

Rhadine exilis (no common name), *Rhadine infernalis* (no common name), Madla Cave meshweaver (*Cicurina madla*), Braken Bat Cave meshweaver (*C. venii*), Government Canyon Bat Cave meshweaver (*C. vespera*), Robber Baron Cave meshweaver (*C. baronia*), Cokendolpher cave harvestman (*Texella cokendolpheri*), Government Canyon Bat Cave spider (*Neoleptoneta microps*), and Helotes mold beetle (*Batrisodes venyivi*)

5-Year Review: Summary and Evaluation

**U.S. Fish and Wildlife Service
Austin Ecological Services Field Office
Austin, Texas**

5-YEAR REVIEW

Species reviewed: *Rhadine exilis* (no common name), *Rhadine infernalis* (no common name), Madla Cave meshweaver (*Cicurina madla*), Braken Bat Cave meshweaver (*C. venii*), Government Canyon Bat Cave meshweaver (*C. vespera*), Robber Baron Cave meshweaver (*C. baronia*), Cokendolpher cave harvestman (*Texella cokendolpheri*), Government Canyon Bat Cave spider (*Neoleptoneta microps*), and Helotes mold beetle (*Batrisodes venyivi*)

1.0 GENERAL INFORMATION

1.1 Reviewers:

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1.2 Methodology used to complete the review:

The U.S. Fish and Wildlife Service (Service) conducts status reviews of species on the List of Endangered and Threatened Wildlife and Plants (List) (50 CFR 17.12) as required by section 4(c)(2)(A) of the Endangered Species Act (Act) (16 U.S.C. 1531 et seq.). The Service provides notice of status reviews via the Federal Register and requests information on the status of the species. This review was conducted by Cyndee Watson from the Austin Ecological Services Field Office (AESFO). This status review mostly relied on information summarized and cited in the Government Canyon Karst Maintenance and Management Plan Annual Report (KMMP) (Texas Parks and Wildlife Department [TPWD] 2010), La Cantera Annual Report (SWCA 2010a), Bexar County Karst Invertebrate Recovery Plan (recovery plan) (Service 2011). Drainage basin information was provided (in part) by Veni and Associates (2002). Information on cave footprints was provided by Veni (1988) and other sources. The recovery plan contains results of karst invertebrate research, preserve design concepts, and cave data contained in the AESFO files.

As a basic first step in assessing the status of these species, we looked at whether locations that contain these species met the downlisting recovery criteria in the recovery plan. The recovery plan compiled research pertinent to karst preserve design to help identify ideal karst preserves. These preserve design principles and characteristics describe what is needed to protect each karst invertebrate location/population. From the list of known locations of these species, we identified those that had the highest likelihood of meeting these characteristics. Our determinations (discussed in section 2.2.3) for each of these characteristics were based on site-specific information found in the AESFO files. Unless otherwise noted, all acreage and distance estimates were calculated using Geographic Information Systems (GIS), 2010 digital aerial

photography, and the 2010 Bexar County parcel data. These estimates are subject to typical margins of error (about 30 m) associated with Global Positioning Systems (GPS) units, GIS, and transferring data from paper sources to digital media.

1.3 Background:

The purpose of a 5-year review is to examine new information and determine whether the species is appropriately listed as endangered or threatened or whether its listing classification should be changed (that is, de-listed, changed from endangered to threatened or vice-versa). The 5-year review examines new relevant information and documents a determination by the Service regarding whether the species status has changed since the last status review. The review also provides updated information on the current threats to the species, ongoing conservation efforts, and the priority needs for future conservation actions.

These species are troglobites, which are species restricted to the subterranean environment and that typically exhibit morphological adaptations to that environment, such as elongated appendages and loss or reduction of eyes and pigment. Troglotic habitat includes caves and mesocavernous voids in karst limestone (a terrain characterized by landforms and subsurface features, such as sinkholes and caves, which are produced by solution of bedrock) in Bexar County. Within this habitat, these species depend on high humidity, stable temperatures, and nutrients derived from the surface. Examples of nutrient sources include leaf litter fallen or washed in, animal droppings, and animal carcasses. It is imperative to consider that while these species spend their entire lives underground, their ecosystem is dependent on the overlying surface habitat.

Threats to these species and their habitat include destruction and/or deterioration of habitat by construction; filling of caves and karst features; loss of impermeable cover; contamination from septic effluent, sewer leaks, run-off, pesticides, and other sources; predation by and competition with red-imported fire ants (RIFA); and vandalism (65 FR 81419). Currently, these species face the same threats that they did at the time they were listed. However, climate change was not identified as a threat to these species in the original listing document and this threat is discussed in greater detail in the recovery plan (Service 2011). Also, while the areas discussed in section 2.2.3 are undeveloped now, some of them are subject to imminent development.

1.3.1 FR Notice citation announcing initiation of this review: 71 FR 20714, April 21, 2006

1.3.2 Listing history

Original Listing

FR notice: 65 FR 81419

Date listed: December 26, 2000

Entity listed: Madla Cave meshweaver (*Cicurina madla*), *Rhadine exilis* (no common name), *Rhadine infernalis* (no common name), Braken Bat Cave meshweaver (*Cicurina venii*), Government Canyon Bat Cave spider (*C. vespera*), Robber Baron Cave meshweaver (*C. baronia*), Cokendolpher cave harvestman

(*Texella cokendolpheri*), Government Canyon Bat Cave spider (*Neoleptoneta microps*), and the Helotes mold beetle (*Batrisodes venyivi*)

Classification: Endangered

1.3.3 Associated rulemakings: Critical habitat was designated for the Bexar County karst invertebrates, except *N. microps* and *C. vespera*, as announced in an April 8, 2003, Federal Register notice (68 FR 17155). In this critical habitat designation, the Service began using the new common names for six of the nine Bexar County invertebrates because after publication of the listing final rule, the common names of these species changed. This change was a result of a meeting of the Committee on Common Names of Arachnids of the American Arachnological Society in 2000 (Breene et al. 2003). Accordingly, we changed the common names of the species that were listed as Robber Baron Cave harvestman, Robber Baron cave spider, Madla's cave spider, vesper cave spider, Government Canyon cave spider, and one with no common name (*Cicurina venii*) to Cokendolpher cave harvestman, Robber Baron Cave meshweaver, Madla Cave meshweaver, Government Canyon Bat Cave meshweaver, Government Canyon Bat Cave spider, and Braken Bat Cave meshweaver, respectively (Breene et al. 2003). This notice (in the final critical habitat designation) was made to ensure that these species continued to receive protection under the Act.

On February 22, 2011, the Service proposed a revision of the previous critical habitat designation (cited above) and proposed critical habitat for *N. microps* and *C. vespera* as announced in a Federal Register notice (76 FR 9872).

1.3.4 Review History: Status reviews for these species were conducted in 2000 for the final listing of the species (65 FR 81419). No previous 5-year reviews have been conducted for these species.

1.3.5 Species' Recovery Priority Number at start of 5-year review: At the start of the 5-year review, all nine species had a recovery priority number of 2C, which means that these species face a high degree of threat with a high potential for recovery and there may be conflict between species recovery and economic development. However, in section 3.2 in this review we recommend that recovery priority numbers for two of these species (*T. cokendolpheri* and *C. baronia*) be changed to 5C because the likelihood that we can recover them is low considering that they are known from so few locations and they occur in an area that is highly urbanized.

1.3.6 Recovery Plan or Outline

Name of plan or outline: Bexar County Karst Invertebrates Recovery Plan

Date issued: 2011

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Are the species under review vertebrates? No, these species are invertebrates, so the DPS policy does not apply.

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria? Yes, the final recovery plan (Service 2011) is publishing concurrently with this review.

2.2.2 Adequacy of recovery criteria

2.2.2.1 Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat? Yes.

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)? Yes.

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

Goal - The goal of the recovery plan is to reduce or remove threats to the species such that their long-term survival is secured in the wild; the species are no longer endangered or threatened, and can be delisted.

For the purposes of the recovery program, a karst fauna area (KFA) is an area known to support one or more locations of a listed species. A KFA is distinct in that it acts as a system that is separated from other KFAs by geologic and hydrologic features and/or processes that create barriers to the movement of water, contaminants, and troglobitic fauna. Karst fauna areas should be far enough apart so that if a catastrophic event (for example, contamination of the water supply, flooding, disease) were to destroy one of the areas, that event would not likely destroy any other area occupied by that species.

Objective 1 - Perpetually preserve a sufficient amount and configuration of habitat areas (KFAs) to preserve populations that span the range and provide representation of the genetic diversity of the species. This will help conserve their adaptive capabilities and will help protect the species survival in the event of catastrophic or other stochastic influences. When preserved, ensure these areas have a high probability of the species survival in perpetuity.

Objective 2 - Manage these areas to remove threats to the species' survival.

Criterion 1 (downlisting) – The location and configuration of at least the minimum quality and number of KFAs in each karst fauna region (KFR) (Table 1) for each species are preserved. Also, legally binding commitments are in place for perpetual protection and management of these KFAs.

Overarching criteria that are reflected in Table 1 (applied per species) include:

- (1) at least one high quality protected KFA per KFR;
- (2) at least three total medium or high quality protected KFAs per KFR;
- (3) a minimum of six protected KFAs rangewide per species;
- (4) a minimum of three high quality KFAs
- (5) all KFAs at least medium or high quality

Criterion 2 - (delisting) – In addition to the downlisting criterion, monitoring and research have been completed to conclude with a high degree of certainty that KFA sizes, quality, configurations, and management are adequate to provide a high probability of the species survival (greater than 90 percent over 100 years). To assess adequacy, results should be measured over a long enough time that cause and effect can be inferred with a high degree of certainty.

To be considered adequate to contribute to meeting the recovery criteria, a KFA must be sufficiently large to maintain the integrity of the karst ecosystem on which the species depend(s). In addition, to be considered “protected” these areas must provide protection in perpetuity from threats such as RIFA, habitat destruction, and contaminants.

There are six KFRs (Veni 1994) (Figure 1) in Bexar County that contain listed species. These regions are delineated based on geologic continuity, hydrology, and the distribution of rare troglobites. These six KFRs were used in the final rule to define the ranges of the listed species (65 FR 81419) and are as follows: Stone Oak, University of Texas at San Antonio (UTSA), Helotes, Government Canyon, Culebra Anticline, and Alamo Heights.

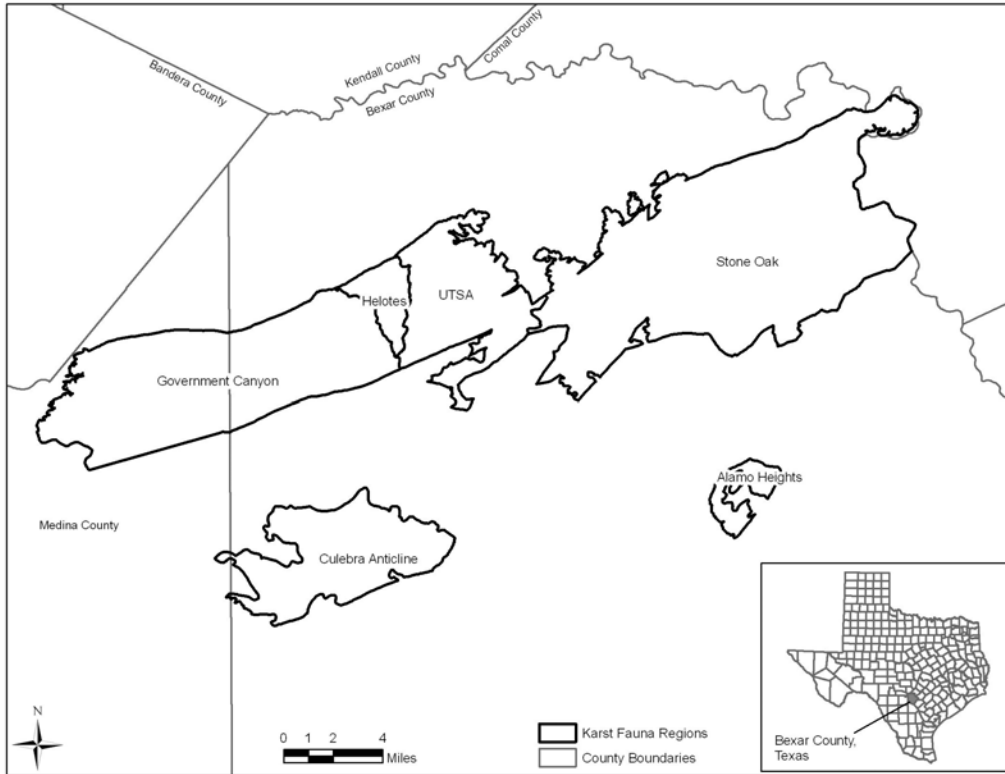


Figure 1. Karst Fauna Regions

Additional information from the recovery plan on the recovery criteria is provided below. To be considered for downlisting, each species should occur in six or more protected KFAs rangewide and be distributed as discussed below. Within KFRs, opportunities will vary for recovering karst invertebrates; therefore, there are various distributions and qualities of KFAs in each KFR that could meet recovery criteria (Table 1).

To understand Table 1, it may be helpful to also examine Table 2, which gives the actual number of KFRs in which each species occurs. For example, a species that occurs in only one KFR would need at least six KFAs with at least three being high quality and the other three at least medium quality to be considered for downlisting. Table 2 also shows the number of potential high quality and medium quality KFAs that are currently known in each KFR. Table 1 shows options for the minimum number and qualities of KFAs that need to be preserved in each KFR for a species to be considered for downlisting. The center column illustrates the possible configurations of the minimum number and minimum quality of KFAs within the total number of KFRs. The right column indicates the total number of KFAs needed to be considered for downlisting.

Table 1. Quality and quantity of preserves needed to meet recovery criterion one.

No. of KFRs with that species	Combination of KFAs needed per KFR					Total No. of KFAs
1	KFR #1: 3 High (H) + 3 Medium (M)					6
2	KFR #1: HMM	KFR #2: HMM				6
3	KFR #1: HMM	KFR #2: HMM	KFR #3: HMM			9
4	KFR #1: HMM	KFR #2: HMM	KFR #3: HMM	KFR #4: HMM		12
5	KFR #1: HMM	KFR #2: HMM	KFR #3: HMM	KFR #4: HMM	KFR #5: HMM	15

Table 2. Distribution of species and preserve quality potential in KFRs

Species	Karst Fauna Region	Potential High Quality	Potential Medium Quality	Number of KFAs to protect
<i>Rhadine exilis</i>	Government Canyon	3		12
	UTSA	3		
	Helotes	1	1	
	Stone Oak	1		
<i>Rhadine infernalis</i>	Government Canyon	5		15
	UTSA	2		
	Helotes	2	1	
	Stone Oak			
	Culebra Anticline	2		
<i>Batrisodes venyivi</i>	Government Canyon	1		6
	Helotes		1	
<i>Texella cokendolpheri</i>	Alamo Heights			6
<i>Neoleptoneta microps</i>	Government Canyon	1		6
<i>Cicurina baronia</i>	Alamo Heights			6
<i>Cicurina madla</i>	Government Canyon	4		12
	UTSA	4		
	Helotes	2	1	
	Stone Oak			
<i>Cicurina venii</i>	Culebra Anticline			6
<i>Cicurina vespera</i>	Government Canyon	1		6

Brief summary of preserve design principles:

The conservation and recovery of these endangered and cryptic species is dependent upon the long-term preservation of their habitat. Most endangered karst invertebrates are difficult to detect during in-cave faunal surveys; therefore, their conservation strategies focus on the delineation, study, and management of occupied KFAs. Regarding size and configuration of KFAs, the recovery plan provides conceptual guidelines on habitat conditions that are important to karst invertebrates, including maintaining humid conditions, air flow, and stable temperatures in the air-filled voids. Maintaining adequate nutrient supply, preventing contamination from the surface and groundwater entering the karst ecosystem, controlling the invasion of exotic species (for example, RIFA), and allowing for movement of karst fauna and nutrients through mesocavernous voids between karst features is also necessary. Additional scientific information and karst preserve design guidelines are presented in our karst preserve design document. This information further defines what is needed for a protected KFA to be considered adequate to meet the recovery criteria (Service 2011). According to these preserve design guidelines, KFAs should include the following: 1) surface and subsurface drainage basins of at least one occupied karst feature; 2) ideally a minimum of 40 hectares (ha) (100 acres [ac]) of contiguous, unfragmented, undisturbed land to maintain native plant and animal communities around the feature and protect the subsurface karst community; 3) 105 meter (m) (345 foot [ft]) radius, undisturbed area, from each cave entrance for cave cricket foraging; and 4) at least 100 m (328 ft), undisturbed, from the cave footprint to the edge (for example, development) of the preserve to minimize deleterious edge effects.

The recovery plan also recognizes various qualities of KFAs. The quality of KFAs is defined based on the probability of long-term survival of the species in that area and the amount of active management necessary to maintain those species. To be considered a high or medium quality, a KFA should have the four characteristics described in the paragraph above and be at least 16 ha (40 ac). High quality KFAs require less active management, have a high probability of long-term species survival, and are at least 40 ha (100 ac). Medium quality KFAs are 16 to 40 ha (40 to 99 ac) and may have some compromised characteristics of a high quality preserve; however, they have potential for reasonable remediation. Low quality karst preserves are less than 16 ha (40 ac) and do not count toward meeting the minimum Bexar County karst invertebrates recovery criteria. However, they are still important because they increase the probability of survival of these species above what it would be without them. Additionally, the recovery plan outlines perpetual management, maintenance, and monitoring necessary for ensuring a high probability of species survival at each site (Service 2011). At a minimum, these activities should include: 1) controlling RIFA; 2) installing and maintaining fencing; 3) installing (if necessary) and maintaining cave gates; and 4) monitoring of karst invertebrates and the ecosystem upon which they depend (Service 2011).

Analysis regarding whether downlisting criteria have been met:

Based on a review of known locations and available data, two areas in the Culebra Anticline KFR, six areas in the Government Canyon KFR, three areas in the Helotes KFR, one area in the Stone Oak KFR, and four areas in the UTSA KFR may meet the definition of a high or medium KFA (for one or more of these species) adequate to count toward the downlisting recovery criterion if they were managed, monitored, and protected in perpetuity (Table 3). However, more research is needed to confirm this assessment. Below is a discussion of these areas with a description of how they have the potential to contribute to meeting the recovery criterion.

Culebra Anticline Karst Fauna Region

Game Pasture Cave Cluster

A 45-ha (110-ac) privately owned parcel contains Game Pasture Cave No.1 and Stevens Ranch Trash Hole Cave. The adjacent 186-ac privately owned parcel contains King Toad Cave. All three of these caves contain *R. infernalis*. The distance from the cave entrance of Game Pasture Cave No.1, Stevens Ranch Trash Hole, and King Toad Cave to the nearest edge is about 1,600 m (5,249 ft), 998 m (3,275 ft), and 405 m (1,330 ft), respectively. There are no cave footprint maps available for these three caves so we are unsure how far they are from an edge. The cave cricket foraging areas for these caves are undeveloped. The surface and subsurface drainage basins are unaltered and included in the parcels (Veni and Associates 2002). We do not know if these caves receive any management, including looking for signs of trespass, RIFA, or monitoring of these species. This area has adequate undeveloped acreage to be considered a high quality KFA. However, we need cave footprints maps to confirm this assessment. In addition, to be considered a “protected” KFA we need verification that this karst area will be managed, monitored, and protected in perpetuity.

Max and Roberts Cave

This cave occurs on a 192-ha (475-ac) privately owned parcel and contains *R. infernalis*. The distance from the cave entrance of Max and Roberts Cave to the nearest edge is 568 m (1,864 ft). However, the parcel boundary is only 10 m (33 ft) from the cave entrance. We do not have a detailed map of the cave footprint so we are unsure how far it is from an edge. The cave cricket foraging area for this cave is undeveloped. We do not have maps of the surface and subsurface drainage basins, so we are unsure if they are undeveloped. We do not know if this cave receives any management, including looking for signs of trespass, RIFA, or monitoring of these species. This area has adequate undeveloped acreage to be considered a high quality KFA. However, to confirm this assessment we need: 1) a map of the cave footprint and 2) surface and subsurface drainage basin delineations. In addition, to be considered a “protected” KFA we need verification that this cave and karst area will be managed, monitored, and protected in perpetuity.

There is potential for two high quality KFAs for R. infernalis in the Culebra Anticline KFR.

Government Canyon Karst Fauna Region

Scenic Overlook Cave Cluster

Government Canyon State Natural Area (GCSNA) is a 3,489-ha (8,622-ac) preserve owned by the Texas Parks and Wildlife Department (TPWD). It is adjacent to the privately owned 30-ha (75-ac) Canyon Ranch Karst Preserve (managed under the La Cantera Habitat Conservation Plan [Service 2001]) and the 239-ha (590-ac) Iron Horse parcel (owned by the City of San Antonio [COSA]). Together these parcels contain a cluster of caves including four on GCSNA (Pig Cave, Tight Cave, Creek Bank Cave, San Antonio Ranch Pit); three on the Canyon Ranch Preserve (Scenic Overlook Cave, Fat Man's Nightmare Cave, Canyon Ranch Pit); and one on the Iron Horse parcel (Continental Park Cave). Four of these caves contain *R. exilis*, six contain *R. infernalis*, four contain *C. madla*, and three contain *B. ventyivi* (see Table 3 for detailed distribution information). The distance from all of these cave entrances and footprints to the nearest edge is at or over 800 m (2,625 ft). The cave cricket foraging areas for these caves are undeveloped. There are internal jeep roads closer than this distance, but they could be revegetated. The surface and subsurface drainage basins are included in the preserves/parcels and are unaltered. The caves on GCSNA are not included in the GCSNA Karst Management and Maintenance Plan (TPWD 2002) because they were acquired after the KMMP was drafted. Scenic Overlook Cave, Fat Man's Nightmare Cave, and Canyon Ranch Pit receive management including biannual RIFA monitoring and treatment, annual faunal monitoring, biannual cave cricket exit counts, and monthly surface inspections per the La Cantera Habitat Conservation Plan (SWCA 2010a, SWCA 2010b). Management at Continental Park Cave (on the Iron Horse parcel) consists of periodic boundary checks for vandalism. This cave cluster has adequate undeveloped acreage to be considered a high quality KFA. In addition, to be considered a "protected" KFA we need verification that the parcels will be managed, monitored, and protected in perpetuity.

Surprise Sink and Bone Pile Cave Cluster

Surprise Sink contains *R. infernalis* and *C. madla*. Bone Pile Cave contains *R. infernalis*. These caves are in GCSNA. The distance from the cave entrance and footprint of Surprise Sink to the nearest edge is about 1,380 m (4,527 ft). The distance from the entrance of Bone Pile Sink to the nearest edge is about 1,600 m (5,249 ft). These edges are outside of the GCSNA boundary. We do not have a map of Bone Pile Sink so we are unsure how far the cave footprint is from the nearest edge, but it is likely at least 100 m (328 ft). The cave cricket foraging areas for these caves are undeveloped. All of the surface and subsurface drainage basins are included in the preserve and are unaltered. These caves receive management including biannual RIFA monitoring and treatment, occasional faunal monitoring (based on availability of a Service-permitted volunteer biologist), annual cave cricket exit counts, and monthly surface inspections per the GCSNA Karst Management and Maintenance Plan (TPWD 2002, TPWD 2010). This area has adequate undeveloped acreage to be considered a high quality KFA. However, we need a map of the cave footprint of Surprise Sink to confirm this assessment. In addition, a protective mechanism (such as a conservation easement) needs to be in place

to ensure that these caves and karst area will be managed, monitored, and protected in perpetuity.

Lost Pothole

This cave occurs in the GCSNA and contains *C. madla*. The distance from the cave entrance and footprint to the nearest edge is about 2,500 m (8,202 ft), which is just on the other side of the GCSNA boundary. The cave cricket foraging area for this cave is undeveloped. The surface and subsurface drainage basins are included in the preserve and are unaltered. Management for this cave includes biannual RIFA monitoring and treatment, occasional faunal monitoring (based on availability of a Service-permitted volunteer biologist), annual cave cricket exit counts, and monthly surface inspections per the GCSNA Karst Management and Maintenance Plan (TPWD 2002, TPWD 2010). This area has adequate undeveloped acreage to be considered a high quality KFA. However, a protective mechanism (such as a conservation easement) needs to be in place to ensure that this cave will be managed, monitored, and protected in perpetuity.

Government Canyon Bat Cave

This cave occurs in GCSNA and contains *R. infernalis*, *R. exilis*, *C. vespera*, and *N. microps*. The distance from the cave entrance and footprint to the nearest edge is about 1,440 m (4,724 ft) and 1,425 m (4,674 ft), respectively (Veni 1988). These edges are just outside the preserve boundary. The cave cricket foraging area for this cave is undeveloped. The surface and subsurface drainage basins are included in the preserve and are unaltered. Management for this cave includes biannual RIFA monitoring and treatment, occasional faunal monitoring (based on availability of a Service-permitted volunteer biologist), annual cave cricket exit counts, and monthly surface inspections per the GCSNA Karst Management and Maintenance Plan (TPWD 2002, TPWD 2010). This area appears to have adequate undeveloped acreage to be considered a high quality KFA. However, a protective mechanism (such as a conservation easement) needs to be in place to ensure that this cave will be managed, monitored, and protected in perpetuity.

Lithic Ridge Cave Cluster

Lithic Ridge Cave, Dancing Rattler Cave, and Hackberry Sink occur in GCSNA and contain *R. infernalis*, *R. exilis*, and *C. madla*; *R. infernalis*; and *R. infernalis*, respectively. The distance from the cave entrances and footprints of Lithic Ridge to the nearest edge is about 1,900 m (6,350 ft) and 1,917 m (6,290 ft), respectively (TPWD 2010), which is just outside the GCSNA boundary. The distance from the cave entrances of Dancing Rattler Cave and Hackberry Sink to the nearest edge is about 1,500 m (4,921 ft). We do not have cave footprints for these two caves, so we are unsure how far they are from the nearest edge, but these distances are likely more than 100 m (328 ft). The cave cricket foraging areas for these caves are undeveloped. The surface and subsurface drainage basins are included in the preserve and are unaltered. Lithic Ridge and Dancing Rattler caves receive management including biannual RIFA monitoring and treatment, occasional faunal monitoring (based on availability of a Service-permitted volunteer biologist), annual cave cricket exit counts, and monthly surface inspections per the GCSNA Karst Management and Maintenance Plan (TPWD 2002, TPWD 2010). Hackberry Sink is not included in the Karst Maintenance and Management Plan. This

cave cluster appears to have adequate undeveloped acreage to be considered a high quality KFA. However, to confirm this assessment we need a map of the cave footprint of Dancing Rattler Cave and Hackberry Sink. In addition, a protective mechanism (such as a conservation easement) needs to be in place to ensure that these caves will be managed, monitored, and protected in perpetuity.

10K Cave

This cave occurs on GCSNA and contains *R. infernalis*. The distance from the cave entrance of 10K Cave to the nearest edge is about 660 m (2,165 ft), which is just outside the GCSNA boundary. We do not have a map of the cave footprint for this cave, so we are unsure how far it is from the nearest edge. The cave cricket foraging area for this cave is undeveloped. The surface and subsurface drainage basins are not delineated, so we are unsure if they are in the preserve. This cave is not included in the GCSNA KMMP. This area has adequate undeveloped acreage to be considered a high quality KFA. However, we need the following information to confirm this assessment: 1) map of the cave footprint of 10K cave and 2) surface and subsurface drainage basin delineations. In addition, a protective mechanism (such as a conservation easement) needs to be in place to ensure that this cave will be managed, monitored, and protected in perpetuity.

There is potential for five high quality KFAs for R. infernalis, three high quality KFAs for R. exilis, four high quality KFAs for C. madla, and one high quality KFA for C. vespera, B. venyivi, and N. microps in the Government Canyon KFR.

Helotes Karst Fauna Region

Helotes Hilltop Preserve

This 10-ha (25-ac) privately owned preserve contains two caves (Helotes Blowhole Cave and Helotes Hilltop Cave). Helotes Hilltop Cave contains *R. exilis*, *B. venyivi*, and *C. madla*. Helotes Blowhole Cave contains *R. exilis*, *R. infernalis*, and *C. madla*. The distance from the cave entrance of Helotes Hilltop and Helotes Blowhole to the nearest edge is about 220 m (722 ft) and 48 m (160 ft), respectively. The distance from the cave footprint of Helotes Hilltop and Helotes Blowhole to the nearest edge is about 67 m (572 ft) and 48 m (160 ft), respectively (Veni 1988). Helotes Blowhole Cave is on a cliff in a streambed; hence, it has a natural edge. Therefore, because Helotes Blowhole has a natural edge (of this type) it can still meet the preserve design criteria. The cave cricket foraging area for Helotes Hilltop is undeveloped; however, Helotes Blowhole does have impacts in its cave cricket foraging area on the opposite side of the cliff from where the cave entrance occurs. The surface drainage basins are unaltered and included in the preserve; however, the subsurface drainage basins are not entirely in the preserve. This preserve is managed per the La Cantera Habitat Conservation Plan (Service 2001). Management for this preserve includes biannual RIFA treatment, biannual faunal monitoring, biannual cave cricket exit counts, and surface inspections every other month (SWCA 2010a, SWCA 2010b). This preserve is only 10 ha (25 ac) in size and the subsurface drainage basins for Helotes Hilltop Cave and Helotes Blowhole Cave are not fully protected. However, this preserve could be combined with undeveloped parcels

around the preserve to protect the drainage basins and reach the acreage estimate necessary to be considered a medium quality KFA.

Logan's Cave and Madla's Drop Cave

Logan's Cave occurs on a 7-ha (18-ac) privately owned parcel and contains *R. exilis* and *R. infernalis*. Madla's Drop Cave occurs on a nearby 20-ha (50-ac) privately owned parcel and contains *R. infernalis* and *C. madla*. The distance from the cave entrance to the nearest edge is 90 m (295 ft) and 134 m (440 ft) to Logan's Cave and Madla's Drop Cave, respectively. However, the edge near Logan's Cave consists of a single house on a large parcel (not in a subdivision). The distance from the cave footprint of Madla's Drop Cave to the nearest edge is 74 m (243 ft) (Veni and Associates 2002). We do not have a map of the cave footprint for Logan's Cave, so we are unsure how far it is from the nearest edge. The cave cricket foraging area for these caves is predominantly undeveloped except for a few jeep roads that can be remediated and a single house. The surface drainage basins are unaltered; however, the subsurface drainage basins are quite large and cross several parcel boundaries that would need to be combined to adequately protect them. We do not know if these caves receive any management, including looking for signs of trespass, RIFA control, or monitoring of these species. This area has adequate undeveloped acreage to be considered a high quality KFA if the parcels could be combined, managed, monitored, and protected in perpetuity.

Madla's Cave

This cave occurs on a privately owned 12-ha (30-ac) parcel and contains *R. infernalis* and *C. madla*. A 2-ha (5-ac) conservation easement exists around the cave within this parcel and is managed per the La Cantera Habitat Conservation Plan (Service 2001). The distance from the cave entrance and footprint to the nearest edge is about 260 m (853 ft) and 230 m (755 ft), respectively (Veni and Associates 2002). The cave cricket foraging area for this cave is undeveloped. The surface and subsurface drainage basins are unaltered and included in the parcel. Management for this cave includes biannual RIFA treatment, biannual faunal monitoring, biannual cave cricket exit counts, and surface inspections every other month (SWCA 2010a, SWCA 2010b). This area has adequate undeveloped acreage to be considered a high quality KFA. In addition, to be considered a "protected" KFA," we need verification that the parcels will be managed, monitored, and protected in perpetuity.

There is potential for one medium quality KFA for R. infernalis, R. exilis, B. venyivi, and C. madla; one high quality KFA for R. exilis; and two high quality KFAs for R. infernalis and C. madla in the Helotes KFR.

Stone Oak Karst Fauna Region

Springtail Crevice Cave Cluster

This 67-ha (165-ac) park is owned by the City of San Antonio and contains three caves that contain *R. exilis*: Kick Start Cave, Springtail Crevice Cave, and Hornet's Last Laugh Pit. The distance from the cave entrance of Kick Start cave, Springtail Crevice, and Hornet's Last Laugh to the nearest hard edge is about 344 m (1,130 ft), 152 m (500 ft),

and 226 m (740 ft), respectively. The distance from the nearest edge to the footprint of Hornet's Last Laugh is 221 m (728 ft) (Veni 1988). We do not know the distance to the cave footprint for the other two caves because we do not have maps of those caves. The cave cricket foraging area for all three caves is undeveloped. The normal surface drainage basin is unaltered and included in the park for Kick Start Cave and Hornet's Last Laugh. However, the park and caves are in a stormwater retention reservoir, which periodically floods these caves. The floodwater may come from outside the normal drainage basins as they are currently delineated. The surface drainage basin for Springtail Crevice is not included in the park. The subsurface drainage basins of all three caves are included in the park except for a small portion of the Springtail Crevice. While Springtail Crevice does not meet the recovery criteria on its own since the entire surface and subsurface drainage basins are not in the park, it contributes to the overall health of this cave cluster. Management for these caves includes periodic surface inspections and biannual cave cricket exit counts (W. Leonard 2011, pers. comm.). They do not receive RIFA treatment or in-cave monitoring. This park has adequate acreage to be considered a high quality KFA. However, to confirm this assessment we need 1) a map of the cave footprints for Kick Start Cave and Springtail Crevice and 2) a thorough assessment of habitat quality since the park is a stormwater retention reservoir and runoff that has entered this reservoir may have degraded the subterranean habitat quality of the caves. In addition, to be considered "protected," we need verification that these caves will be managed, monitored, and protected in perpetuity.

There is one potential high quality KFA in the Stone Oak KFR for R. exilis.

University of Texas at San Antonio Karst Fauna Region

Three Fingers Cave Cluster

Robber's Cave occurs on the 61-ha (150-ac) Sinken Nature Preserve (owned by the COSA) and contains *R. exilis*, *R. infernalis*, and *C. madla*. Three Fingers Cave occurs on a nearby 103-ha (255-ac) privately owned parcel and contains *R. exilis* and *R. infernalis*. Hills and Dales Pit occurs on a nearby 28 ha (70 ac) privately owned preserve managed under the La Cantera Habitat Conservation Plan and contains *R. exilis* and *C. madla*. The distance from the cave entrance and cave footprint of Robber's Cave to the nearest edge is about 228 m (750 ft) and 210 m (690 ft), respectively. The distance from the cave entrance of Three Fingers Cave to the nearest hard edge is about 116 m (380 ft). We do not have a map of the cave footprint of Three Fingers Cave, so we are unsure how far it is from an edge. The distance from the cave entrance and footprint of Hills and Dales Pit to the nearest edge is 91 m (300 ft) and 82 m (269 ft), respectively. The cave cricket foraging area for Robber's Cave and Three Fingers Cave are undeveloped. However, there is some development in the cave cricket foraging area for Hills and Dales Pit. The surface drainage basins for Robber's Cave and Three Fingers Cave are unaltered and included in the preserve/parcel. However, part of the surface drainage basin for Hills and Dales Pit has been altered. The subsurface drainage basins for all three caves are unaltered and included in the parcel or preserves. Management for Robber's Cave includes periodic boundary inspections. This cave does not receive RIFA treatment or in-cave monitoring (J. Neal 2011, pers. comm.). We do not know if Three Fingers Cave

receives any management including looking for signs of trespass, RIFA, or monitoring of these species. Management at Hills and Dales Pit includes biannual RIFA treatment, biannual faunal monitoring, biannual cave cricket exit counts, and monthly surface inspections (SWCA 2010a, 2010b). Hills and Dales Pit does not meet the recovery criteria as a single cave because it is less than 100 m (328 ft) from an edge, the cave cricket foraging area is impacted, and part of the surface drainage basin is altered. However, it does contribute to the overall health of the karst ecosystem associated with these three caves. The parcels that these caves occur on and the ones in between them are undeveloped. Hence, there is adequate undeveloped acreage for this area to be considered a high quality KFA. In addition, to be considered a “protected” KFA we need verification that the combined parcels will be managed, monitored, and protected in perpetuity.

John Wagner Ranch Cave No. 3

This privately owned cave is located on a 2-ha (4-ac) preserve and is known to contain *R. exilis*, *R. infernalis*, and *C. madla*. This preserve is adjacent to the Rancho Diana preserve, which is about 466 ha (1,152 ac) and is owned by the COSA. The distance from the nearest edge to the cave entrance and cave footprint is about 90 m (295 ft). As mentioned earlier, there is a margin-of-error with GPS and GIS of about 30 m (98 ft), so there is a possibility that it is the recommended 100 m (328 ft) from an edge. The cave cricket foraging area for this cave is undeveloped except for a small portion to the west of the cave entrance. The surface drainage basin is unaltered and included in the preserve (Veni and Associates 2002, SWCA 2000). The subsurface drainage basin is intact and about 60 percent of it is on this preserve. The remaining 40 percent extends into the Rancho Diana preserve (SWCA 2000). The John Wagner Ranch Preserve is managed per the La Cantera Habitat Conservation Plan (Service 2001). Management for this cave includes biannual RIFA treatment, biannual faunal monitoring, biannual cave cricket exit counts, and monthly surface inspections (SWCA 2010a, SWCA 2010b). The 2-ha (5-ac) preserve that John Wagner Ranch Cave No. 3 occurs on does not have enough acreage to meet the recovery criteria. However, it could be combined with Rancho Diana to meet the acreage needed to be considered a high quality KFA. In addition, to be considered a “protected” KFA we need verification that the combined parcels will be managed, monitored, and protected in perpetuity.

Breathless Cave

This cave occurs on an 85-ha (210-ac) preserve that is owned by the City of San Antonio and contains *C. madla*. The distance from the cave entrance and footprint to the nearest edge is about 400 m (1,312 ft), which is off the preserve. The cave cricket foraging area for this cave is undeveloped. The surface and subsurface drainage basins have not been delineated. Management for this cave consists of two cave cricket surveys during the summer and biannual RIFA surveys (J. Neal 2011, pers. comm.). While this preserve has enough acreage to potentially count towards the downlisting recovery criterion, the cave occurs in a linear section of the preserve. Adjacent parcels would need to be acquired to ensure that future impacts would not occur within 100 m (328 ft) of the cave footprint. To confirm this assessment we need surface and subsurface drainage basin delineations of this cave. This area has adequate undeveloped acreage to be considered a high quality

“protected” KFA. In addition, to be considered a “protected” KFA we need verification that the combined parcels will be managed, monitored, and protected in perpetuity.

Mastodon Pit and Feature 50

These two caves occur on about 53 ha (130 ac) of undeveloped land that is owned by University of Texas at San Antonio. Mastodon Pit contains *R. exilis* and Feature 50 contains *C. madla*. The distance from the cave entrance of Mastodon Pit and Feature 50 to the nearest edge is about 95 m (312 ft) and 150 m (492 ft), respectively. We do not have maps of the cave footprints so we are unsure how far they are from an edge. The cave cricket foraging area for Mastodon Pit is undeveloped except for a small portion that is north of the cave. The cave cricket foraging area for Feature 50 is undeveloped. The surface and subsurface drainage basins for Mastodon Pit are included in the undeveloped area around the cave. The surface and subsurface drainage basins for Feature 50 have not been delineated. We do not know if these caves receive any management. This area has adequate undeveloped acreage to be considered a high quality KFA. However, to confirm this assessment we need cave footprint maps. In addition, a protective mechanism (such as a conservation easement) needs to be in place to ensure that these karst features and area will be managed, monitored, and protected in perpetuity.

There is potential for three high quality KFAs for R. exilis, four high quality KFAs for C. madla, and two high quality KFAs for R. infernalis in the UTSA KFR.

Table 3. Areas that have potential to meet the recovery criteria. Within each KFR, caves that would cluster together as one KFA are shown clustered in the table.

Cave Name	<i>R. exi</i>	<i>R. inf</i>	<i>B. venyivi</i>	<i>T. coke</i>	<i>N. micro</i>	<i>C. bar</i>	<i>C. mad</i>	<i>C. venii</i>	<i>C. vesp</i>
Culebra Anticline Karst Fauna Region									
Game Pasture Cave Cluster									
Stevens* Ranch Trash Hole Cave		X							
Game Pasture Cave No. 1		X							
King Toad Cave		X							
Max and Roberts Cave									
Max and Roberts Cave		X							
Government Canyon Karst Fauna Region									
10K Cave									
10K Cave		X							
Scenic Overlook Cave Cluster									
Fat Man's Nightmare Cave		X					X		
Creek Bank Cave	X								
Pig Cave	X	X					X		
San Antonio Ranch Pit	X	X	X				X		
Tight Cave	X		X						
Canyon Ranch Pit		X							
Continental Park Cave		X							
Scenic Overlook Cave		X	X				X		
Government Canyon Bat Cave									
Government Canyon Bat Cave	X	X			X				X
Lithic Ridge Cave Cluster									
Dancing Rattler Cave		X							
Hackberry Sink Cave		X							

Cave Name	<i>R. exi</i>	<i>R. inf</i>	<i>B. venyivi</i>	<i>T. coke</i>	<i>N. micro</i>	<i>C. bar</i>	<i>C. mad</i>	<i>C. venii</i>	<i>C. vesp</i>
Lithic Ridge Cave	X	X					X		
Lost Pothole									
Lost Pothole							X		
Bone Pile and Surprise Sink									
Bone Pile Cave		X							
Surprise Sink		X					X		
Helotes Karst Fauna Region									
Helotes Hilltop Preserve									
Helotes Blowhole	X	X					X		
Helotes Hilltop Cave	X		X				X		
Madla's Cave									
Madla's Cave		X					X		
Logan's Cave and Madla's Drop Cave									
Logan's Cave	X	X							
Madla's Drop Cave		X					X		
Stone Oak Karst Fauna Region									
Springtail Crevice Cave Cluster									
Kick Start Cave	X								
Springtail Crevice	X								
Hornet's Last Laugh Pt	X								
University of Texas at San Antonio Karst Fauna Region									
John Wagner Ranch Cave No. 3									
John Wagner Ranch Cave No. 3	X	X					X		
Mastodon Pit and Feature 50									
Mastodon Pit	X								
Feature #50							X		
Three Fingers Cave Cluster									
Three Fingers Cave	X	X							
Robber's Cave	X	X					X		
Hills and Dales Pit	X						X		
Breathless Cave									
Breathless Cave							X		

2.3 Updated Information and Current Species Status

The most recent information regarding the current species status as well as a discussion of the threats in relation to the five factors considered when listing or delisting a species can be found in the recovery plan (Service 2011). Climate change was not identified as a threat to these species in the original listing document. However, the dependence of these species on stable temperature and humidity opens the possibility that climate change is impacting these species. Therefore, while it appears reasonable to assume that these species may be affected, we lack sufficient certainty to know how climate change will affect these species. For more detailed information, see the recovery plan (Service 2011).

2.4 Synthesis

According to the downlisting recovery criterion in the recovery plan, three KFAs within each KFR should be protected and at least six KFAs (of medium or high quality) should be protected rangewide if the species occurs in one KFR. To be considered protected, these areas must provide perpetual protection from threats such as RIFA, habitat destruction, and contaminants.

Based on a review of available data, two areas in the Culebra Anticline KFR, six areas in the Government Canyon KFR, three areas in the Helotes KFR, one area in the Stone Oak KFR, and four areas in the UTSA KFR may meet the definition of a medium or high quality KFA for one or more species. However, the number of potential high quality and medium quality KFAs that are currently known in each KFR (Table 2) are not sufficient to meet the downlisting criterion, indicating that further surveying is necessary. Likewise, none of them are considered protected as defined above. Also, while these areas appear to currently be high or medium quality, many could be planned for development, which would reduce their quality.

None of these species have met recovery criterion one. Therefore, we recommend that they all remain listed as endangered and that efforts be focused on protecting high and medium quality KFAs.

3.0 RESULTS

3.1 Recommended Classification:

- Downlist to Threatened**
- Uplist to Endangered**
- Delist** (*Indicate reasons for delisting per 50 CFR 424.11*):
- Extinction*
- Recovery*
- Original data for classification in error*
- No change is needed**

3.2 New Recovery Priority Number: We recommend changing the recovery priority number for two of these species (*T. cokendolpheri* and *C. baronia*) to 5C because the likelihood that we can recover them is low considering that they are known from so few locations and they occur in a highly urbanized area. There is no change to the other seven species as their recovery priority number remains 2C.

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

The following actions are our highest priority actions in the next five years.

- Secure protection for adjacent parcels near Max and Roberts Cave, Breathless Cave, Helotes Hilltop/Blowhole Preserve, Three Fingers Cave Cluster, Logan's Cave, Madla's Drop Cave, and Madla's Cave, to reach the acreage requirement (or to be more than 100 m [328 ft] from an edge) for these caves to meet high or medium KFA status, as needed.
- Confirm long-term commitment to implement management at all potential KFAs identified in this review.
- Map cave footprints of Max and Roberts Cave, 10K Cave, Mastodon Pit, Feature 50, Springtail Crevice Cave, Kick Start Cave, Three Fingers Cave, Logan's Cave, Bone Pile Sink, Dancing Rattler Cave, Hackberry Sink, Game Pasture Cave No. 1, King Toad Cave, and Stevens Ranch Trash Hole.
- Delineate surface and/or subsurface drainage basins for Breathless Cave and for Max and Roberts Cave.
- Assess habitat quality at the Springtail Crevice Cave Cluster.
- Conduct surveys to locate additional locations for the species covered in this review, especially in KFRs where there are not enough potential medium or high quality KFAs to meet the recovery criterion.

5.0 REFERENCES

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FISH AND WILDLIFE SERVICE

5-YEAR REVIEW of *Rhadine exilis* (no common name), *Rhadine infernalis* (no common name), Madla Cave meshweaver (*Cicurina madla*), Braken Bat Cave meshweaver (*C. venii*), Government Canyon Bat Cave meshweaver (*C. vespera*), Robber Baron Cave meshweaver (*C. baronia*), Cokendolpher cave harvestman (*Texella cokendolpheri*), Government Canyon Bat Cave spider (*Neoleptoneta microps*), and Helotes mold beetle (*Batrisodes venyivi*)

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: N/A

Review Conducted By: Cyndee Watson, Austin Ecological Services Field Office, Austin, Texas

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____

Date _____

August 29, 2011

REGIONAL OFFICE APPROVAL:

Assistant Regional Director, Ecological Services, Fish and Wildlife Service, Region 2

Approve _____

Date _____

Michelle Shaykessy

8/29/11