an average daily discharge of 0.07 to 150 cubic feet per second (cfs); water temperature of cave streams, springs, resurgences, and surface streams should be between 55 and 62 °F (12.78 and 16.67 °C); dissolved oxygen levels should equal or exceed 4.5 milligrams per liter; and turbidity of an average monthly reading should not exceed 200 Nephelometric Units (units used to measure sediment discharge) and should not persist for a period greater than 4 hours. Adequate water flow, temperature, and quality (as defined above) are essential for normal behavior, growth, and viability during all life stages of the grotto sculpin. Therefore, based on the information above, we identify adequate water flow, temperature, and quality to be physical and biological features essential to the conservation for the grotto sculpin.

Cover or Shelter

Burr *et al.* (2001, p. 284) noted that grotto sculpin occur in the open as well as under rocks. Rocks within cave streams allow the grotto sculpin to avoid predators (Gerken 2007, p. 25); at least six different species of piscivorous, predatory fish occur within occupied grotto sculpin habitat (Burr *et al.* 2001, p. 284). Additionally, rocks provide a substrate for egg laying (Gerken 2007, p. 2; Adams 2005, p. 10). In addition to rocks, large cobble has been identified as an important component of sculpin habitat (Gerken 2007, pp. 22–27).

Due to the wide variety of habitats used by grotto sculpin depending on age and season (Burr *et. al* 2001, pp. 283–284; 294; Gerken 2007, pp. 27–30; Gerken and Adams 2008, pp. 75–76), occupied underground and surface aquatic habitats including associated transitional aquatic habitats are all essential physical or biological features for the species. The grotto sculpin requires cave and surface streams with a stable stream bottom and solid bedrock and stable stream banks to maintain a stable horizontal dimension and vertical profile of pool and riffle habitats. A mixture of bottom substrates, including sand, gravel, pebbles, cobble, ceiling breakdown areas and larger rocks, is necessary to provide cover and attachment surfaces for egg masses. Additionally, bottom substrates must not be covered with excessive amounts of silt.

Therefore, based on the information above, we identify the following as primary components of the physical or biological features essential to the conservation of the grotto sculpin: cave streams, resurgences, springs, surface streams, and interconnected areas between surface and subterranean habitats with stable bottom and banks; rocks or large cobble to provide cover; and substrates consisting of fine gravel with coarse gravel or cobble, or bedrock with sand and gravel, with low amounts of fine sand and sediments within the interstitial spaces of the substrates.

Sites for Breeding, Reproduction, or Rearing

Adams (2005, pp. 10; Adams *et al.* 2008, p. 8; Gerken 2007, pp. 19–21) demonstrated that grotto sculpin spawn in caves but some young-of-the-year move to resurgences or surface streams and spend much of their lives away from caves. Juvenile grotto sculpin likely move out of caves to avoid predation by adult sculpin (Gerken 2007, p. 19) or to take advantage of higher levels of prey in such habitats (Burr *et al.* 2001, p. 291; Gerken 2007, pp. 19–20; Day 2008, pp. 18–21). Gerken (2007, p. 19) and Day (2008, p. 18) postulated that juvenile grotto sculpin use resurgences and surface streams as nursery areas to gain size by taking advantage of increased food resources. At some point in their maturation process, juvenile sculpin move from resurgences and surface streams into caves to complete their life cycle (Gerken 2007, p. 19; Day 2008, p. 18). Based on the information above, consistent connectivity between cave streams and resurgences or surface streams is a primary component of the physical or biological features essential to the conservation for the grotto sculpin.

Primary Constituent Elements (PCEs) for the Grotto Sculpin

Under the Act and its implementing regulations, we are required to identify the physical or biological features essential to the conservation of the grotto sculpin in areas occupied at the time of listing, focusing on the features' primary constituent elements. We consider primary constituent elements to be the elements of physical or biological features that provide for a species' life-history processes and are essential to the conservation of the species.

Based on our current knowledge of the physical or biological features and habitat characteristics required to sustain the species' life-history processes, we determine that the primary constituent elements specific to the grotto sculpin are:

(1) Geomorphically stable stream bottoms and banks (stable horizontal dimension and vertical profile) with riffles, runs, pools, and transition zones between these stream features.

(2) Instream flow regime with an average daily discharge between 0.07 and 150 cubic feet per second (cfs), inclusive of surface runoff, cave streams, resurgences, springs, and occupied surface streams and all interconnected karst areas with flowing water.

(3) Water temperature between 12.8 and 16.7 °C (55 and 62 °F), dissolved oxygen 4.5 milligrams or greater per liter, and turbidity of an average monthly reading of no more than 200 Nephelometric Turbidity Units for a duration not to exceed 4 hours.

(4) Adequate water quality characterized by low levels of contaminants. Adequate water quality is defined as the quality necessary for normal behavior, growth, and viability of all life stages of the grotto sculpin.

(5) Bottom substrates consisting of a mixture of sand, gravel, pebble, cobble, solid bedrock, larger cobble and rocks for cover, with low amounts of sediments.

(6) Abundance of aquatic invertebrate prey base to support the different life stages of the grotto sculpin.

(7) Connected underground and surface aquatic habitats that provide for all life stages of the grotto sculpin, with sufficient water levels to facilitate movement of individuals among habitats.

With this proposed designation of critical habitat, we intend to identify the physical and biological features essential to the conservation of the species, through the identification of the primary constituent elements sufficient to support the life-history requirements of the species. All units proposed as critical habitat are currently occupied by the grotto sculpin and contain the primary constituent elements sufficient to support the life-history needs of the grotto sculpin.

Special Management Considerations or Protection

When designating critical habitat, we assess whether the specific areas within the geographic area occupied by the species at the time of listing contain features that are essential to the conservation of the species and that may require special management considerations or protection.

The four units we are proposing for designation as critical habitat will require some level of management to address the current and future threats to the physical and biological features essential to the conservation of the species.

Although little area within the proposed critical habitat units is presently under special management or protection provided by a legally operative plan or agreement for the conservation of the grotto sculpin, some landowners within the recharge zones of caves occupied by the species have worked cooperatively with the MDC in the implementation of various conservation measures that facilitate good water quality. Keyhole Spring and Ball Mill Spring have both been purchased by the L–A–D Foundation, and these water sources are managed by MDC (Moss and Pobst 2010, pp. 152–153). Management of areas within the recharge areas of Keyhole and Ball Mill springs will provide some conservation benefits to the grotto sculpin.

A landowner agreement between MDC and the Missouri Caves and Karst Conservancy in 2011 will facilitate conservation actions at Berome Moore Cave (Pobst 2011a, pp. 1–2). These include access to the cave to conduct research and monitor population numbers of grotto sculpin; livestock fencing to prohibit access to sinkholes, reduce nutrient runoff, and facilitate erosion control; and the planting of warm-season grasses to benefit wildlife. Various debris and trash have been removed from multiple sinkholes within the recharge zones of cave streams occupied by grotto sculpin (Pobst 2011b, pp. 1–3), and additional access agreements are being pursued with other interested landowners to control entrances to caves occupied by the species (Pobst 2011a, p. 1).

Although best management practices (BMPs) have not been specifically developed for the grotto sculpin, guidelines established by MDC (2000, p. 1) for the Ozark cavefish (*Amblyopsis rosae*) would contribute to the conservation of the sculpin because both species occur in similar habitats.

Various activities in or adjacent to the critical habitat units described in this proposed rule may affect one or more of the physical or biological features and may require special management considerations or protection. Some of these activities include, but are not limited to, those previously discussed in the ''Summary of Factors Affecting the Species.'' Features in all of the proposed critical habitat units may require special management due to threats associated with activities that could be sources of contamination that adversely affect water quality of habitats occupied by grotto sculpin; with significant changes in the existing flow regime of caves streams, resurgences, springs, or surface streams occupied by grotto sculpin; with significant alteration in the quantity of groundwater and alteration of spring discharge sites; with alterations to septic systems that could adversely affect water quality; and with other watershed and floodplain disturbances that release sediments or nutrients into the water. Other activities that may affect essential features in the proposed critical habitat unit include those listed in the ''Effects of Critical Habitat Designation'' section below.

In summary, we find that the areas we are proposing as critical habitat contain the features essential to the conservation of the grotto sculpin and that these features may require special management considerations or protections. Special management considerations or protections may be required to eliminate, or to reduce to negligible levels, the threats affecting each unit and to preserve and maintain the essential features that the proposed critical habitat units provide to the grotto sculpin. There are multiple threats to the grotto sculpin in all four units proposed as critical habitat. These include industrial sand mining and degraded water quality due to various sources of contamination and siltation. Additional discussions of threats facing individual sites, where applicable, are provided in the individual unit descriptions.

Criteria Used To Identify Proposed Critical Habitat

As required by section 4(b)(2) of the Act, we use the best scientific and commercial data available to designate critical habitat. We review available information pertaining to the habitat requirements of the species to determine areas within the geographical area

currently occupied by the species that contain the physical and biological features essential to the conservation of the grotto sculpin. In accordance with the Act and its implementing regulation at 50 CFR 424.12(e), we consider whether designating additional areas—outside those currently occupied as well as those occupied at the time of listing—are necessary to ensure the conservation of the species. We are not currently proposing to designate any areas outside the geographical area occupied by the species because occupied areas are sufficient for the conservation of the species.

In order to determine which sites are currently occupied, we used information from surveys conducted by Burr *et al.* (2001, pp. 280–286), Adams (2005, pp. 11–13), Day (2008, pp. 9–11; 62–66), Gerken (2007, pp. 5–8), and Gerken and Adams (2008, pp. 74–76), and dye tracing studies conducted by Moss and Pobst (2010, pp. 146–160, 177, 180–192). Currently, occupied habitat for the species includes all caves streams, resurgences, springs, and surface streams associated with the recharge areas for the Moore Cave System, the Crevice Cave System, Mystery Cave, Rimstone River Cave, Running Bull Cave, and Hot Caverns; as well as Thunder Hole Resurgence, Mystery Cave Resurgence, Cinque Hommes Creek, and Blue Spring Branch. After identifying the specific locations occupied by the grotto sculpin, we determined the appropriate area of occupied segments of aquatic habitats essential for the conservation of the species. These areas are collectively contained within the Central Perryville and Mystery-Rimstone karst areas as described by House (1976, pp. 13–14) and Burr *et al.* (2001, pp. 280–282).

Although there are underground portions within the Central Perryville and Mystery-Rimstone karst areas that are inaccessible to humans, all underground aquatic habitats within the recharge zones of the Moore Cave System, the Crevice Cave System, Mystery Cave, Rimstone River Cave, Running Bull Cave, Thunder Hole Resurgence, Mystery Cave Resurgence, Cinque Hommes Creek, and Blue Spring Branch are believed to be occupied by the grotto sculpin. Areas delineated within the Central Perryville and Mystery-Rimstone karst areas are believed to comprise the entire known range of the grotto sculpin. We are not proposing to designate any areas outside of those mentioned above, because the species is believed to be a local endemic, and surveys in other nearby cave streams and springs have failed to find additional populations (Burr *et al.* 2001, pp. 283–284).

Although the total area within the Central Perryville and Mystery Cave-Rimstone karst areas is estimated to encompass approximately 222 km^2 (89 mi^2) (Service calculations from Vandike 1985, p. 1 and Burr *et al.* 2001, p. 282) and the above-ground recharge areas of the Moore Cave System, the Crevice Cave System, Mystery Cave, Rimstone River Cave, Running Bull Cave, and Thunderhole Resurgence have been estimated to be 93.95 km^2 (36.28 mi^2) (Moss and Pobst 2010, pp. 183–186), and are important to maintain the condition of sculpin habitat, non-aquatic areas within such areas do not themselves contain the physical and biological features essential to the conservation of the species.

We have determined that all of the areas proposed as critical habitat are currently occupied and contain sufficient elements of physical and biological features to support life-history processes essential for the conservation of the species. Other than all caves streams, resurgences, springs, and surface streams associated with the recharge areas for the Moore Cave System, the Crevice Cave System, Mystery Cave, Rimstone River Cave, Running Bull Cave, Thunder Hole Resurgence, Mystery Cave Resurgence, Cinque Hommes Creek, and Blue Spring Branch, we are currently unaware of any other areas occupied by the grotto sculpin. Therefore, we are unable to determine which additional areas, if any, may be appropriate to include in the proposed critical habitat for this species. All of the areas proposed as critical habitat are within the known historical range of the species, and we are not proposing to designate any areas outside the geographical area currently occupied by the species. At this time, we believe that the occupied areas are sufficient for the conservation of the species.

When determining proposed critical habitat boundaries, we made every effort to avoid including developed areas such as lands covered by buildings, pavement, and other structures because such lands lack physical or biological features for the grotto sculpin. The scale of the maps we prepared under the parameters for publication within the Code of Federal Regulations may not reflect the exclusion of such developed lands. Any such lands inadvertently left inside critical habitat boundaries shown on the maps of this proposed rule have been excluded by text in the proposed rule and are not proposed for designation as critical habitat. Therefore, if the critical habitat is finalized as proposed, a Federal action involving these lands would not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification, unless the specific action would affect the physical or biological features in the adjacent critical habitat.

Units are proposed for designation based on sufficient elements of physical or biological features being present to support grotto sculpin life-history processes. All units contain all of the identified elements of physical or biological features and support multiple life-history processes.

The critical habitat designation is defined by the map or maps, as modified by any accompanying regulatory text, presented at the end of this document in the rule portion. We include more detailed information on the boundaries of the critical habitat designation in the preamble of this document. We will make the coordinates or plot points or both on which each map is based available to the public on *http://www.regulations.gov* at Docket No. FWS–ES–R3–2012–0065, on our Internet site *http://www.fws.gov/midwest/Endangered,* and at the field office responsible for the designation (see **FOR FURTHER INFORMATION CONTACT** above).

Proposed Critical Habitat Designation

We are proposing four units, totaling approximately 94 km^2 (36.28 mi^2) plus 31 kilometers (19.2 miles) of surface stream as critical habitat for the grotto sculpin. Critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for the grotto sculpin. The first unit encompasses all aquatic habitat within the recharge areas of the Moore Cave System, the Crevice Cave System, Ball Mill Spring and Keyhole Spring totaling approximately 46 km^2 (17.61 mi^2). The second unit covers all aquatic habitat within the recharge areas of Mystery Cave, Rimstone River Cave, Running Bull Cave, and Thunderhole Resurgence, totaling approximately 48 km^2 (18.67 mi^2). The third unit envelops approximately 6.4 km (4.0 mi) of Blue Spring Branch from its emergence within the Moore Cave System to its confluence with Bois Brule Creek (Burr *et al.* 2001, pp. 280–281; Moss and Pobst 2010, p. 183). The fourth unit entails approximately 24 km (15.2 mi) of Cinque Hommes Creek from its emergence near Mystery Cave and Resurgence to its confluence with Bois Brule Creek (Burr *et al.* 2001, pp. 280–281; Moss and Pobst 2010, p. 185).

Although the exact extent of occupied aquatic habitat by grotto sculpin within the recharge areas is not known due to the inaccessibility of underground karst, we presume all aquatic habitats within the entire 94 km² (36.28 mi²) recharge could reasonably be occupied, and thus propose to designate the entire area as critical habitat. It should be implied that all references to the delineated boundaries of critical habitat for Units One and Two within cave and resurgence recharge zones apply only to those areas of aquatic habitat, because only these areas contain the physical and biological features essential to the conservation of the grotto sculpin.

We present brief descriptions for the four units and reasons why they meet the definition of critical habitat below. For occupied aquatic habitats proposed as critical habitat, the approximate area of recharge areas of Tom and Berome Moore Caves, Crevice Cave, Mystery Cave, Rimstone River Cave, Running Bull Cave, and Thunderhole Resurgence, as well as upstream and downstream boundaries for Blue Spring Branch and Cinque Hommes Creek, are described generally below; more precise descriptions, as best can be determined, are provided in the Proposed Regulation Promulgation section at the end of this proposed rule. The approximate area and ownership of each proposed critical habitat unit is shown in Table 1.

TABLE 1—OCCUPANCY AND OWNERSHIP OF THE PROPOSED CRITICAL HABITAT UNITS FOR THE GROTTO SCULPIN

[Area estimates reflect all land within critical habitat unit boundaries.]

Unit	Location	Occupied	Private ownership		State, county, city ownership		Total
			sq. km (sq. mi)	km (mi)	sq. km (sq. mi)	km (mi)	
1	Central Perryville Karst Area	Yes	35 (14)	0	11 (4)	0	46 (18)
2	Mystery-Rimstone Karst Area	Yes	48 (19)	0	1 (1)	0	48 (19)
3	Blue Spring Branch	Yes	0	6 (4)	0	0	6 (4)
4	Cinque Hommes Creek	Yes	0	24 (14)	0	0	24 (14)
						karst area	94 (36)
Total			83 (32)	31 (19)	11 (4)	stream	31 (19)

Note: Area sizes may not sum due to rounding.

All units are considered currently occupied and all units contain all or some components of all four physical and biological features, and are therefore essential to the conservation of the species. The grotto sculpin and its habitat may require special management considerations or protections to address activities that are sources of contamination; changes in the existing flow regime of caves streams, resurgences, springs, or surface streams occupied by grotto sculpin; alteration in the quantity of groundwater and alteration of spring discharge sites; alterations to septic systems that could adversely affect water quality; and other watershed and floodplain disturbances that release sediments or nutrients into the water. Land use in the four units is similar and is primarily agriculture (row cropping and livestock production), rural or residential development, and industrial mining and quarrying. The majority of all proposed units are privately owned, with the exception of two municipalities: Perryville in Unit 1, and Longtown in Unit 2.

Unit 1: Central Perryville Karst Area, Perry County, Missouri

Unit 1 includes all aquatic habitats within the recharge area of the Moore Cave System, the Crevice Cave System, Ball Mill Spring, and Keyhole Spring. The entire area covers approximately 45.61 km² (17.61 mi²). The Moore Cave System Recharge Area encompasses approximately 10.23 km² (3.95 mi²) and drains north from the edge of Perryville and discharges at Blue Spring on Blue Spring Branch; it can overflow from an adjacent spring called Blue Spring Overflow or Blue Spring Resurgence (Moss and Pobst 2010, pp. 147, 183). The recharge area of Crevice Cave includes Mertz Cave and Resurgence, Zahner Cave, Doc White Spring, Hogpen Spring, Herberlie Resurgence, Circle Drive Resurgence, Rob Roy Sink, Rozier Sink, Edgemont Sink, Shoe Factory Sink, and Lurk Sink, and has been estimated to be approximately 30.33 km² (11.71 mi²) (Moss and Pobst 2010, pp. 151–152). Ball Mill Spring feeds portions of the Blue Spring Branch (a separate proposed critical habitat unit (Unit 3) outlined below) and the recharge area for this water source is approximately 1.71 km² (0.66 mi²) (Moss and Pobst 2010, p. 153). Keyhole Spring includes Keyhole Resurgence, and the total recharge area has been estimated to be 3.34 km² (1.29 mi²) (Moss and Pobst 2010, p. 152). The recharge area for Crevice Cave contains the city of Perryville. In addition to the threats that may require special management considerations or protections outlined above for all units, this unit is negatively affected by urban growth and development that might impact water quality, such as hazardous waste facilities, underground storage tanks, wastewater discharges, and poorly maintained septic systems in and around the city (Pobst and Taylor 2008, p. 69; Moss and Pobst 2010, p. 164).

Unit 2: Mystery-Rimstone Karst Area, Perry County, Missouri

Unit 2 includes all aquatic habitats within the recharge zone of Mystery Cave, Rimstone River Cave, Running Bull Cave, and Thunderhole Resurgence, and incorporates an area of approximately 48.34 km² (18.67 mi²). Mystery Cave includes Mystery Resurgence, Mystery Overflow Spring, Maple Leaf Cave, and Miller Spring, and the total area of its recharge area is approximately 18.26 km² (7.05 mi²) (Moss and Pobst 2010, p. 154). The recharge area of Rimstone River Cave covers 24.53 km² (9.47 mi²), and the main features within it include Lost Creek Cave, Weinrich Onyx Cave, Onyx Annex Cave, Twin Cave, and Snow Caverns (Moss and Pobst 2010, p. 158). The recharge area for Running Bull Cave extends from Maple Leaf Cave to Thunderhole Resurgence and encompasses 2.74 km² (1.06 mi²) (Moss and Pobst 2010, p. 159). Thunderhole Resurgence receives water from multiple sources and, during high water events, some of the caves mentioned previously can contribute water to this resurgence (Moss and Pobst 2010, pp. 154, 159–160). Under high flow conditions, the Mystery Cave groundwater system overflows to Thunderhole Resurgence (Moss and Pobst 2010, p. 160). The total base flow recharge area of Thunderhole Resurgence is approximately 5.57 km² (2.15 mi²).

Unit 3: Blue Spring Branch, Perry County, Missouri

Unit 3 includes approximately 6.4 km (4.0 mi) of the surface portions of Blue Spring Branch from points downstream of the Moore Cave System to its confluence with Bois Brule Creek (Burr *et al.* 2002, pp. 280–281; Moss and Pobst 2010, pp. 147, 183). Blue Spring Branch is the principal resurgence stream for caves identified above within the Moore Cave System (Burr *et al.* 2001, p. 284).

Unit 4: Cinque Hommes Creek, Perry County, Missouri

Unit 4 includes approximately 24.4 km (15.2 mi) of Cinque Hommes Creek that generally flows in a northeast direction from near Interstate 55 south-southeast of Perryville to its confluence with Bois Brule Creek (Adams 2005, p. 90; Burr *et al.* 2001, p. 281).

Effects of Critical Habitat Designation

Section 7 Consultation

Section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that any action they fund, authorize, or carry out is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. In addition, section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed under the Act or result in the destruction or adverse modification of proposed critical habitat.

Decisions by the 5th and 9th Circuit Courts of Appeals have invalidated our regulatory definition of ''destruction or adverse modification'' (50 CFR 402.02) (see *Gifford Pinchot Task Force* v. *U.S. Fish and Wildlife Service,* 378 F. 3d 1059 (9th Cir. 2004) and *Sierra Club* v. *U.S. Fish and Wildlife Service et al.,* 245 F.3d 434, 442 (5th Cir. 2001)), and we do not rely on this regulatory definition when analyzing whether an action is likely to destroy or adversely modify critical habitat. Under the statutory provisions of the Act, we determine destruction or adverse modification on the basis of whether, with implementation of the proposed Federal action, the affected critical habitat would continue to serve its intended conservation role for the species.

If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. Examples of actions that are subject to the section 7 consultation process are actions on State, tribal, local, or private lands that require a Federal permit (such as a permit from the U.S. Army Corps of Engineers under section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq.*) or a permit from the Service under section 10 of the Act) or that involve some other Federal action (such as funding from the Federal Highway Administration, Federal Aviation Administration, or the Federal Emergency Management Agency). Federal actions not affecting listed species or critical habitat, and actions on State, tribal, local, or private lands that are not federally funded or authorized, do not require section 7 consultation.

As a result of section 7 consultation, we document compliance with the requirements of section 7(a)(2) through our issuance of:

(1) A concurrence letter for Federal actions that may affect, but are not likely to adversely affect, listed species or critical habitat; or

(2) A biological opinion for Federal actions that may affect, and are likely to adversely affect, listed species or critical habitat.

When we issue a biological opinion concluding that a project is likely to jeopardize the continued existence of a listed species and/or destroy or adversely modify critical habitat, we provide reasonable and prudent alternatives to the project, if any are identifiable, that would avoid the likelihood of jeopardy and/or destruction or adverse modification of critical habitat. We define ''reasonable and prudent alternatives'' (at 50 CFR 402.02) as alternative actions identified during consultation that:

(1) Can be implemented in a manner consistent with the intended purpose of the action,

(2) Can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction,

(3) Are economically and technologically feasible, and

(4) Would, in the Director's opinion, avoid the likelihood of jeopardizing the continued existence of the listed species and/or avoid the likelihood of destroying or adversely modifying critical habitat.

Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of the project. Costs associated with implementing a reasonable and prudent alternative are similarly variable.

Regulations at 50 CFR 402.16 require Federal agencies to reinitiate consultation on previously reviewed actions in instances where we have listed a new species or subsequently designated critical habitat that may be affected and the Federal agency has retained discretionary involvement or control over the action (or the agency's discretionary involvement or control is authorized by law). Consequently, Federal agencies sometimes may need to request reinitiation of consultation with us on actions for which formal consultation has been completed, if those actions with discretionary involvement or control may affect subsequently listed species or designated critical habitat.

Application of the ''Adverse Modification'' Standard

The key factor related to the adverse modification determination is whether, with implementation of the proposed Federal action, the affected critical habitat would continue to serve its intended conservation role for the species. Activities that may destroy or adversely modify critical habitat are those that alter the physical or biological features to an extent that appreciably reduces the conservation value of critical habitat for the grotto sculpin. As discussed above, the role of critical habitat is to support life-history needs of the species and provide for the conservation of the species.

Section 4(b)(8) of the Act requires us to briefly evaluate and describe, in any proposed or final regulation that designates critical habitat, activities involving a Federal action that may destroy or adversely modify such habitat, or that may be affected by such designation.

Activities that may affect critical habitat, when carried out, funded, or authorized by a Federal agency, should result in consultation for the grotto sculpin. These activities include, but are not limited to:

(1) Actions that would cause an increase in sedimentation to areas of all cave streams, resurgences, springs, or surface streams occupied by the grotto sculpin. Such activities could include, but are not limited to, surface soil disturbance associated with construction; agriculture and forestry practices; mining operations; maintenance of secondary or non-paved roads within the recharge areas of occupied caves; or actions that result in run off into occupied surface streams. These activities could eliminate or reduce habitats necessary for the growth and reproduction of the species by causing excessive sedimentation resulting in a decrease in dissolved oxygen levels, serving as a method of transport of hazardous chemicals that bind to soil particles, smothering egg

masses, or eliminating interstitial spaces needed by grotto sculpin.

(2) Actions that would significantly alter the existing flow regime of cave streams, resurgences, springs, or surface streams occupied by the grotto sculpin including all aquatic habitats within cave or resurgence recharge areas. Such activities could include, but are not limited to, high water demands needed for agricultural, residential, commercial, and industrial development.

(3) Actions that would significantly alter water chemistry or water quality (for example, changes to temperature or pH, introduction of contaminants, or excess nutrients) in cave streams, resurgences, springs, or surface streams occupied by the grotto sculpin, including all aquatic habitats within cave or resurgence recharge areas. Such activities could include, but are not limited to, the release of chemicals or biological pollutants; pesticides or herbicides used for agriculture; hormones or antibiotics associated with animal husbandry operations; sand mining operations associated with hydraulic fracturing; disposal of dead animals and trash in sinkholes; and bacteria and nutrients from human sewage and animal manure. These activities could alter water conditions that are beyond the tolerances of the species and result in direct or cumulative adverse effects on the species and its life cycle. These activities could eliminate or reduce habitats necessary for the growth and reproduction of the species by causing eutrophication, leading to excessive filamentous algal growth. Excessive filamentous algal growth can cause extreme decreases in nighttime dissolved oxygen levels through vegetation respiration, and cover the bottom substrates and the interstitial spaces needed by sculpin. Introduction of harmful chemicals into aquatic habitats occupied by the grotto sculpin could result in adverse impacts to reproduction (*e.g.,* cholinesterase inhibition) or mortality of the species or its food base.

(4) Actions that could accidentally introduce nonnative species into occupied cave streams via tile or vertical drains. These activities could introduce potential predators, outcompeting fish (for example, catfish), or aquatic parasites and disease.

(5) Actions that could significantly alter the prey base of grotto sculpin. Despite the fact that an excess of naturally occurring organic material in aquatic habitats occupied by the grotto sculpin can be deleterious, some level of energy input is important for maintaining the prey base of grotto sculpin. A balance must be maintained that allows for some level of organic input that provides a food source for grotto sculpin prey, but not at such levels that impede reproduction and growth of grotto sculpin or at levels that introduce harmful chemicals and nutrients into occupied aquatic habitats.

(6) Activities with a Federal nexus that may affect areas outside of critical habitat, such as development; road construction and maintenance; oil, gas, and utility easements; industrial sand mining associated with the removal of mineral deposits used in hydraulic fracturing (or fracking); forest and pasture management; herbicide and pesticide use or the migration and movement of sediment associated with crop production; and effluent discharges. These actions would be subject to review under section 7 of the Act if they may affect grotto sculpin, because Federal agencies must consider both effects to the species and effects to critical habitat independently. The Service should be consulted regarding disturbances to areas both within the proposed critical habitat units as well as areas within the recharge area of cave streams occupied by the sculpin, including resurgences, springs, and surface streams that contribute to in-stream flows, especially during times when water levels in occupied habitats are abnormally low (during droughts), because these activities may impact the essential features of proposed critical habitat. The prohibitions of section 9 of the Act against the take of listed species also continue to apply both inside and outside of designated critical habitat.

Exemptions

Application of Section 4(a)(3) of the Act

The Sikes Act Improvement Act of 1997 (Sikes Act) (16 U.S.C. 670a) required each military installation that includes land and water suitable for the conservation and management of natural resources to complete an integrated natural resources management plan (INRMP) by November 17, 2001. An INRMP integrates implementation of the military mission of the installation with stewardship of the natural resources found on the base. Each INRMP includes:

(1) An assessment of the ecological needs on the installation, including the need to provide for the conservation of listed species;

(2) A statement of goals and priorities;

(3) A detailed description of management actions to be implemented to provide for these ecological needs; and

(4) A monitoring and adaptive management plan.

Among other things, each INRMP must, to the extent appropriate and applicable, provide for fish and wildlife management; fish and wildlife habitat enhancement or modification; wetland protection, enhancement, and restoration where necessary to support fish and wildlife; and enforcement of applicable natural resource laws.

The National Defense Authorization Act for Fiscal Year 2004 (Pub. L. 108–136) amended the Act to limit areas eligible for designation as critical habitat. Specifically, section 4(a)(3)(B)(i) of the Act (16 U.S.C. 1533(a)(3)(B)(i)) now provides: ''The Secretary shall not designate as critical habitat any lands or other geographic areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation.''

There are no Department of Defense lands with a completed INRMP within the proposed critical habitat designation for the grotto sculpin.

Exclusions

Application of Section 4(b)(2) of the Act

Section 4(b)(2) of the Act states that the Secretary shall designate or make revisions to critical habitat on the basis of the best available scientific data after taking into consideration the economic impact, national security impact, and any other relevant impacts of specifying any particular area as critical habitat. The Secretary may exclude an area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific and commercial data available, that the failure to designate such area as critical habitat will result in the extinction of the species. In making that determination, the legislative history is clear that the Secretary has broad discretion regarding which factor(s) to use and how much weight to give to any factor.

Under section 4(b)(2) of the Act, we may exclude an area from designated critical habitat based on economic impacts, impacts on national security, or any other relevant impacts. In considering whether to exclude a particular area from the designation, we identify the benefits of including the area in the designation, identify the

benefits of excluding the area from the designation, and evaluate whether the benefits of exclusion outweigh the benefits of inclusion. If the analysis indicates that the benefits of exclusion outweigh the benefits of inclusion, the Secretary may exercise his discretion to exclude the area only if such exclusion would not result in the extinction of the species.

Exclusions Based on Economic Impacts

Under section 4(b)(2) of the Act, we consider the economic impacts of specifying any particular area as critical habitat. In order to consider economic impacts, we are preparing an analysis of the economic impacts of the proposed critical habitat designation and related factors.

We will announce the availability of our draft economic analysis as soon as it is completed. During the development of a final designation, we will consider economic impacts, public comments, and other new information, and areas may be excluded from the final critical habitat designation under section 4(b)(2) of the Act and our implementing regulations at 50 CFR 424.19.

Exclusions Based on National Security Impacts

Under section 4(b)(2) of the Act, we consider whether there are lands owned or managed by the Department of Defense where a national security impact might exist. In preparing this proposal, we have determined that the lands within the proposed designation of critical habitat for the grotto sculpin are not owned or managed by the Department of Defense, and, therefore, we anticipate no impact on national security. Consequently, the Secretary does not propose to exert his discretion to exclude any areas from the final designation based on impacts on national security.

Exclusions Based on Other Relevant Impacts

Under section 4(b)(2) of the Act, we consider any other relevant impacts, in addition to economic impacts and impacts on national security. We consider a number of factors, including whether the landowners have developed any HCPs or other management plans for the area, or whether there are conservation partnerships that would be encouraged by designation of, or exclusion from, critical habitat. In addition, we look at any tribal issues, and consider the government-to-government relationship of the United States with tribal entities. We also consider any social impacts that might occur because of the designation.

In preparing this proposal, we have determined that there are currently no HCPs or other management plans for the grotto sculpin, and the proposed designation does not include any tribal lands or trust resources. We anticipate no impact on tribal lands, partnerships, or HCPs from this proposed critical habitat designation. Accordingly, the Secretary does not propose to exert his discretion to exclude any areas from the final designation based on other relevant impacts.

Peer Review

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), we will seek the expert opinions of at least three appropriate and independent specialists regarding this proposed rule. The purpose of peer review is to ensure that our proposed listing and proposed critical habitat designation are based on scientifically sound data, assumptions, and analyses. We have invited these peer reviewers to comment during this public comment period on our proposed listing and designation of critical habitat.

We will consider all comments and information we receive during this comment period on this proposed rule during our preparation of a final determination. Accordingly, the final decision may differ from this proposal.

Public Hearings

Section 4(b)(5) of the Act provides for one or more public hearings on this proposal, if requested. Requests must be received within 45 days after the date of publication of this proposed rule in the **Federal Register**. Such requests must be sent to the address shown in the **ADDRESSES** section. We will schedule public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings, as well as how to obtain reasonable accommodations, in the **Federal Register** and local newspapers at least 15 days before the hearing.

Persons needing reasonable accommodations to attend and participate in a public hearing or meeting should contact the Columbia Missouri Ecological Services Field Office at 573–234–2132 as soon as possible. To allow sufficient time to process requests, please call no later than one week before the hearing or meeting date. Information regarding this proposed rule is available in alternative formats upon request.

Required Determinations

Regulatory Planning and Review (Executive Orders 12866 and 13563)

Executive Order 12866 provides that the Office of Information and Regulatory Affairs (OIRA) will review all significant rules. The Office of Information and Regulatory Affairs has determined that this rule is not significant.

Executive Order 13563 reaffirms the principles of E.O. 12866 while calling for improvements in the nation's regulatory system to promote predictability, to reduce uncertainty, and to use the best, most innovative, and least burdensome tools for achieving regulatory ends. The executive order directs agencies to consider regulatory approaches that reduce burdens and maintain flexibility and freedom of choice for the public where these approaches are relevant, feasible, and consistent with regulatory objectives. E.O. 13563 emphasizes further that regulations must be based on the best available science and that the rulemaking process must allow for public participation and an open exchange of ideas. We have developed this rule in a manner consistent with these requirements.

Regulatory Flexibility Act (5 U.S.C. 601 et seq.)

Under the Regulatory Flexibility Act (RFA; 5 U.S.C. 601 *et seq.*) as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 (5 U.S.C. 801 *et seq.*), whenever an agency must publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small entities (small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of the agency certifies the rule will not have a significant economic impact on a substantial number of small entities. The SBREFA amended the RFA to require Federal agencies to provide a certification statement of the factual basis for certifying that the rule will not have a significant economic impact on a substantial number of small entities.

According to the Small Business Administration, small entities include small organizations such as independent nonprofit organizations; small governmental jurisdictions, including school boards and city and town governments that serve fewer than 50,000 residents; and small businesses (13 CFR 121.201). Small businesses include such businesses as

manufacturing and mining concerns with fewer than 500 employees, wholesale trade entities with fewer than 100 employees, retail and service businesses with less than $5 million in annual sales, general and heavy construction businesses with less than $27.5 million in annual business, special trade contractors doing less than $11.5 million in annual business, and forestry and logging operations with fewer than 500 employees and annual business less than $7 million. To determine whether small entities may be affected, we will consider the types of activities that might trigger regulatory impacts under this designation as well as types of project modifications that may result. In general, the term ''significant economic impact'' is meant to apply to a typical small business firm's business operations.

Importantly, the incremental impacts of a rule must be both significant and substantial to prevent certification of the rule under the RFA and to require the preparation of an initial regulatory flexibility analysis. If a substantial number of small entities are affected by the proposed critical habitat designation, but the per-entity economic impact is not significant, the Service may certify. Likewise, if the per-entity economic impact is likely to be significant, but the number of affected entities is not substantial, the Service may also certify.

Under the RFA, as amended, and following recent court decisions, Federal agencies are only required to evaluate the potential incremental impacts of rulemaking on those entities directly regulated by the rulemaking itself, and not the potential impacts to indirectly affected entities. The regulatory mechanism through which critical habitat protections are realized is section 7 of the Act, which requires Federal agencies, in consultation with the Service, to ensure that any action authorized, funded, or carried by the Agency is not likely to adversely modify critical habitat. Therefore, only Federal action agencies are directly subject to the specific regulatory requirement (avoiding destruction and adverse modification) imposed by critical habitat designation. Under these circumstances, it is our position that only Federal action agencies will be directly regulated by this designation. Therefore, because Federal agencies are not small entities, the Service may certify that the proposed critical habitat rule will not have a significant economic impact on a substantial number of small entities.

We acknowledge, however, that in some cases, third-party proponents of the action subject to permitting or funding may participate in a section 7 consultation, and thus may be indirectly affected. We believe it is good policy to assess these impacts if we have sufficient data before us to complete the necessary analysis, whether or not this analysis is strictly required by the RFA. While this regulation does not directly regulate these entities, in our draft economic analysis we will conduct a brief evaluation of the potential number of third parties participating in consultations on an annual basis in order to ensure a more complete examination of the incremental effects of this proposed rule in the context of the RFA.

In conclusion, we believe that, based on our interpretation of directly regulated entities under the RFA and relevant case law, this designation of critical habitat will only directly regulate Federal agencies, which are not by definition small business entities. As such, we certify that, if promulgated, this designation of critical habitat would not have a significant economic impact on a substantial number of small business entities. Therefore, an initial regulatory flexibility analysis is not required. However, though not necessarily required by the RFA, in our draft economic analysis for this proposal we will consider and evaluate the potential effects to third parties that may be involved with consultations with Federal action agencies related to this action.

Energy Supply, Distribution, or Use—Executive Order 13211

Executive Order 13211 (Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use) requires agencies to prepare Statements of Energy Effects when undertaking certain actions. We do not expect the designation of this proposed critical habitat to significantly affect energy supplies, distribution, or use. Industrial sand mining and development activities occur or could potentially occur in all of the proposed critical habitat units for the grotto sculpin. However, compliance with State regulatory requirements or voluntary BMPs would be expected to minimize impacts of industrial sand mining and development in the areas of proposed critical habitat for this species. The measures for industrial sand mining and development are likely not considered a substantial cost compared with overall project costs and are predictably being implemented by mining companies. No other activities associated with energy supply, distribution, or use are anticipated within the proposed critical habitat. We do not expect the designation of this proposed critical habitat to significantly affect energy supplies, distribution, or use. Therefore, this action is not a significant energy action, and no Statement of Energy Effects is required. However, we will further evaluate this issue as we conduct our economic analysis, and review and revise this assessment as warranted.

Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.)

In accordance with the Unfunded Mandates Reform Act (2 U.S.C. 1501 *et seq.*), we make the following findings:

(1) This rule would not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute, or regulation that would impose an enforceable duty upon State, local, or tribal governments, or the private sector, and includes both ''Federal intergovernmental mandates'' and ''Federal private sector mandates.'' These terms are defined in 2 U.S.C. 658(5)–(7). ''Federal intergovernmental mandate'' includes a regulation that ''would impose an enforceable duty upon State, local, or tribal governments'' with two exceptions. It excludes ''a condition of Federal assistance.'' It also excludes ''a duty arising from participation in a voluntary Federal program,'' unless the regulation ''relates to a then-existing Federal program under which $500,000,000 or more is provided annually to State, local, and tribal governments under entitlement authority,'' if the provision would ''increase the stringency of conditions of assistance'' or ''place caps upon, or otherwise decrease, the Federal Government's responsibility to provide funding,'' and the State, local, or tribal governments ''lack authority'' to adjust accordingly. At the time of enactment, these entitlement programs were: Medicaid; Aid to Families with Dependent Children work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement. ''Federal private sector mandate'' includes a regulation that ''would impose an enforceable duty upon the private sector, except (i) a condition of Federal assistance or (ii) a duty arising from participation in a voluntary Federal program.''

The designation of critical habitat does not impose a legally binding duty on non-Federal Government entities or private parties. Under the Act, the only regulatory effect is that Federal agencies

must ensure that their actions do not destroy or adversely modify critical habitat under section 7. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency. Furthermore, to the extent that non-Federal entities are indirectly impacted because they receive Federal assistance or participate in a voluntary Federal aid program, the Unfunded Mandates Reform Act would not apply and neither would critical habitat shift the costs of the large entitlement programs listed above onto State governments.

(2) We do not believe that this rule would significantly or uniquely affect small governments because it will not produce a Federal mandate of $100 million or greater in any year, that is, it is not a ''significant regulatory action'' under the Unfunded Mandates Reform Act. The designation of critical habitat imposes no obligations on State or local governments and, as such, a Small Government Agency Plan is not required. However, we will further evaluate this issue as we conduct our economic analysis, and review and revise this assessment if appropriate.

Takings—Executive Order 12630

In accordance with Executive Order 12630 (Government Actions and Interference with Constitutionally Protected Private Property Rights), we have analyzed the potential takings implications of designating critical habitat for the grotto sculpin in a takings implications assessment. Critical habitat designation does not affect landowner actions that do not require Federal funding or permits, nor does it preclude development of habitat conservation programs or issuance of incidental take permits to permit actions that do require Federal funding or permits to go forward. The takings implications assessment concludes that this proposed designation of critical habitat for the grotto sculpin would not pose significant takings implications for lands within or affected by the proposed designation.

Federalism—Executive Order 13132

In accordance with Executive Order 13132 (Federalism), this proposed rule does not have significant Federalism effects. A federalism summary impact statement is not required. In keeping with Department of the Interior and Department of Commerce policy, we requested information from, and coordinated development of, this proposed critical habitat designation with appropriate State resource agencies in Missouri. The designation of critical habitat in areas currently occupied by the grotto sculpin may impose nominal additional regulatory restrictions, and therefore may have some incremental impacts on State and local governments and their activities. The designation may have some benefit to these governments because the areas that contain the physical or biological features essential to the conservation of the species are more clearly defined, and the elements of the features of the habitat necessary to the conservation of the species are specifically identified. This information does not alter where and what federally sponsored activities may occur. However, it may assist local governments in long-range planning (rather than having them wait for case-by-case section 7 consultations to occur).

Where State and local governments require approval or authorization from a Federal agency for actions that may affect critical habitat, consultation under section 7(a)(2) would be required. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency.

Civil Justice Reform—Executive Order 12988

In accordance with Executive Order 12988 (Civil Justice Reform), the Office of the Solicitor has determined that the rule does not unduly burden the judicial system and that it meets the requirements of sections 3(a) and 3(b)(2) of the Order. We have proposed designating critical habitat in accordance with the provisions of the Act. This proposed rule uses standard property descriptions and identifies the elements of physical or biological features essential to the conservation of the grotto sculpin within the designated areas to assist the public in understanding the habitat needs of the species.

Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

This rule does not contain any new collections of information that require approval by OMB under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). This rule will not impose recordkeeping or reporting requirements on State or local governments, individuals, businesses, or organizations. 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 OMB control number.

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*), need not be prepared in connection with listing a species as endangered or threatened under the Endangered Species Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

It is our position that, outside the jurisdiction of the U.S. Court of Appeals for the Tenth Circuit, we do not need to prepare environmental analyses pursuant to NEPA in connection with designating critical habitat under the Endangered Species Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244). This position was upheld by the U.S. Court of Appeals for the Ninth Circuit (*Douglas County* v. *Babbitt,* 48 F.3d 1495 (9th Cir. 1995), cert. denied 516 U.S. 1042 (1996)).

Clarity of the Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

(1) Be logically organized;

(2) Use the active voice to address readers directly;

(3) Use clear language rather than jargon;

(4) Be divided into short sections and sentences; and

(5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in the **ADDRESSES** section. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

Government-to-Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with tribes in developing programs for healthy ecosystems, to acknowledge that tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to tribes.

We determined that there are no tribal lands that are currently occupied by the grotto sculpin that contain the features essential for conservation of the species, and no tribal lands unoccupied by the grotto sculpin that are essential for the conservation of the species. Therefore, we are not proposing to designate critical habitat for the grotto sculpin on tribal lands.

References Cited

A complete list of references cited in this rulemaking is available on the Internet at *http://www.regulations.gov* and upon request from the Columbia, Missouri Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this package are the staff members of the Columbia Missouri Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

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

Proposed Regulation Promulgation

Accordingly, we propose to 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 an entry for ''Sculpin, grotto'' in alphabetical order under FISHES to the List of Endangered and Threatened Wildlife to read as follows:

§ 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						
*	*	*	*	*	*		*
FISHES							
*	*	*	*	*	*		*
Sculpin, grotto	*Cottus* sp. nov.	U.S.A. (MO)	Entire	E		17.95(e)	NA
*	*	*	*	*	*		*

3. In § 17.95, amend paragraph (e) by adding an entry for ''Grotto Sculpin (*Cottus* sp. nov.),'' in the same alphabetical order that the species appears in the table at § 17.11(h), to read as follows:

§ 17.95 Critical habitat—fish and wildlife.

* * * * *

(e) *Fishes.*

* * * * *

Grotto Sculpin (*Cottus* sp. nov.)

(1) Critical habitat units are depicted for Perry County, Missouri, on the maps below.

(2) Within these areas, the primary constituent elements of the physical or biological features essential to the conservation of the grotto sculpin consist of:

(i) Geomorphically stable stream bottoms and banks (stable horizontal dimension and vertical profile) with riffles, runs, pools, and transition zones between these stream features.

(ii) Instream flow regime with an average daily discharge between 0.07 and 150 cubic feet per second (cfs), inclusive of surface runoff, cave streams, resurgences, springs, and occupied surface streams and all interconnected karst areas with flowing water.

(iii) Water temperature between 12.8 and 16.7 °C (55 and 62 °F), dissolved oxygen 4.5 milligrams or greater per liter, and turbidity of an average monthly reading of no more than 200 Nephelometric Turbidity Units for a duration not to exceed 4 hours.

(iv) Adequate water quality characterized by low levels of contaminants. Adequate water quality is defined as the quality necessary for normal behavior, growth, and viability of all life stages of the grotto sculpin.

(v) Bottom substrates consisting of a mixture of sand, gravel, pebble, cobble, solid bedrock, larger cobble, and rocks for cover, with low amounts of sediments.

(vi) Energy input from naturally occurring organic sources that provide habitat for the prey base that is needed by different life stages of the grotto sculpin.

(vii) Connected underground and surface aquatic habitats that provide for all life stages of the grotto sculpin, with sufficient water levels to facilitate movement of individuals among habitats.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on the effective date of this rule.

(4) *Critical habitat units index map.* The map was developed from National Geographic USA Topographic maps (© National Geographic Society 2010). Upstream and downstream limits for critical habitat surface stream units were identified by degree, minute, second. Extent for critical habitat underlying recharge areas was defined by spatial data layers of recharge area delineations by Moss and Pobst (2010). The maps in this entry, as modified by any accompanying regulatory text, establish the boundaries of the critical habitat designation. The coordinates or plot points or both on which each map is based are available to the public at the Service's internet site *http://www.fws.gov/midwest/Endangered, http://www.regulations.gov* at Docket No. FWS–R3–ES–2012–0065, and at the field office responsible for this designation. You may obtain field office location information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) Index map of critical habitat units for the grotto sculpin follows:

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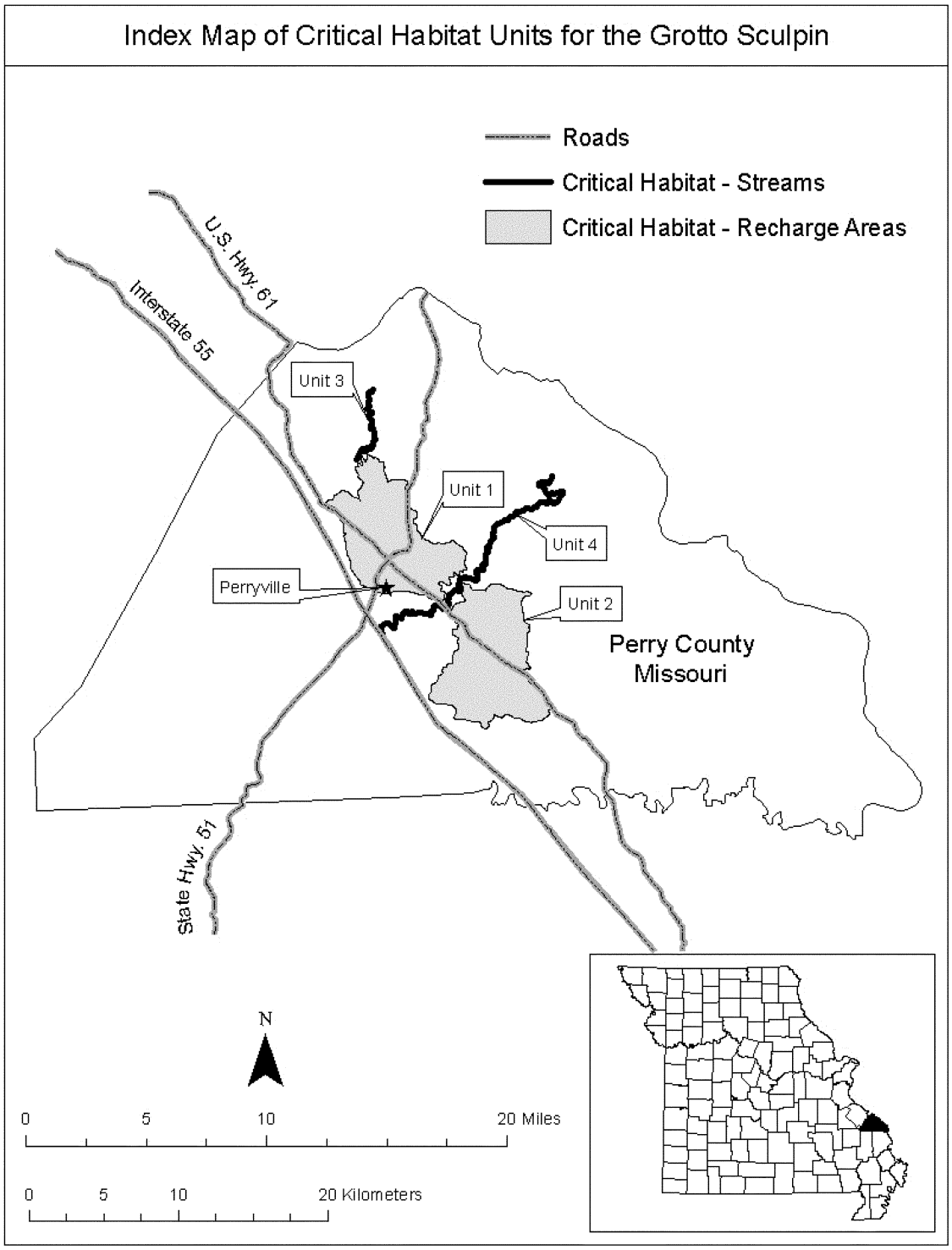
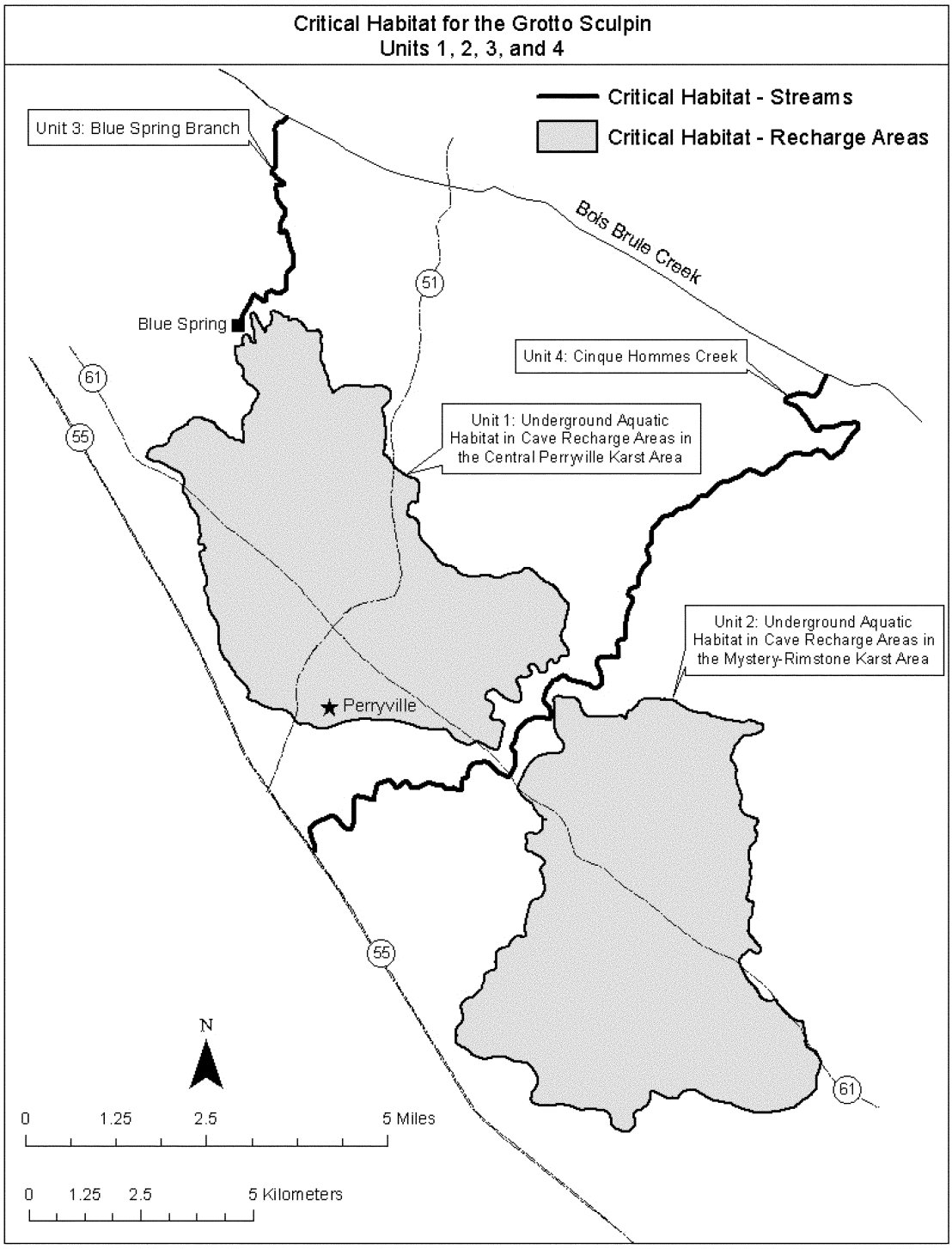


(6) Unit 1: Central Perryville Karst Area, Perry County, Missouri.

(i) Unit 1 includes all underground aquatic habitats in the recharge areas of the Moore and Crevice cave systems, Ball Mill Spring, and Keyhole Spring. The Unit extends as far north as, and parallels, Blue Spring Branch. The western boundary of Unit 1 roughly parallels the division between the St. Peter Sandstone and Joachim Dolomite formations. The southern extent is approximately Edgemont Boulevard in Perryville. The southeastern boundary parallels Cinque Hommes Creek and crosses State Highway E approximately 1.5 miles east of Perryville. The boundary runs northeast from State Highway E to cross Missouri Route 51 near County Road 624 and continue northeast to Ball Mill Spring.

(ii) Map of Units 1, 2, 3, and 4 follows:



(7) Unit 2: Cave streams, resurgences, and springs within the Mystery-Rimstone Karst Area of Perry County, Missouri.

(i) Unit 2 includes all underground aquatic habitats in the recharge areas of Mystery, Rimstone, and Running Bull caves, and Thunderhole Resurgence. The northern extend of the Unit County Road 316 from Stump Cemetery to State Highway P and Mystery Resurgence on Cinque Hommes Creek. The northwestern boundary of Unit 2 parallels Cinque Hommes Creek between Mystery Resurgence and the intersection of Route P and U.S. Route 61. The western boundary of Unit 2 roughly parallels the division between the St. Peter Sandstone and Joachim Dolomite formations and turns southeast near the intersection of State Highway B and County Road 502. The Unit extends as far south as County Road 512 and continues east from the intersection of County Road 512 and County Road 510 to U.S. Route 61 approximately 1.5 miles south of Longtown. The eastern boundary follows U.S. Route 61 north to Longtown and continues north to County Road 316 near Stump Cemetery.

(ii) Map of Unit 2 is provided at paragraph (6)(ii) of this entry.

(8) Unit 3: Blue Spring Branch, Perry County, Missouri.

(i) Unit 3 includes the channel in Blue Spring Branch from the resurgence of Mystery Cave (089°53′43.10″ W long., 037°48′12.45″ N lat.) to its confluence with Bois Brule Creek (089°52′54.04 W long., 037°50′40.25″ N lat.).

(ii) Map of Unit 3 is provided at paragraph (6)(ii) of this entry.

(9) Unit 4: Cinque Hommes Creek, Perry County, Missouri.

(i) Unit 4 includes the channel in Cinque Hommes Creek from Interstate 55 (089°52′50.77″ W long., 037°41′48.54″ N lat.) to its confluence with Bois Brule Creek (089°44′50.98″ W long., 037°47′19.22″ N lat.).

(ii) Map of Unit 4 is provided at paragraph (6)(ii) of this entry.

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Dated: September 10, 2012.

Michael J. Bean,

Acting Principal Deputy Assistant Secretary for Fish and Wildlife and Parks.

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