



BILL GRAVELL JR.
County Judge
WILLIAMSON COUNTY TEXAS

Public Comments Processing
Attn: FWS-R2-ES-2017-0018
U.S. Fish and Wildlife Service
MS; JAO/1N
5275 Leesburg Pike
Falls Church, Virginia 22041-3803

RE: Information in support of U.S. Fish and Wildlife Service's 12-month status review of the Bone Cave harvestman (*Texella reyesi*) required pursuant to the October 10, 2019, positive 90-day finding on a petition to delist

To whom it may concern:

Williamson County, Texas ("County") submits this letter in connection with the U.S. Fish and Wildlife Service's ("Service") 90-day finding that a June 2, 2014 petition ("Petition") to delist the Bone Cave harvestman (*Texella reyesi*) ("BCH") provided substantial information indicating delisting the BCH may be warranted, which was published in the Federal Register on October 10, 2019 ("Positive 90-day Finding") (Federal Register 84:54,542). A copy of the Petition is provided as Exhibit 1 hereto and is fully incorporated by reference.

The Petition urged the Service to delist the BCH on the grounds that the species had recovered and that the species was originally listed in error. The Service found in 2017¹ that the Petition did not present substantial scientific or commercial information indicating delisting may be warranted ("2017 Finding"), and the American Stewards of Liberty ("ASL") and others challenged that finding in the U.S. District Court for the Western District of Texas. The County, along with John Yearwood, intervened as a plaintiff in that case, on the basis that the Service's failure to delist the BCH violated the Necessary and Proper and Commerce Clauses of the United States Constitution. On March 28, 2019, the court vacated the 2017 Finding, holding that it was arbitrary and capricious and directing the Service to make a new 90-day finding. In its order, the court concluded that "the [P]etition presents available, substantial scientific and commercial information indicating that delisting of the [BCH] may be warranted" (*American Stewards of*

¹ The Service also made a negative 90-day finding in 2015; however, that finding was voluntarily remanded back to the agency when it was discovered during litigation brought by ASL that the Service had failed to consider dozens of documents provided by ASL and others in support of the Petition.

Liberty v. Department of the Interior, 370 F.Supp.3d 711, 729 [Western District of Texas, 2019]) (emphasis added). The court instructed the Service to analyze the Petition based on available population information, not population information that the Service admits is impossible to attain” (370 F.Supp.3d 711, 729).

The Service published the Positive 90-day Finding within the time subsequently agreed upon by the parties and approved by the court.

On August 27, 2019, six months after the court vacated the 2017 Finding, the Service (along with the National Marine Fisheries Service) revised their joint regulations governing the Endangered Species Act (“ESA”) listing and delisting processes (“Revised Regulations”) (Federal Register 84:45,020 [August 27, 2019]). The Revised Regulations had an effective date of September 26, 2019. The County’s comments regarding the status of the BCH follow the Service’s Revised Regulations; however, whether the Service applies the ESA listing and delisting regulations that were in place at the time the Petition was submitted or the Revised Regulations that currently are in effect, it is clear that the best available scientific and commercial information demonstrates that delisting the BCH is warranted.

The BCH has occupied and persisted in caves surrounded by development since it was listed. Circumstances once viewed as threats to the species have, over time, proven not to have the kinds of impacts once predicted by the Service and others. Moreover, the species has received a significant amount of protection due largely in part to the existence of the Williamson County Regional Habitat Conservation Plan (“RHCP”) and Balcones Canyonlands Conservation Plan (“BCCP”), under which numerous species-occupied caves have been permanently protected and through which those caves undergo regular monitoring and management for the benefit of the BCH and other endangered karst invertebrates.

Through the efforts of the County, the Williamson County Conservation Foundation (“Foundation”) and others, nearly 100 species-occupied caves have been preserved; implementation of robust monitoring and maintenance of occupied caves is ongoing; and (as described below) under state and local law, best management practices that prevent or ameliorate many of the supposed stressors previously identified by the Service as having an impact on the species are enforced across the species’ range. The stable and increasing status of the BCH should serve as a resounding success story for the Service. Efforts undertaken or supported by the Service, such as the development and approval of two habitat conservation plans (“HCPs”) covering the entire known range of the BCH and close coordination of the Service with Travis and Williamson Counties to identify and encourage permanent preservation of dozens of species-occupied caves, have propelled the BCH to a point where the listing criteria no longer support maintenance of the species on the list of endangered or threatened species. Studies, monitoring, and management undertaken pursuant to these two HCPs and others approved by the Service have resulted in the discovery of a host of new, confirmed locations for the BCH far beyond the range known at the time the species was listed.

It is truly remarkable that a species once known from only five or six caves is now known from 203 caves, 100 of which (approximately 50% of the total known localities) are protected in preserves, parks, or other open spaces. As a result of the increase in known localities, the known distribution of the species has increased more than 3,000% (that is, more than 30-fold) over a period of 25 or so years.²

When one views the totality of the best scientific and commercial data available, it is now clear that the BCH does not currently meet the listing criteria established by section 4 of the ESA and implemented under the Revised Regulations or former versions thereof. Instead, the best available scientific and commercial data available clearly demonstrates that the BCH is neither “in danger of extinction throughout all or a significant portion of its range” nor “likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (16 United States Code [USC] 1532(6), (20)).³

I. Summary of Best Available Scientific and Commercial Information

As described in greater detail below, the best available scientific and commercial data demonstrate clearly and unequivocally that the BCH does not meet the definition of an endangered or threatened species as those terms are defined in the ESA. When the BCH was listed (as the Bee Creek Cave harvestman [*Texella reddelli*]), it was known from merely five or six localities, and the Service did not indicate a belief that significant numbers of new locations would be discovered (Federal Register 53:36,029 [September 16, 1988]). On the contrary, the perceived status of the BCH at the time of listing was so dire that the Service waived the typical 30-day delay between publication of the final rule and the effective date of the listing, stating that “immediate protection is needed to meet the ongoing threat of construction activities that are taking place on land that includes all or a major portion of each of the subject species’ habitat” (Federal Register 53:36,030).

More than thirty years after the BCH was listed, the species is now confirmed in over 200 caves, 100 of which are under some form of protection and/or management and many of which are conserved in the context of Service-approved HCPs and interagency consultations under the ESA. As noted above, the BCH is covered by the RHCP and the BCCP, which together address

² The County is aware of a recent study by Hedin and Derkarabetian (2020) investigating BCH genetic diversity. The researchers examined the closely related Bee Creek Cave harvestman (*T. reddelli*) and found strong evidence that both species form a single clade (i.e. single species) at locations north of the Colorado River. While the authors stop short of taxonomic revision, the potential of adding more BCH localities to the map further increases the representation of the species across the landscape. The same study also increases our understanding of the BCH by showing that this species exhibits a high degree of genetic variability across its range, again pointing to robust representation of the species.

³ Under the Service’s listing framework, the agency has explained that “the term foreseeable future extends only so far into the future as the [Service] can reasonably determine that both the future threats *and the species responses to those threats are likely*” (Federal Register 84:45,020 [August 27, 2019]) (emphasis added). The Service is required to “describe the foreseeable future on a case-by-case basis, using the best available data and taking into account considerations such as the species’ life-history characteristics, threat-projection timeframes, and environmental variability” (Federal Register 84:45,020). The Service interprets the term “likely” to mean “more likely than not” (Federal Register 84:45,020).

the entirety of the species' known range. State and local regulatory mechanisms have been adopted since the BCH was listed that provide direct and/or indirect protection of the BCH through implementation of best management practices, setbacks, and others mechanisms. Monitoring of occupied caves has demonstrated that BCH continue to persist even where those caves surrounded by development.

Available data, when applied against the ESA listing criteria, demonstrate clearly that the BCH does not meet the definition of an endangered or threatened species under the ESA and should be promptly delisted in accordance with applicable law and regulation. Consequently, the County urges the Service to find that the Petition is warranted and promptly publish in the Federal Register a proposed rule to delist the BCH.

II. Regulatory Framework

Under the Revised Regulations, Title 50 of the Code of Federal Regulations (CFR) 424.11(e) requires the Service to delist a species where the Service finds after a review of the best scientific and commercial data available that any of the following situations apply: 1) the species is extinct; 2) the species *"does not meet the definition of an endangered species or a threatened species;"* or 3) the listed entity does not meet the statutory definition of a species⁴ (50 CFR 424.11(e)) (emphasis added).

The Revised Regulations require the Service, when determining whether a species meets the definition of an endangered or threatened species,⁵ to apply the same factors and standards the agency uses in making listing or reclassification determinations (50 CFR 424.11(e)(2)). The ESA includes five criteria, commonly referred to as "listing factors," that the Service must apply in making listing and delisting determinations (16 USC 1533(a)(1)(A)-(E); 50 CFR 424.11(c)):

- The present or threatened destruction, modification, or curtailment of a species' habitat or range ("Listing Factor A");
- Overutilization for commercial, recreational, scientific, or educational purposes ("Listing Factor B");

⁴ In the preamble to the Revised Regulations, the Service indicated that it removed as basis for delisting that the listing was in error due to the fact that the language was "unnecessary," as "the other delisting factors being finalized in this rule, including whether the listed entity meets the definition of 'species' or a determination that a species meets the definition of a 'threatened species' or 'endangered species,' adequately capture instances in which a species was listed due to an error in the data, or in the interpretation of that data, at the time of the original classification" (Federal Register 84:45,196).

⁵ In the context of making a determination as to whether a species should be listed as threatened or endangered, it is important to keep in mind the ESA's definitions relating to the same. An endangered species is one that is presently "in danger of extinction throughout all or a significant portion of its range" (16 USC 1532(6)). By contrast, a *threatened* species is one that is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 USC 1532(20)). Importantly, under the Service's listing framework, the agency has explained that "the term foreseeable future extends only so far into the future as the [Service] can reasonably determine that both the future threats *and the species responses to those threats are likely*" (Federal Register 84:45,020 [August 27, 2019]) (emphasis added). The Service is required to "describe the foreseeable future on a case-by-case basis, using the best available data and taking into account considerations such as the species' life-history characteristics, threat-projection timeframes, and environmental variability" (Federal Register 84:45,020). The Service interprets the term "likely" to mean "more likely than not" (Federal Register 84:45,020).

- Disease or predation (“Listing Factor C”);
- The inadequacy of existing regulatory mechanisms (“Listing Factor D”); or
- Other natural or manmade factors affecting the species’ continued existence (“Listing Factor E”)

Listing factors A, B, C, D, and E are collectively referred to herein as the “Listing Factors.” As set forth in the Revised Regulations, the Service “shall” delist a species where that species does not meet the definition of an endangered or threatened species and, in making such determination, must apply the Listing Factors (50 CFR 424.11(e)).

III. Listing Factor A: The Present or Threatened Destruction, Modification, or Curtailment of a Species’ Habitat or Range

In previous reviews, the Service has identified Listing Factor A—the present or threatened destruction, modification, or curtailment of the species’ range—as particularly relevant to the BCH listing status (Service 1988, 2018a, 2018b). Specifically, the Service has indicated that activities associated with urbanization (e.g., those associated with roads, industrial use, and residential and commercial construction) pose a threat to the continued existence of the BCH due to “destruction of macro- and mesocaverns, alteration of drainage patterns, degradation of native plant communities, increased edge effects, contamination, human visitation and vandalism, and invasive species” (Service 2018a). These consequences are described by the Service’s 2018 “Species Status Assessment for the Bone Cave Harvestman” (Service 2018a) (“2018 SSA”) and “Bone Cave Harvestman 5-year Review” (Service 2018b) (“2018 5-year Review”) as potentially resulting in decline or extirpation of BCH populations; potential loss, destruction, and degradation of BCH habitat; disruption of nutrient inputs and nutrient cycling; and flooding of karst features. In those documents, the Service forecasts that continued human population growth and associated development will threaten the BCH into the foreseeable future. However, the Service found in their Positive 90-Day Finding that the Petition presented substantial scientific or commercial data to indicate that these threats may be reduced or ameliorated (Service 2019a).

As described in greater detail below, available data indicate that causal links between surface development and adverse effects to BCH are, in fact, absent or tenuous and there is substantial evidence that threats to the species previously identified by the Service are not as significant as previously perceived by the agency. Even if one were to assume solely for the sake of argument that there existed a causal link between surface development and some degree of adverse effects to BCH, such threats could not be said to threaten the BCH with extinction now or in the foreseeable future due to the species’ apparent proliferation across its known range since the time of listing. This is especially so once one takes into consideration the extensive and varied protections the BCH receives across its known range.

The Petition provided ample information demonstrating BCH persistence both in areas of typical development and with human access. For example, the Petition pointed out: 1) the continued persistence of the species in Inner Space Caverns despite receiving 100,000 visitors annually and being located underneath Interstate Highway 35; 2) the continued persistence of BCH in 25 caves located within the Sun City residential community near Georgetown, Texas; 3) the

continued persistence of the species in Weldon Cave, which was feared by the Service in 1988 to no longer exist due to a road extension and neighboring residential development; and 4) the continued persistence of the species in Three-Mile and Four-Mile Caves located under State Highway 29 in Williamson County.

A more recent document reporting on a study of Millipede Annex Cave, which is located in the middle of a large high school complex, demonstrates BCH presence within a developed area, and includes temporal data demonstrating persistence (Cambrian Environmental [Cambrian] 2017). This study demonstrated that the BCH population in Millipede Annex Cave not only has persisted, but has even seen a documented increase in abundance for more than 20 years since the school was built (Cambrian 2017).

Additional documentation of BCH persistence has also been reported by Cambrian at other localities (Cambrian 2017), as well as by the on-going monitoring program associated with the Foundation's obligations under the RHCP (Van Kampen-Lewis and White 2020a). Both of these studies indicate that urbanized localities—such as the Beck Preserve (44.5 acres) and the Beck Commons Preserve (4.2 acres)—include caves with some of the highest BCH counts among the caves managed and monitored by the Foundation. For example, Van Kampen-Lewis and White (2020a) indicate Beck Bat Cave had more than 30 BCH documented in 2017 (p.20) and Beck Sewer Cave had more than 40 BCH in 2017 (p.85). Although these high counts are not typical even at the same locations and may be tied to increased rainfall during the study period, the data nevertheless demonstrates that the species persists and can flourish despite substantial urbanization.

a. *BCH is not threatened by edge effects and other changes caused by urbanization*

The Service has expressed concern that certain indirect effects to the BCH stemming from urban development, sometimes referred to as “edge effects,”⁶ pose a threat to the species. However, available data—namely, the continued persistence of BCH within caves surrounded by development—strongly suggests that edge effects do not pose a threat to the species continued existence (Cambrian 2017; Van Kampen-Lewis and White 2020a) and there exists virtually no countervailing data.⁷ There is not a circumstance in which urban development has been documented to extirpate a BCH population.

Edge effects on the BCH resulting from development activities were identified by the 2018 SSA as including changes to plant/animal communities, increased solar radiation in cleared areas, changes to nutrient cycling, and changes to leaf litter decomposition (Service 2018a). Studies published over the last several decades, however, provide a different perspective. For example,

⁶ As described in the Service's 2018 Status Review for the BCH, edge effects are “changes to the animal and plant communities where different habitats meet” (Service 2018a:35).

⁷ The County is aware of only one instance of a BCH location apparently experiencing decline as a result of surrounding development: Lakeline Mall Cave. This locality is situated squarely within a roughly 80-acre mall and parking lot complex, and studies shown evidence of decline. The mall complex was built prior to implementation of various state and local regulations and ordinances governing setbacks and others measures for the protection of the Edwards Aquifer and karst features. It is highly unlikely that, were the same area to be developed today, Lakeline Mall Cave would be similarly impacted.

one study indicated that where terrestrial vegetation is not a significant source of nutrient input, changes to leaf litter decomposition may have little effect on cave fauna (Reddell 1993). Another study posited that some surface nutrients may be transferred to deeper portions of caves via water (Simon et al. 2007). While some studies on which the Service has previously relied have shown that surface nutrients may be mediated through a limited number of fauna such as cave crickets (*Ceuthophilus* spp.) (Taylor et al. 2004; Taylor et al. 2007), Van Kampen-Lewis and White (2020a, 2020b) document many species that forage on the surface and then deposit nutrients (i.e., feces, dead bodies) within the cave ecosystem. Such species include (but are not limited to) common harvestman (*Leiobunum townsendi*), racoon (*Procyon lotor*),⁸ chirping frogs (*Eleutherodactylus* sp.), and various snake species. Given the above-referenced data, it is evident that the Service's (2018a, 2018b) focus on the import of cave crickets does not capture the full picture of nutrient input to the cave ecosystem from other sources, including animal-derived sources such as raccoons and other such creatures.

The Service has for years considered cave crickets to be important conduits of surface nutrients to karst systems and as a result has opined that development activities affecting cave crickets have significant ramifications on nutrient availability in karst systems (Service 2011, 2018a, 2018b). Critically, however, there is no *actual* data concerning the diet of the BCH. Drawing inferences about BCH diet based on the diet of other harvestman species absent validation is unwise (Murphy et al. 2011), as studies have shown the diets of harvestmen to be quite varied. Some harvestmen forage on fungi or plants, others forage on soft-bodied invertebrates, and yet others on hard-bodied invertebrates including small beetles (Service 2018a).

The fact that BCH persist with stable or increasing populations in numerous caves situated within highly developed areas calls into question the Service's previous reliance on edge effects as a stressor on the species and additionally demonstrates that edge effects are not a present threat to the species habitat or range (Cambrian 2017; Van Kampen-Lewis and White 2020a).

b. *Habitat fragmentation is not a major stressor on the BCH*

Although the Service (2018a) recently indicated that habitat fragmentation may constitute a major stressor on the BCH, it is apparent that the agency did not consider the fact that urbanization in the BCH range occurs atop a three-dimensional, rather than two-dimensional, karst matrix. Urbanization in two-dimensional surface habitats has been documented to preclude surface species movement between localities. The karst matrix, however, remains connected even where urbanization is occurring or has occurred, and as a result, species dependent upon that matrix do not experience the same kind of effects caused by surface habitat fragmentation as species that have no such dependence. For example, BCH have been documented in the Beck Preserve for 10 years despite the fact that the preserve has been surrounded by residential and commercial development for many decades (Van Kampen-Lewis and White 2020a).

⁸ Indeed, Prange et al. (2004) indicate raccoons actually increase their densities in urban and suburban areas compared to more natural settings.

The recent discovery in the Beck Preserve of a karst invertebrate never before documented in the preserve lends additional support to the fact that surface habitat fragmentation caused by urbanization does not pose a significant adverse threat to karst matrix-dependent species. Specifically, the blind *Batrises reyesi* (no common name) ("*B. reyesi*") was recently documented in Beck Bat Cave. *B. reyesi* presence in Beck Bat Cave constitutes a major range expansion of the known range for this species (Van Kampen-Lewis et al. 2019). While it is technically possible that previous biota surveys overlooked prior presence of *B. reyesi*, it is highly unlikely given Reddell and Finch (1963) indicate Beck Bat Cave was regularly visited as early as the 1950s. It is very possible this species is, in fact, expanding its range to the east through the karst matrix. Such an occurrence may indicate that the current level of urbanization around the Beck Preserve is not hindering troglitic movement within the subsurface is not negatively impacting species diversity at the Beck Preserve.

In sum, the continued existence of the BCH, particularly when combined with the recent discovery of other troglites not previously recorded in the Beck Preserve, indicate continued karst habitat connectivity in the range of the BCH despite adjacent urbanization. As demonstrated above, the effects of urbanization on the BCH do not necessarily include fragmentation of the species' actual habitat because that habitat persists below the surface and continues to allow movement of the species from one area to another.

c. *Effects on the BCH from quarrying are likely to be minimal*

The 2018 SSA states that quarrying or mining operations "have the potential to impact Bone Cave harvestman populations" (Service 2018a:47). Limestone quarries physically remove the karst matrix required by the BCH, and as a result, quarry operations represent a highly localized threat to the species where such activities are occurring. In order to ascertain the approximate spatial extent of quarries within the known range of the BCH, the County reviewed the U.S. Geological Survey's Mineral Resources Data System (Schweitzer 2019). Because Schweitzer (2019) primarily provides point locations and not acreage for these mines the County used aerial imagery on ArcMAP combined with Travis and Williamson County central appraisal district parcel data to determine approximate quarry spatial extent. Active mines and adjacent tracts owned by the same entities were combined to estimate existing and potential quarry extent in the foreseeable future. Using this process, the County was able to determine that existing and potential limestone quarries could conceivably occur within 17.7% percent of the estimated 166 square-mile BCH range. Specifically, these quarries could intersect BCH range across 1.6 square miles (1,007 acres) in Travis County and 27.7 square miles (17,713 acres) in Williamson County. These numbers assume that all existing and potential quarries will be fully developed. Even using this assumption, there is not sufficient information indicating the BCH is threatened with extinction or will foreseeably be so as a result of quarrying activities within all or a significant portion of the species' range.

d. *Substantial conservation in place for the BCH protects the species from threats due to habitat loss*

Currently available data indicate at least 100 caves with documented BCH occupancy are under protection from land development and/or are managed in a manner consistent with conservation of the BCH (SWCA Environmental Consultants [SWCA] 2017a; Yearwood et al. 2014).⁹ This includes caves protected in preserved lands across 51.9 square miles (35%) of the current known range of the BCH (SWCA 2017a). Much of that protection has been provided pursuant to the RHCP and BCCP, which are discussed in greater detail below.

i. Williamson County Regional Habitat Conservation Plan

The County's RHCP was approved by the Service in 2008 and supporting an ESA section 10 ITP, Permit No. TE-181840-1. The RHCP is administered jointly by the County and Foundation. Pursuant to the RHCP, the County and Foundation committed to, among other things, purchase or acquire management control of approximately 700 acres of land constituting three karst faunal areas for each of the RHCP-covered species (including the BCH) in the karst faunal areas where the species occurs (SWCA et al. 2008:5-3). The mitigation strategy set forth in the RHCP was based on the recovery criteria set forth in the recovery plan in place for the BCH and other listed karst invertebrates at the time the RHCP was approved (Service 1994).

Through the efforts of the Foundation pursuant to the RHCP, approximately 943 acres of land have been preserved containing 59 named karst features managed for the benefit of rare karst invertebrates in Williamson County (Van Kampen-Lewis and White 2020b). The Foundation also manages four additional karst preserves established since the Petition was submitted in 2014, which further increases the redundancy of protected BCH localities. These include the Beck Commons Preserve (4.2 acres), the Shaman Cave Preserve (81.7 acres), the Bat Well Cave Preserve (46.5 acres),¹⁰ the Snowmelt Cave Preserve (1.3 acres), and the Coffin Cave Preserve (39.4 acres) (Van Kampen-Lewis and White 2020b). Biota surveys also indicate two Karankawa Cave Preserve locations (i.e., War Party Cave, Pemmican Cave) are now documented BCH localities, which were not previously known prior to management by the WCCF (Van Kampen-Lewis and White 2020a). The number of caves under some form of protection represents approximately half of all known occupied localities of the species as recognized by the Service (see Petition [Attachment A:2]; SWCA 2017a).

ii. Balcones Canyonlands Conservation Plan

The BCCP is an HCP approved by the Service in 1996 and supporting an ESA section 10 incidental take permit ("ITP"), Permit No. 78841 (Regional Environmental Consultants [RECON] and Service 1996). The BCCP authorizes take of eight ESA-listed species, including

⁹ Of the 100 protected or managed BCH localities, at least nine also contain other ESA-listed species and would continue to retain ESA-centric protection even if the BCH were delisted. These nine localities include every currently approved karst fauna area. Additionally, even if the BCH were delisted, many of these caves would continue to be protected due to the fact that conservation easements or other encumbrances have been permanently adopted.

¹⁰ BCH has not yet been confirmed in Bat Well Cave; however, it is very likely the species exists in that cave due to its proximity to other confirmed BCH localities and when considering the local rock strata.

the BCH. The BCCP is administered jointly by the City of Austin, Texas, and Travis County, Texas.

Under the terms of the BCCP, the City of Austin and Travis County committed to preserving 35 caves or cave clusters containing ESA-listed species, 19 of which were to be protected for the benefit of the BCH (RECON and Service 1996:3–44). The BCCP also calls for protection of an additional 27 caves that host karst invertebrate “species of concern” identified in the plan. Protection of 19 BCH-occupied features under the BCCP would have resulted in protection for 86% of the species’ total known localities within Travis County at the time the BCCP was approved (RECON and Service 1996). In exchange for this preservation, development of the remainder of the County covered by the BCCP may move forward, so long as the development complies with all applicable rules and regulations. Developers within the City of Austin and Travis County participate in the BCCP by paying fees and agreeing to a set of measures aimed at minimizing the impact of any take of listed species—including BCH—that may occur in connection with development activities. According to the most recent BCCP annual report, 50 of the 62 karst features identified by the BCCP for protection have been preserved in some way (Travis County and City of Austin 2020), including 16 caves containing BCH.

Preservation pursuant to the BCCP alone includes 21.6 square miles (13% of BCH range) of preserved land protected in perpetuity (SWCA 2017b). This includes habitat with demonstrated occupancy and areas over karst zones 1 and 2, which the Service has on many occasions indicated are highly likely to contain listed karst invertebrates.

iii. Summary of the RHCP and BCCP

Appendix A to the Petition (see Attachment A) contains a thorough description of caves that were protected and/or managed for the benefit of the BCH at the time of the Petition and includes detail about the degree of protection, as well as the ownership and management given to each cave. Since the Petition was submitted, and as noted above, six new BCH locations have been preserved, for a total of 100 as of the date of this comment letter. The County urges the Service to review carefully Appendix A to the Petition as well as the literature cited in this comment letter that has been published since 2014. The totality of current, on-the-ground conservation alone for the BCH justifies immediate delisting of the species.

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

There is no commercial or scientific information suggesting Listing Factor B is a significant threat to the BCH and the Service has not previously indicated such a threat exists.

V. Listing Factor C: Disease or Predation

Although the Service has previously identified Listing Factor C and, specifically, ill effects to the BCH caused by red imported fire ants (*Solenopsis invicta*) (“RIFA”), as potentially posing a significant threat to the species (Service 2018a, 2018b), recent data indicate that threats to the BCH from nonnative species such as RIFA and tawny crazy ants (*Nylanderia fulva*) are, in fact, not as severe as has been previously postulated by the Service and others (SWCA 2017c).

The RIFA is an aggressive generalist forager recognized nationally and internationally as an invasive species and a pest (Tschinkel 2006). In the past, the Service has assumed that native fauna are threatened by RIFA and, specifically, the agency has identified RIFA as a significant predator within karst ecosystems (Service 1994).

SWCA (2017c), however, provides a review of the best available science of the effects of RIFA on karst invertebrates endemic to Central Texas and presents many studies showing evidence of surface arthropod resiliency to RIFA invasion. SWCA (2017c) documents the disconnect between RIFA foraging and previously perceived effects to the BCH, including the fact that there have been no reported accounts of BCH consumption by RIFA. While some have posited that RIFA may forage or scavenge within caves (see, e.g., Elliott [1993]), others have noted that “RIFA foraging in the entrance and twilight zones resulted in relatively little interaction with cave-limited species” (Taylor et al. [2003:3]). To the extent BCH are dependent upon cave crickets, which is debatable, multiple sources point to the fact that there is little evidence to suggest RIFA has significant effects on nutrient deposition in caves mediated by cave crickets. For example, Taylor et al. (2007) indicate RIFA and cave crickets do not overlap (compete) in food chains, Morrison et al. (2002) indicated RIFA may not pose a long-term threat to native arthropods, and SWCA (2017a) indicates there is scant evidence to suggest cave cricket abundance is significantly reduced by the presence of RIFA.

Put simply, the best scientific and commercial information indicates at a minimum that there exists substantial doubt about whether RIFA, in fact, pose a threat to BCH that would rise to the level of threatening the species with extinction now or in the foreseeable future. Instead, the best scientific and commercial information suggests that RIFA do not pose a threat to BCH under Listing Factor C that would justify continued listing of the species under the ESA.¹¹

VI. Listing Factor D: The Inadequacy of Existing Regulatory Mechanisms

The Service previously has indicated the lack of adequate existing regulatory mechanisms represents a continued threat to the BCH (Service 2009; 2018b; 2019b). However, there are a number of significant regulatory mechanisms in place that protect karst invertebrate habitat, including specifically habitat for the BCH. The Petition provided significant detail concerning regulatory mechanisms adopted by the City of Georgetown, the City of Austin, and

¹¹ The County also acknowledges the Service’s recent hypothesis that the tawny crazy ant may be a threat to the BCH (Service 2018b). However the literature does not extensively document tawny crazy ant presence within caves or within the karst ecosystems. A limited study conducted by LeBrun (2017) in several Travis County caves indicated neither a localized nor widespread threat to the BCH, documented only limited foraging within caves, and noted the complete disappearance of tawny crazy ant presence from a study cave for unknown reasons.

the Texas Commission on Environmental Quality (“TCEQ”), among others. These city and state regulations and ordinances were adopted specifically to protect the quality of water entering the Edwards Aquifer. By their very nature, these rules and ordinances protect associated karst features by reducing or avoiding impacts to these features that would potentially result from development activities. The jurisdictional coverage of the regulations and ordinances put in place by the cities of Georgetown and Austin alone encompass approximately 115 square miles or 78% of the known range of the BCH. Likewise, TCEQ rules addressing water quality over the Edwards Aquifer cover a vast majority of the species’ range. Below, the County provides a brief overview of these protections. Additional information may be found in the Petition.

a. *Existing preserves benefitting BCH*

The Petition noted that as of 2014, there were 94 BCH-occupied caves under some form of protection from land development. As described above, there are now 100 protected caves spread across the species’ range which representing one-half of all known BCH localities.

b. *City of Georgetown Water Quality Ordinance and Water Quality Management Plan*

In 2015, the City of Georgetown adopted Water Quality Regulations for Property located Over the Edwards Aquifer Recharge Zone (Ord. No. 2015-13§ 3 [Exh. A]) (“Water Quality Ordinance”). The City’s Water Quality Ordinance protects water quality within the City and its extra-territorial jurisdiction and provides substantial benefits to the federally listed Georgetown salamander (*Eurycea naufragia*) and its habitat and tangential benefits to the BCH.¹² Among the requirements of the Water Quality Ordinance are setbacks from streams and springs with flow potentially to the Edwards Aquifer.

In 2013, the City also adopted a Water Quality Management Plan for all areas within the Edwards Aquifer Recharge Zone (“EARZ”) (found at: <https://planning.georgetown.org/water-quality-regulations/>). The purpose of the Water Quality Management Plan was to establish and implement best management practices, including construction-site stormwater runoff control and pollution prevention, over the EARZ.¹³ Under the City’s Water Quality Management Plan, the City implements public education, illicit discharge detection and elimination, construction site stormwater runoff control, post-construction stormwater management in new developments and re-developments, and pollution prevention for municipal operations. Taken together, these measures benefit BCH by preventing harmful materials from reaching BCH habitat and cover more than 10,000 acres of the species’ known range.

c. *City of Austin Regulations*

The City of Austin has adopted several regulatory mechanisms benefitting the BCH, including those relating to water quality, recharge, and karst features. City of Austin regulations benefitting

¹² In addition to the Water Quality Ordinance, the City’s Unified Development Code contains a set of voluntary measures the regulated community may implement for the benefit of the Georgetown salamander. These re

¹³ In 2014, TCEQ adopted rules requiring the City of Georgetown (and others) to submit stormwater implementation plans describing how BMPs and other control measures implemented by the City would reduce pollutants into the City’s stormwater to the maximum extent practicable. TCEQ’s required stormwater implementation plan has been incorporated in and serve as the City’s water quality management plan.

the BCH cover approximately 67% of the species' range (Petition at 25). For example, section 1.3.0 of the City of Austin Environmental Criteria Manual ("ECM") and related guidance typically require a 150- to 300-foot radius setback around caves, sinkholes, and recharge features. The ECM also includes best management practices required to be implemented within the City of Austin (e.g., work stoppage where certain types of voids are discovered during construction, completion of geologic assessment). In 2008, the City of Austin adopted the Void and Water Flow Mitigation Rule (ECM Section 1.12.0), which requires an inspection of construction sites to identify sensitive features prior to any backfilling and requires certain measures be implemented if a void is discovered during construction. Stated purposes of the Void and Water Flow Mitigation Rule include preserving hydrologic function, maintaining recharge paths to springs, creeks, and wells, isolating karst features from potential contaminants, maintaining the structural integrity of voids, and protecting the Edwards Aquifer. Additional information on the ECM, Void and Water Flow Mitigation Rule, and other City of Austin regulations is provided in the Petition and within the rules themselves.

d. *Texas Commission on Environmental Quality Regulations*

As described in detail in the Petition, the stated purpose of TCEQ's Edwards Aquifer Rules is to protect the existing quality of groundwater, "consistent with . . . the propagation and protection of terrestrial and aquatic life" and for "protection of the environment," among other things (30 Tex. Admin. Code § 213.1(1)). The Edwards Aquifer Rules include measures to reduce threats relating to urbanization and construction activities, pollution over the karst zone from pesticides and other chemicals, and protection from modification of surface habitats. Although not adopted specifically for the benefit of the BCH, because the surface-connected caves and mesocavernous spaces that provide habitat for BCH are also considered significant recharge features to the Edwards Aquifer, the conservation measures required by the Edwards Aquifer Rules also directly benefit BCH. Additional and significant detail may be found in the Petition.

e. *ESA*

A number of caves presently known to be occupied by BCH that are currently under some form of protection would continue to be protected even if the BCH were delisted due to the presence of other federally listed karst invertebrates in those locations. Table 3 of the Petition provides additional detail concerning these caves and the protection afforded thereto.

f. *Summary of Listing Factor D*

Nearly all of the BCH range is afforded protection via regulations, ordinances, and permanent preservation separate and apart from ESA regulations associated with federally listed species. Taken together, the information presented above and in the Petition provides substantial evidence to indicate that the BCH is not threatened with extinction—now or in the foreseeable future—throughout all or a significant portion of its range due to the inadequacy of existing regulatory mechanisms.

VII. Listing Factor E: Other Natural or Manmade Factors Affecting the Species' Continued Existence

In the past, the Service has identified threats to BCH based on human visitation and vandalism of species-occupied caves and the potential impacts of climate change as factors weighing in favor of listing the BCH or maintaining its endangered status. The best available scientific and commercial information, however, indicates that cave visitation, vandalism, and climate change do not represent threats to the species under Listing Factor E.

a. Human visitation and vandalism

The Service has in the past viewed human visitation and vandalism as posing a threat to the species (Service 1988). The Service's theory appears to assume that individual BCH could be trampled by humans and that such trampling, cumulatively, would severely impact the persistence of the BCH and the other listed karst species. The Service noted at the time of listing that the species is "extremely vulnerable to losses because of their severely limited range and habitat and because of the naturally limited ability to colonize new habitats" (Service 1988:38032). The Service also believed at the time of listing that the BCH (and other listed troglobites) were confined to shallow caves that were "isolated islands of the Edwards Limestone that were separated from one another" (Service 1988:36030). However, as mentioned above, the best scientific and commercial data available today demonstrate continued BCH occurrence and persistence in caves accessible to and visited by humans (e.g., Inner Space Caverns). Studies simply have not shown that BCH populations are threatened by vandalism or human visitation. Indeed, the County was unable to find published data indicating one or more BCH localities had been extirpated or seen a local population decline as a result of human vandalism or visitation since the time of listing. This is likely the case given the species is thought to inhabit a three-dimensional karst matrix of mesocavernous voids (Service 2018a) across an estimated 166-square mile range (SWCA 2017a). Accordingly, threats to the BCH as a result of human visitation and vandalism of caves under Listing Factor E do not pose a threat that warrants the species' maintenance on the list of endangered species.

b. Climate change

The Service has presented an equivocal stance on whether and to what extent climate change poses a threat to the BCH, and even where climate change has been raised as a potential threat to the BCH, the agency has never indicated that any such threat would occur with reasonable certainty. For example, climate change was mentioned as a possible threat by the Service for the first time in 2009 (Service 2009). At that time, the agency stated that while they believed it "reasonable to assume" that BCH may be affected by climate change, the Service also acknowledged it "lack[ed] sufficient certainty to know *how* climate change will affect the species" (Service 2009:18) (emphasis added). In 2018, the Service cited two studies standing for the premise that "longer dry periods are anticipated in the Great Plains and American Southwest with resultant decreases in soil moisture" (Service 2018a, citing Seager et al. 2013 and Cook et

al. 2015).¹⁴ The Service then stated that “[t]he dependence of troglobitic arachnids on stable temperatures and humidity . . . suggest[s] the Bone Cave harvestman may be affected by changing climactic conditions” (Service 2018a). The Service concluded that “[i]f surface temperatures increase and the area experiences [a] longer dry period and reduced soil moisture, this could increase in-cave temperatures and reduce humidity which *may* affect the Bone Cave harvestman” (Service 2018a) (emphasis added).

More recent research on climate change (Wang et al. 2015) predicts increased temperatures will result in increased precipitation, not decreased precipitation as indicated by the Service (2018a). Wang et al. (2015) investigated intense flooding in Texas and Oklahoma associated with an unusually strong El Nino Southern Oscillation (“ENSO”) event during May 2015. They investigated ENSO-related precipitation anomalies in the southern United States using precipitation regression from 1940–2014 and found a significantly stronger precipitation signal over central Texas through that period, with a distinctly stronger precipitation signal from 1980–2014. ENSO warming in the tropical Pacific helps to deepen the stationary trough west of Texas, which enhances southerly winds from the Gulf of Mexico flowing northward, increasing moisture for above-average precipitation. Wang et al. (2015) conclude that anthropogenic warming contributed to the processes that dramatically elevated precipitation during May 2015 in Texas and Oklahoma. Wang et al. (2015) also link a warming climate to increased ENSO-related precipitation since 1940. Wang et al. (2015) predict similar future precipitation outcomes for climate projections from 2010–2050, including above-average spring precipitation during ENSO events.

Feng et al. (2016) examined long-term satellite, surface radar, and rain-gauge network data across the central United States from 1979–2014. They document increased springtime mesoscale convective system (“MCS”) activity in the Northern and Southern Great Plains during this period. These springtime MCSs are essentially thunderstorms and have increased in frequency and intensity during this period and show a very distinct trend of overall increased precipitation across the Great Plains and Midwestern United States. Feng et al. (2016) documented more intense and more frequent longer-lasting MCSs within the central United States as the climate has warmed and believe this overall trend will intensify.

Maupin et al. (2020) also note that MCSs in the Southern Great Plains have increased in intensity and frequency, but that more data are required to resolve uncertainty in global climate models as MCSs cause uncertainty in climate prediction. Maupin et al. (2020) add vital datapoints to resolve MCS-driven uncertainty in Southern Great Plains climate predictions by utilizing oxygen isotope ratio variations deposited in Williamson County stalactites dated to 30,000–50,000 years ago in order to recreate climactic conditions in Central Texas during this period. Maupin et al.

¹⁴ The County acknowledges the Seager et al. explain that decreases in soil moisture will “only be a few percent” and reiterate that “[a]nnual average mean and median soil moisture also decreases in all three regions with the largest and most certain drop in Texas but by less than 5%” (Seager et al. 2013:482, 485). However, the County notes that Seager et al. (2013) appeared to be largely concerned with surface water availability as it relates to agriculture, which, as demonstrated above, is not a requirement of BCH continued persistence and survival. Cook et al. (2015) do not include application specifically to Texas, but speak in generalities with respect to the Central Plains and Southwest regions of the United States.

(2020) document dramatic climate shifts during the last glacial period, with significant precipitation increases during warmer periods through this timeframe as MCS activity intensifies. Their climate reconstructions show that a hotter Texas is a wetter Texas. The historical climate reconstruction used data from the karst system in Williamson County and is directly representative of climatological conditions that have occurred during BCH evolution.

The research discussed above indicates that climate change in the Southern Great Plains of Texas will include increased temperatures and precipitation into the foreseeable future. Given positive correlations between BCH counts and precipitation as discussed above (Cambrian 2017; Van Kampen-Lewis and White 2020a), the best available scientific data indicate climate change likely does not pose a substantial threat to the species now warranting continued listing. Furthermore, it is unlikely that climate change will rise to the magnitude or severity in the coming years such that the species will become endangered within the foreseeable future.

Even without evidence that precipitation will increase as a result of climate change, the County points out that the BCH nevertheless would be able to persist despite any ill effects of climate change. During its previous reviews of the Petition, the Service disagreed with evidence presented by the Petition that effects to the BCH in connection with climate change may be mitigated via the species' use of mesocaverns (Service 2015, 2017). In 2017, the Service stated, "[w]e acknowledge that mesocaverns may provide some protection from fluctuations in temperature and humidity that may be induced by climate change. However, the presence of mesocaverns alone will likely not be sufficient to ameliorate all of the effects that climate change may pose to this species" (Service 2017:12).

In the 2017 Finding, the Service postulates that all potential ramifications from climate change—including increased temperatures, more severe storms, and/or more severe drought, flooding, or caves becoming drier—may directly or indirectly adversely affect the BCH. However, even if one ignores the recent climate change modeling and studies cited immediately above, none of the potential effects of climate change identified by the Service in its 2017 Finding translate to specific identifiable consequences to the BCH that will occur with reasonable certainty. That the Service is uncertain as to the impacts of climate change on the BCH and the role of mesocaverns is evident in the 2018 SSA and 2018 5-year review of the BCH (Service 2018a, 2018b). The 2018 SSA notes that "[n]etworks of interconnected mesocavernous voids are important, if not the preferred, habitat for many karst invertebrates" (Service 2018a) and the 2018 5-year Status Review of the BCH gives no indication that climate change poses an actual threat (rather than a mere stressor) to the species (Service 2018b). Without reasonable certainty that the threats discussed by the Service will result in measurable impacts to BCH in the foreseeable future, those threats cannot be used as a premise that the BCH is in danger of extinction. Any effects of climate change specifically in relation to the BCH are speculative, unforeseeable, and uncertain in their likelihood of occurrence and do not meet the standard for the species' listing under the ESA.

VIII. Delisting the BCH is Warranted Even Where Recovery Plan Goals Have Not Been Met

The Service first published a recovery plan for the BCH and six other karst invertebrate species endemic to Travis and Williamson Counties, Texas in 1994 (Service 1994) and adopted updates to that plan in 2019 (Service 2019b) (collectively, the 1994 and 2019 recovery plans addressing the BCH are referred to as the “Recovery Plan”). The Recovery Plan provides both downlisting and delisting criteria based on the preservation of a certain number and quality of karst fauna areas (“KFAs”)¹⁵ within identified karst fauna regions (“KFRs”)¹⁶ (Service 2019b).

Meeting the criteria for delisting or downlisting set forth in a species recovery plan prepared pursuant to ESA section 4(f) is not a requirement for the Service to remove the species from the list of threatened or endangered species. Numerous courts have held that although ESA section 4(f) requires the Service to prepare species recovery plans, such plans serve as guidance for the agency and do not carry the force of law in an agency’s determination as to whether or not a listed species should be delisted (*see Friends of Blackwater v. Salazar*, 691 F.3d 428, 434 [D.C. Cir. 2012; *Fund for Animals, Inc. v. Rice*, 85 F.3d 535, 547 [11th Cir. 1996]; *Conservation Congress v. Finley*, 774 F.3d 611, 614 [9th Cir. 2014]; *Friends of Animals v. U.S. Fish and Wildlife Service*, Case No. 6:14-cv-01449 [2015 WL 4429147, at *5] [D. Ore., July 16, 2015]), *appeal docketed* No. 15-35639 [9th Cir. August 7, 2015]). Notably, in *Friends of Blackwater*, the Service itself argued successfully in the D.C. Circuit Court that the “criteria in the [r]ecovery [p]lan, unlike the factors in 4(a)(1) of the [ESA], are not binding upon the agency in deciding whether a species is no longer endangered and therefore should be delisted” (691 F.3d 428, 432). And in the preamble to the Revised Regulations, the Service justified its removal of recovery as a basis for delisting by stating, “we are removing the word ‘recovery’ from this section . . . because recovered species would no longer meet the definition of either an ‘endangered species’ or a ‘threatened species’” (Federal Register 84:45,035).

While the delisting criteria set forth in the Recovery Plan are intended to establish benchmarks for when the status of the BCH is secure and self-sustaining, the criteria are neither tractable, attainable, nor appropriate given the limited understanding of the BCH’s biology, habitat needs, and available habitat. Much of the underpinnings supporting the design and use of KFAs is based on limited research of cave cricket conservation (as cited in Service 2012) and the metric(s) to link attributes of a KFA with the status of the BCH is unclear.

¹⁵ KFAs are geographic areas known to support one or more locations of an endangered species and act as distinct preserve systems separated from other KFAs by geologic and hydrologic features and/or processes or distances creating barriers to movement of water, contaminants, and troglobitic fauna (Service 2012).

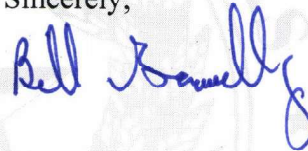
¹⁶ KFRs are geographic areas delineated based on the “discontinuity of karst habitat that may reduce or limit interaction between troglobite populations” (Service 2012).

IX. Conclusion

As set forth above, the data are clear that, when one applies the Listing Factors established by ESA implementing regulations, the BCH does not meet the definition of an endangered or threatened species under the ESA.

Threats previously identified by the Service as justified listing or continued listing of the BCH have not proven, over time, to result in the kind of consequences to the species as was originally predicted and certainly do not justify continued listing of the species. State and local regulatory mechanisms in place across the species' range reduce or ameliorate a great number of previously perceived threats even where such regulatory mechanisms were not adopted specifically for the benefit of the BCH. As a result of local planning and coordination with the Service, robust conservation is in place for the species across its entire range. Since the species listing, the number of caves known to be occupied by the BCH has increased more than 30-fold, and approximately 100 known locations are under some form of protection. In short, it is clear when applying the Listing Factors that the BCH does not meet the definition of a threatened or endangered species under the ESA. For this reason, the County urges the Service to find that delisting the species is warranted and to promptly publish a proposed rule to delist the Bone Cave harvestman.

Sincerely,



Bill Gravell