An Incidental Take Permit for Endangered Karst Invertebrates in Bexar County, Texas

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Abstract

Nine species of cave invertebrates presently known only from karst topography in north and northwest Bexar County, Texas, were listed as endangered on December 26, 2000. Species listed include: two troglobitic ground beetles, *Rhadine infernalis* and *R. exilis,* a mold beetle, *Batrisodes venyivi,* an eyeless harvestman, *Texella cokendolpheri,* and five eyeless spiders, *Cicurina baronia, C. madla, C. Venii, C. vespera,* and *Neoleptoneta microps.* A local landowner with three small caves, all occupied by one or two of the listed species, has recently applied for a Section 10(a) incidental take permit to close one of the caves and preserve, in perpetuity, each of the other two caves in small (one-acre) preserves. The applicant and the authors worked with the United States Fish and Wildlife Service (Austin, Texas, Ecological Service Field Office) to establish guidelines for evaluating the specifics of incidental take for the project, as well as establishing mitigation criteria and long-term protection guidelines for designated mitigation preserves. The preserves that will be established include nine caves, on 179 acres, each occupied by at least two and up to five of the listed species. This presentation will provide details of preserve establishment, maintenance and monitoring and comments on the distribution and demographic characteristics of some of the listed species.

Introduction

Section 9 of the Endangered Species Act, as amended, prohibits the "take" of listed wildlife species. Take, as defined by the Act, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct" (Endangered Species Act, 16 U.S.C. 1531 *et seq*.). Amendments to the Endangered Species Act in 1982 provided provisions in Section 10 that allow for the "incidental take" of endangered species, by non-federal entities, as long as the take is incidental to "otherwise lawful activities." Section 10(a)(2)(A) of the Act requires that an applicant for an incidental take permit detail in a "conservation plan" the impacts that are likely to result from the taking and the measures that will be taken to minimize and mitigate for such impacts. The administration of the Endangered Species Act and responsibility for issuing take permits for non-marine wildlife species is the responsibility of the United States Fish and Wildlife Service.

This paper provides a brief description of an incidental take permit (Permit No. TE044512-1) and supporting habitat conservation plan for three species of listed karst invertebrates. The activity requiring the permit is the commercial development (La Cantera) of approximately 1,000 acres in Bexar County, Texas, just northwest of the City of San Antonio. On December 26, 2000, the U.S. Fish and Wildlife Service published a final rule and determined nine cave-dwelling invertebrates from Bexar County, Texas, to be endangered species under the authority of the Endangered Species Act. These invertebrates are all endemic, obligate troglobites of local distribution in karst terrain in Bexar County. The species listed are: *Rhadine exilis* (no common name) and *Rhadine infernalis* (no common name), small, eyeless ground beetles; *Batrisodes venyivi* (Helotes mold beetle) a small, eyeless beetle; *Texella cokendolpheri* (Robber Baron Cave harvestman) a small, eyeless harvestman; *Cicurina baronia* (Robber Baron cave spider), *Cicurina madla* (Madlas cave spider),

Cicurina venii (no common name), *Cicurina vespera* (Government Canyon Bat Cave spider), and *Neoleptoneta microps* (Government Canyon cave spider), all small, eyeless or essentially eyeless spiders (USFWS, 2000a).

Background

The life history and taxonomy of the Bexar County listed invertebrates is not represented by definitive studies. In 1993, the Service contracted two studies to summarize the known information on these species. One study focused on the overall karst geography in the San Antonio region and the potential geological and geographical barriers to karst invertebrate movement and limits to their distribution (Veni and Associates, 1994). The other study summarized the distribution of the nine invertebrates as understood at that time (Reddell, 1993).

The karst geography report (Veni and Associates, 1994) delineates six karst areas or karst regions within Bexar County. These regions are as follows: Stone Oak, University of Texas at San Antonio, Helotes, Government Canyon, Culebra Anticline, and Alamo Heights. The boundaries of these karst regions are geologic or geographic features that are thought to represent obstructions to invertebrate movement and which have resulted in the present-day distribution of invertebrates. Whether or not these karst region boundaries are truly barriers (past or present) to invertebrate distribution is presently uncertain. Additional studies are required before the relationship of invertebrate distribution and karst regions is fully understood.

The La Cantera property is located within the University of Texas at San Antonio karst region, which is bounded by Helotes Creek to the west, Leon Creek to the east, and the limits of exposure of the Edwards Group and Glenrose Limestone Formation to the north and south. The 1993 studies determined that only two of the nine listed species were present in the University of Texas region, *Rhadine exilis* and *Rhadine infernalis*. Subsequent studies have also documented occurrence of *Cicurina madla* in the region outside the La Cantera property (USFWS, 2000a). Biota surveys conducted by SWCA in 1994, 1995, and 2000 in three La Cantera caves resulted in discovery of eyeless *Cicurina* spiders and *Rhadine exilis*, but no *Rhadine infernalis*. Based on the best available scientific information, the *Cicurina* spider found on the La Cantera property is most likely the listed *Cicurina madla*. It is possible that this spider is an undescribed species of *Cicurina* (Cokendolpher, pers comm). Although an adult La Cantera eyeless spider sufficient for positive identification has not been collected, based on the fact that *Cicurina madla* has been verified as occurring in two caves within two to three miles of La Cantera, and no other eyeless *Cicurina* are known from the University of Texas karst area, this spider was assumed, for purposes of the incidental take permit, to be the federally listed species *Cicurina madla* (USFWS, 2001).

La Cantera Caves

Quality of caves on La Cantera

Over 400 potential karst features have been evaluated on the property. Three primary geological assessments have been performed in the past, and their combined scope has included the entire property (Raba-Kistner, 1993a and 1993b; SWCA, 2000; Horizon Environmental Services Inc., 2000).

During extensive karst surveys beginning in 1993 three caves (La Cantera Caves #1, #2, and #3) containing habitat for the listed karst invertebrates were found on the La Cantera property. Two of these caves (La Cantera Caves #1 and #2) are known to contain *Rhadine exilis* and *Cicurina madla.* The entrances to both caves lie within 200 feet of the west-bound frontage road of Loop 1604, a heavily traveled highway. Both caves are immediately south (approximately 100 feet) of a two-lane road designed to serve traffic to and from the commercial development. The entrance to La Cantera Cave #3, which contains *Cicurina madla,* lies within 100 feet of another internal thoroughfare. Because of the existing disturbances, none of the La Cantera caves is considered high-quality habitat for the invertebrates under consideration (USFWS, 2000b). The U.S. Fish and Wildlife Service has determined that all three La Cantera caves were of medium-quality.

None of the listed endangered invertebrates is known from other karst features present on the La Cantera property. However, the occurrence of *Rhadine exilis*, *Rhadine infernalis*, and/or *Cicurina madla* (the only known endangered karst species within the University of Texas karst region), or any of the other listed invertebrates elsewhere on the property cannot conclusively be ruled out given the potential for these species to occur in subsurface voids lacking obvious surface expression (Veni and Associates, 1994).

Karst Invertebrate Preserve Guidelines

In an effort to provide guidelines for the protection of endangered karst invertebrates,

the U.S. Fish and Wildlife Service has determined that the minimum total area needed to protect caves or cave clusters containing karst invertebrates is 69 to 99 acres (USFWS, 2000b). Further, the agency suggests that an area within that area a minimum 100- to 200-meter (328- to 656-foot) radius from all karst features containing listed invertebrates should be preserved. This includes a core area encompassing the minimum 50-meter (164-foot) cave cricket foraging range and an additional buffer against edge effects. Also, since roads may hinder movement of several species of invertebrates and small mammals, no internal roads or other permanent habitat fragmentation should occur within the protected area. It is the current policy of the U.S. Fish and Wildlife Service that disturbances that approach closer than the standards detailed above, are likely to constitute take.

La Cantera Habitat Conservation Plan

On-site and Off-site Preserves.

As part of the habitat conservation plan's development, La Cantera will assure that seven karst preserves totaling approximately 181 acres will be protected in perpetuity by appropriate legal mechanisms (conservation easements, deed restrictions) before clearing or construction begins on undeveloped portions of the property. The karst preserves include one-acre on-site preserves for La Cantera Caves #1 and #2, and five off-site preserves totaling approximately 179 acres. These off-site preserves include: an approximately five-acre area encompassing Madlas Cave; an approximately four-acre area encompassing John Wagner Ranch Cave #3; approximately 70 acres encompassing Hills and Dales Pit; approximately 25 acres encompassing Helotes Hilltop and Helotes Blowhole Caves; and approximately 75 acres encompassing Scenic Overlook, Canyon Ranch Pit, and Fat Mans Nightmare Caves. All of the off-site caves within the proposed karst preserves contain endangered karst invertebrate species as well as other cave-adapted species. A summary of endangered invertebrate species known from each of the proposed on- and off-site preserve caves is provided in Table 1.

The U.S. Fish and Wildlife Service considered the La Cantera caves to be of medium quality with regard to habitat for listed invertebrates. For each of these caves, the habitat conservation plan provides for mitigation by preserving caves of similar or higher quality. For each La Cantera cave, the following mitigation has been provided: La Cantera Cave #1 – Hills & Dales Pit (approximately 70 acres, four listed species, one high-quality cave); La Cantera Cave #2 – Helotes Hilltop, Helotes Blowhole, Madlas Cave, and John Wagner Ranch Cave #3 (approximately 34 acres, five listed species, four medium-quality caves); La Cantera Cave #3 – Canyon Ranch Pit, (approximately 75 acres, five listed species, three high-quality caves).

In addition to providing 181 acres of cave preserves, the La Cantera habitat conservation plan also provides for participation with the U.S. Fish and Wildlife Service in the development of an outreach program, and provides for a $20,000 grant to support DNA research of *Cicurina* taxonomy. The outreach program has the goal of raising awareness, understanding, and appreciation for Bexar County endangered karst invertebrates. Under this program information materials will be produced by public relations professionals and will be designed to reach the broadest possible audience (including school children, landowners, and the public at large). The intent of these materials will be to impress upon the audience the importance of preserving the threatened karst resources and their invertebrate inhabitants. These materials will be designed to render technical information relating to karst habitats and their inhabitants in non-technical terms and graphics.

U.S. Fish and Wildlife Service Assessment of Development Impacts to Listed Species

It is the U.S. Fish and Wildlife Service's opinion that take of *Rhadine exilis* will occur in La Cantera Caves #1 and #2, and take of *Cicurina madla* will occur in all three La Cantera caves, as a result of the development and occupation of the La Cantera property. Although the Fish and Wildlife Service recognizes that the existing quality of endangered species habitat presently provided by the three La Cantera caves is not optimal, development of the property would likely reduce the amount of such habitat present in the project region. Take of endangered karst invertebrates could also occur elsewhere on the property in the event previously undiscovered habitat is encountered. Although no endangered karst invertebrates are known to occur on the property in areas outside of the three La Cantera caves, potential exists for listed species to be present in subsurface void spaces lacking obvious surface expression. Such spaces could be destroyed or significantly disturbed by construction activities. As all portions of the property outside of the two proposed on-site karst preserves (at La Cantera Caves #1 and #2) are expected to be devel-

oped, any endangered karst invertebrates occurring on the property outside of these preserves are expected to be taken by completion of the development; however, such take will be fully mitigated for through the conditions detailed in the habitat conservation plan. Due to the extensive karst surveys of the property, the likelihood of discovering previously undetected habitat is considered low.

Protecting La Cantera Caves #1 and #2 within one-acre preserves will significantly reduce the risk of disturbing karst invertebrate habitat during construction. The U.S. Fish and Wildlife Service, however, believes that reduction of native vegetation to one-acre patches surrounding these caves will reduce the amount of nutrients entering these features, the amount of organic material available to be washed into the features, and the amount of habitat supporting cave crickets and other trogloxene species. According to the U.S. Fish and Wildlife Service, increased intensity of fire ant infestations within the karst preserves and/or introduction of other exotic species that could be detrimental to the karst ecosystem may also result from clearing, construction, and development activities. Due to cave depth (roughly 60 to 115 feet) and existing edge along the nearby Loop 1604 right-of-way, potential preserve edge effects (such as increased drying of woodland, with concomitant drying of cave habitat, and increased temperature fluctuations) are expected to be negligible. While proposed development may not result in elimination of *Rhadine exilis* and *Cicurina madla* from these two caves, it is anticipated that numbers of these two species within these caves will be reduced over time. (To put the existing density of invertebrates in perspective, the authors have visited Caves #1 and #2 approximately four times in nine years searching for karst invertebrates for a period of two hours per visit and have found an approximate total of five to six *R. exilis* and 20 to 30 eyeless *Cicurina*.) A monitoring program included in the habitat conservation plan will provide long-term data on the accuracy of these predictions.

The U.S. Fish and Wildlife Service believes that the overall impact to *Rhadine exilis* and *Cicurina madla* resulting from development of the La Cantera property will neither prevent nor seriously impact the long-term conservation of each species within the University of Texas at San Antonio karst region. The U.S. Fish and Wildlife Service desires that a minimum of three karst preserves for each species within each karst region be set aside to provide for long-term conservation of karst invertebrates (USFWS, 1994). Assuming development of the property will preclude on-site survival of the two species (which is not certain), sufficient habitat will likely remain within the University of Texas karst region to provide necessary conservation. Within the University of Texas karst region, two suitable preserves are now inhabited by *Cicurina madla*. Future exploration of Mastodon Pit (less than 0.5 mile south of the property) will probably also yield this species. Moreover, extensive conservation of known, occupied *Cicurina madla* habitat is provided outside the University of Texas karst region. The U.S. Fish and Wildlife Service believes that strict adherence to the "three occupied caves per species" rule may not be biologically required to ensure conservation of a species where the species' range includes several karst regions. Such is the case for *Cicurina madla.* One of the present anomalies of the karst region configuration as currently proposed (Veni and Associates, 1994) is the fact that *Cicurina madla* occurs in four of the six karst regions. The presence of this single taxa in multiple karst regions may call into question the hypothesis of geologic or geographic features obstructing invertebrate movement between karst regions.

Within the University of Texas at San Antonio karst region, at least five caves are known to be inhabited by *Rhadine exilis*. For *Cicurina madla*, positive identifications have been made in two large cave preserves (Hills and Dales Pit and Robbers Cave), and another four caves have produced eyeless *Cicurina* thought to be *Cicurina madla*, though positive identification requires further study.

Other University of Texas at San Antonio karst region caves known to have eyeless *Cicurina* spiders that are most likely *Cicurina madla* include: Mastodon Pit, Kamakazi Cricket, John Wagner Ranch Cave #3, and Three-fingers Cave. Outside the University of Texas at San Antonio karst region, *Cicurina madla* is known to occur in Christmas Cave, Madlas Cave, Madlas Drop Cave, and Helotes Blowhole Cave in the Helotes karst region; Lost Pothole Cave in the Government Canyon karst region; and Headquarters Cave in the Stone Oak karst region. Of these known localities, at least four sites are either in preserves now (Lost Pothole Cave, Headquarters Cave) or will be preserves as a result of the La Cantera habitat conservation plan (Madlas Cave, Helotes Blowhole Cave). Thus, actions effected as a result of the La Cantera permit are not likely to preclude the long-term conservation of either *Rhadine exilis* or *Cicurina madla.*

Because the habitat conservation plan would protect approximately 181 acres of on- and off-site land, the U.S. Fish and Wildlife Service has determined that the project is expected to provide an overall benefit to Bexar

County endangered karst invertebrates. The identification of species, evaluation of take, and design and configuration of the karst preserves are based on the best scientific information available. Protecting off-site karst ecosystems as provided in the habitat conservation plan would represent a major recovery action for other listed species besides *Rhadine exilis*, and *Cicurina madla*, particularly *Rhadine infernalis*, *Batrisodesvenyivi*, and *Texella cokendolpheri*, and the undescribed *Texella* new species and *Neoleptoneta* new species.

Summary and Conclusion

This document has summarized the conditions of the first incidental take permit involving the nine listed Bexar County karst invertebrates. We anticipate that many more will follow, and that the La Cantera permit will serve as a model for future permits. We believe that the La Cantera habitat conservation plan will provide significant conservation opportunities for the subject invertebrates. We are concerned, however, that the existing U.S. Fish and Wildlife Service standard of requiring 69 to 99 acres of habitat per cave or cave cluster could prove to be counterproductive to efforts to preserve cave habitat. We believe there are presently insufficient data to validate the need for these relatively large preserves.

While it is the responsibility of the U.S. Fish and Wildlife Service to err on the side of the species, smaller preserves may, in fact, provide

Table 1. Summary of Endangered Species Known to Occur in the La Cantera On-site and Off-site Preserve Caves.

Preserve Cave	Karst Region	**Endangered Species Present**	**Other Rare Karst Species Present**
La Cantera Cave #1	University of Texas at San Antonio	*Rhadine exilis*	eyless *Cicurina* sp. (probably *C. madla*)
La Canter Cave #2	University of Texas at San Antonio	*Rhadine exilis*	eyless *Cicurina* sp. (probably *C. madla*)
Hills and Dales Pit	University of Texas at San Antonio	*Rhadine exilis* *Cicurina madla*	*Neoleptoneta* new sp. *Texella* sp. (possibly *T. cokendolpheri*)
John Wagner Ranch Cave #3	University of Texas at San Antonio	*Rhadine exilis* (type location) *Rhadine infernalis* *Texella cokendolpheri*	*Neoleptoneta* new sp. eyless *Cicurina* sp. (probably *C. madla*)
Helotes Blowhole Cave	Helotes	*Rhadine exilis* *Rhadine infernalis* *Cicurina madla*	
Helotes Hilltop Cave	Helotes	*Rhadine exilis* *Batrisodes venyivi* (type location)	eyless *Cicurina* sp. (probably *C. madla*)
Madlas Cave	Helotes	*Rhadine infernalis* (type location) *Cicurina madla*	
Canyon Ranch Pit	Government Canyon	*Rhadine infernalis*	eyless *Cicurina* sp. (probably *C. madla*)
Fat Mans Nightmare Cave	Government Canyon	*Rhadine infernalis*	eyless *Cicurina* sp. (probably *C. madla*) *Texella* sp. (possibly *T. cokendolpheri*)
Scenic Over Look Cave	Government Canyon	*Rhadine infernalis* *Batrisodes venyivi* (third known location)	eyless *Cicurina* sp. (probably *C. madla*) *Texella* sp. (possibly *T. cokendolpheri*)

the same measure of protection for these troglobitic organisms. It is important, therefore, that relevant research be focused on this issue as soon as possible. Landowners may be far more willing to provide a five- to ten-acre buffer around significant karst features and our fear is that the 69- to 99-acre requirement will result indestruction of the vary resource we are trying to protect.

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