Memorandum

To:	Scott Storment, EAHCP Program Manager
From:	Lucas Bare, David Zippin, PhD, ICF Ed Oborny, BIO-WEST
Date:	April 26, 2023
Re:	**Evaluation of Covered Species for the Amended EAHCP**

Introduction

The purpose of this memorandum is to evaluate the list of proposed Covered Species for the anticipated amendment to the Edwards Aquifer Habitat Conservation Plan (EAHCP) and Incidental Take Permit (ITP) as part of what is more broadly called the EAHCP permit renewal. The term "Covered Species" as used in this memorandum includes those species for which the EAHCP Permittees would request authorization for incidental take and develop a conservation strategy with avoidance, minimization, and/or mitigation measures. We have focused this Covered Species assessment on the list of species (Attachment 1) provided by the U.S. Fish and Wildlife Service (USFWS) following in-person meetings on December 14, 2022 and January 18, 2023.

As the permit renewal process moves forward, we will use the Covered Species list to 1) continue to compile and update background data and species accounts, 2) evaluate incidental take for Covered Species with respect to Covered Activities, and 3) develop and/or update conservation strategies as necessary or warranted. This memorandum has been organized such that it can be incorporated into the amended EAHCP document and/or its appendices, as appropriate.

The EAHCP permit renewal is a multi-year and iterative planning process. The anticipated timeline for submitting the draft amended EAHCP and incidental take permit amendment application to the USFWS is the end of 2025. Throughout the planning process to identify changes to the EAHCP, components of the plan may need to be re-examined should circumstances change (e.g., identification of new scientific data or changes in regulatory status of species). As such, this memo serves as a check point to identify changes to Covered Species to carry forward in the permit renewal, but the Covered Species list will need to be evaluated throughout the planning process. Any proposed changes to the Covered Species list will be documented through additional technical memoranda or draft EAHCP chapters and reviewed by EAHCP stakeholders, USFWS, and Permittees.

EAHCP Covered Species Background

This section provides an overview of the historical context and original process for the establishment of the existing EAHCP Covered Species. During the development of the EAHCP, the Edwards Aquifer Recovery Implementation Program (EARIP) formed a Covered Species work group charged with determining whether covering additional species, beyond the Federally listed endangered and threatened spring-associated species, was warranted. The specific criteria used for evaluation included the likelihood of listing during the permit term; effect of the Covered Activities on the species; status of knowledge about these species (in relation to meeting permit issuance criteria regarding the link between the Covered Activities and take); and potential problems with implementation. The Covered Species work group recommended 11 Covered Species, all of which were included in the EAHCP; see Table 1, reproduced from Table 1-3 from the EAHCP (EARIP 2012). Of these 11 species, eight were listed at the time. The remaining three species were not listed at the time but were under USFWS evaluation and thus had the potential to become listed during the 15-year permit term. None of those three unlisted species have been listed to date nor are they proposed for listing. A listing petition for the Comal Springs salamander was withdrawn in 2020, so this species is no longer petitioned. The only regulatory status change since the original EAHCP is the San Marcos gambusia. That species was proposed by USFWS in 2021 for delisting with the designation of presumed extinct. We expected that delisting to be finalized and take effect in 2023.

Table 1. Species Covered by the EAHCP

Common Name	Scientific Name	ESA Status at the time of EAHCP Approval
Fountain darter	*Etheostoma fonticola*	Endangered
Comal Springs riffle beetle	*Heterelmis comalensis*	Endangered
San Marcos gambusia	*Gambusia georgei*	Endangered
Comal Springs dryopid beetle	*Stygoparnus comalensis*	Endangered
Peck's cave amphipod	*Stygobromus pecki*	Endangered
Texas wild-rice	*Zizania texana*	Endangered
Texas blind salamander	*Eurycea* [formerly *Typhlomolge*] *rathbuni*	Endangered
San Marcos salamander	*Eurycea nana*	Threatened
Edwards Aquifer diving beetle	*Haideoporus texanus*	Petitioned
Comal Springs salamander	*Eurycea* sp.	Petitioned
Texas troglobitic water slater	*Lirceolus smithii*	Petitioned

Source: Reproduced from Table 1-3 in the EAHCP (EARIP 2012).

The EARIP and Covered Species work group had extensive discussions on the possibility of seeking coverage for one other listed species, whooping crane (*Grus americana*), and a number of other petitioned aquifer and freshwater mussel species that had received positive 90-day findings in 2009. A detailed account of work group proceedings and findings is presented in EAHCP Section 1.4 (EARIP 2012). In summary, the EARIP Covered Species work group began with a potential list of 34 rare species and narrowed the list on the basis that they had been petitioned for listing and USFWS's determination that listing "may be warranted," thus indicating a greater likelihood of listing during the permit term. It was concluded that the proposed Covered Activities had the potential to most

dramatically affect spring dwelling species, those that occur at the "top" of the Aquifer where spring levels fluctuate. As such, only the three surface species petitioned (Table 1) and known to inhabit these spring ecosystems were included in the EAHCP. The deep aquifer dwelling species (blind catfish) or species that did not overlap geographically with the Covered Activities were excluded from consideration.

Additionally, the work group considered downstream freshwater mussel species and whooping crane. It was concluded that seeking coverage for downstream species was not warranted because there was no evidence of take of these species from EAHCP Covered Activities. The minimization and mitigation measures developed for the EAHCP Covered Activities were specifically designed to enhance stability in the flows emerging from the spring systems at Comal and San Marcos Springs during extended periods of drought. The EARIP expected that the EAHCP would provide a net benefit to habitat conditions for the downstream species via this flow stability during extreme drought.

Methods for Evaluating Covered Species

This section includes a description of the methods used to evaluate Covered Species for the Permit Renewal followed by an evaluation of species and recommendations for coverage and/or further evaluation.

Methods

The methods employed to select Covered Species for the permit renewal follow the guidance provided in Chapter 7 of the joint USFWS and National Marine Fisheries Service (NMFS) "Habitat Conservation Planning and Incidental Take Permit (ITP) Processing Handbook" (HCP Handbook) (USFWS and NMFS 2016) and the specific evaluation criteria outlined in the next section.

Evaluation Criteria

Each species presented in Attachment 1 provided by USFWS Austin Ecological Services was considered for coverage and initially screened based on "Activities That Impact Taxa or Their Habitat." These activities were evaluated in the context of EAHCP Covered Activities, and the overall list (Attachment 1) was narrowed down for further consideration. The continued evaluation adhered to the following criteria to determine if a particular species should be recommended for coverage under the amended EAHCP. In general, species meeting all four of these criteria are recommended for coverage and species not meeting one or more criteria are not recommended for coverage at this time.

- **Range.** Is the species known to occur or expected to occur within the Plan Area based on best available data and professional expertise? If not currently known or expected to occur, is it expected to move into the Plan Area during the permit term?
- **Listing status.** Is the species currently listed as threatened or endangered? If not, considering its status and threats to the species, is it likely that the species will be listed during the permit term?

- **Impact.** Will the species or its habitat be affected by Covered Activities at a level that is reasonably likely to result in take?
- **Species data.** Is there sufficient scientific data on the species life history, habitat requirements, and occurrence in the Plan Area to allow for adequate evaluation of impacts on the species and the development of Conservation Measures to mitigate those impacts?

Evaluation and Recommendations

Table 2 presents the refined species list for consideration, including species name, whether it is currently covered in the EAHCP, whether it meets each of the Covered Species criteria, and finally, whether it is recommended for coverage or further evaluation under the amended EAHCP.

Species Recommended for Coverage

As outlined in Table 2, nine species are recommended for coverage in the amended EAHCP at this time, which include 1 fish, 3 aquatic beetles, 1 amphipod, 1 isopod, 2 salamanders, and 1 plant:

1. Fountain darter *Etheostoma fonticola*
2. Comal Springs riffle beetle *Heterelmis comalensis*
3. Comal Springs dryopid beetle *Stygoparnus comalensis*
4. Peck's cave amphipod *Stygobromis pecki*
5. Texas blind salamander *Eurycea rathbuni*
6. San Marcos salamander *Eurycea nana*
7. Texas wild-rice *Zizania texana*
8. Edwards Aquifer diving beetle *Haideoporus texanus*
9. Texas troglobitic water slater *Lirceolis smithii*

Seven of the eight federally listed species presently covered under the EAHCP (EARIP 2012) continue to meet all four evaluation criteria. The San Marcos gambusia is not recommended for coverage because USFWS has concluded in a proposed rule based on the best scientific data available that this species is extinct (Federal Register; 86 FR 54298). We expect this determination to stand and be finalized later this year.

Although the Edwards Aquifer diving beetle and Texas troglobitic water slater are not federally listed, they provide unique situations as discussed herein. Since the inception of drift net sampling over spring orifices, which has been conducted bi-annually since 2003 first by the Edwards Aquifer Authority and then since 2013 as part of the EAHCP's biological monitoring program, approximately 30 individual Edwards Aquifer diving beetles have been collected from Comal Springs. They are typically collected in drift nets during wet periods with subsequent high springflow output. They have also been collected in the Texas State University artesian well, but in limited numbers. To date, the Texas troglobitic water slater has only been confirmed in San Marcos at the Texas State University artesian well, Diversion Springs, and Outfall Well using drift nets (Coleman et al. 2018). Although numerous *Lirceolus* spp. individuals have been collected in the Comal Springs drift net

sampling, by the time they expel from the aquifer they arrive in the nets in fragments. The only way to identify *L. smithii* from the other *Lirceolus* species is by dissecting mouth parts, which is extremely difficult when whole body specimens are not available. Based on available evidence, *L. smithii* may be found in the Edwards Aquifer below Comal Springs, although its occurrence has not yet been confirmed.

At this time, it is recommended that the Edwards Aquifer diving beetle and Texas troglobitic water slater continue to be included as Covered Species in the amended HCP. Both aquifer-dwelling species have been documented in either the immediate springs area at Comal Springs, San Marcos Springs, and likely both. Both species are currently under review and their federal listing status may change during the development of this permit renewal or during the renewed permit term. The potential for take associated with these aquifer species relative to Covered Activities is low based on the Coleman et al. (2018) conclusion that *L. smithii* is assumed to live in deep artesian portions of the Edwards Aquifer which is extensive and buffered from short-term effects of drought or declines in aquifer levels. However, both *L. smithii* and *H. texanus* could be sensitive and susceptible to harm by increased concentrations of regulated or unregulated anthropogenic contaminants. Although limited information is available for these species, existing EAHCP conservation measures targeted at protecting water quality over the aquifer are anticipated to suffice as mitigation for any minimal impact associated with Covered Activities.

Impacts to listed plants are not considered "take" under Section 9 of the ESA, so the USFWS cannot authorize incidental take of plants. However, the USFWS cannot issue a permit that would jeopardize the continued existence or adversely modify the designated critical habitat of any listed species, including plants, so covering Texas wild-rice in the amended EAHCP remains prudent.

Data Gaps

Of the nine recommended species, important data gaps related to evaluating the Comal Springs riffle beetle and four aquifer-dwelling species remain for the amended EAHCP. To start addressing these data gaps, the EAHCP has funded a multi-year, Comal Springs riffle beetle population assessment that will be conducted in 2023 and 2024. Additionally, the EAHCP refugia applied research program has in 2023 embarked on a multi-year, Comal Springs dryopid beetle life history study at the USFWS San Marcos Aquatic Research Center. A basic understanding of the life history of this aquifer-dwelling species is a prerequisite to additional field or population assessments. Furthermore, additional understanding of subsurface habitat use of the Comal Springs riffle beetle, and additional life history studies for the aquifer-dwelling invertebrates may be warranted. Although data gaps are acknowledged for these species, we do not believe this should preclude these five invertebrates from being included in the amended EAHCP.

Table 2. Species Evaluated, Recommended and/or Requires Further Evaluation for Coverage

Species			Criteria[a]				Recommended For Coverage in Permit Renewal
Common Name	Scientific Name	Covered under EAHCP	Range / Habitat	Listing Status[b]	Take from Covered Activities	Data	
EARIP (2012) Covered Species							
Fountain darter	*Etheostoma fonticola*	Yes	Comal and San Marcos Springs / River Ecosystems	E	Yes	Yes	Yes
Comal Spring riffle beetle	*Heterelmis comalensis*	Yes	Comal and San Marcos Springs	E	Yes	Yes, with known data gaps	Yes
Comal Springs dryopid beetle	*Stygoparnus comalensis*	Yes	Comal and San Marcos Springs	E	Yes	Yes, with known data gaps	Yes
Peck's cave amphipod	*Stygobromis pecki*	Yes	Comal Springs and Edwards Aquifer	E	Yes	Yes, with known data gaps	Yes
Texas blind salamander	*Eurycea rathbuni*	Yes	San Marcos Springs and Edwards Aquifer	E	Yes	Yes	Yes
Texas wild-rice	*Zizania texana*	Yes	San Marcos River	E	Yes	Yes	Yes
San Marcos salamander	*Eurycea nana*	Yes	San Marcos Springs / River Ecosystems	T	Yes	Yes	Yes
San Marcos gambusia	*Gambusia georgei*	Yes	Presumed extinct	Proposed for delisting	Presumed extinct	Last documented occurrence in Plan Area in 1983	No
Comal Springs salamander (now grouped with Fern Bank salamander)	*Eurycea sp. (Eurycea pterophila)*	Yes	Comal Springs and Edwards Plateau	Pet. W (NL)	Yes	Yes	No
Edwards Aquifer diving beetle	*Haideoporus texanus*	Yes	Comal and San Marcos Springs and Edwards Aquifer	Pet. / UR	Yes	Yes, with known data gaps	Yes
Texas troglobitic water slater	*Lirceolis smithii*	Yes	San Marcos Springs and Edwards Aquifer	Pet. / UR	Yes	Yes, with known data gaps	Yes
Bexar County Deep Aquifer species							
Toothless blindcat	*Trogloglanis pattersoni*	No	Bexar County Deep Aquifer	Pet. / UR	Yes	No	Undetermined
Widemouth blindcat	*Satan eurystomus*	No	Bexar County Deep Aquifer	Pet. / UR	Yes	No	Undetermined
Mimic cavesnail	*Phreatodrobia imitata*	No	Bexar County Deep Aquifer	Pet. / UR	Yes	No	Undetermined

Species			Criteria[a]				Recommended For Coverage in Permit Renewal
Common Name	**Scientific Name**	**Covered under EAHCP**	**Range / Habitat**	**Listing Status[b]**	**Take from Covered Activities**	**Data**	
Edwards Plateau salamanders							
Texas salamander	*Eurycea neotenes*	No	Edwards Plateau Streams / springs	Pet. / UR	No	Yes	No
Cascade Caverns salamander (former Comal blind salamander)	*Eurycea latitans*	No	Edwards Plateau Streams / springs	Pet. / UR	Yes	Yes, with known data gaps	No
Blanco blind salamander	*Eurycea robusta*	No	Presumed extinct or another species	NL	Presumed extinct or another species	One specimen	No
Barton Springs segment salamanders							
Austin blind salamander	*Eurycea waterlooensis*	No	Barton Springs Segment of the Edwards Aquifer	E	Under evaluation	Yes	Undetermined
Barton Springs salamander	*Eurycea sosorum*	No	Barton Springs Segment of the Edwards Aquifer	E	Under evaluation	Yes	Undetermined
Terrestrial plants							
Bracted twistflower	*Streptanthus bracteatus*	No	Uvalde, Medina and Bexar Counties	T	No	Yes	No
Riverine or Coastal species							
False spike	*Fusconaia mitchelli*	No	Guadalupe River	PE	Under evaluation	Yes	Undetermined
Guadalupe fatmucket	*Lampsilis bergmanni*	No	Upper Guadalupe River	PE	Under evaluation	Yes	Undetermined
Guadalupe orb	*Cyclonaias necki*	No	San Marcos and Guadalupe Rivers	PE	Under evaluation	Yes	Undetermined
Whooping crane	*Grus americanus*	No	Texas Gulf Coast	E	No	Yes	No

[a] **Criteria**

Range: The species is known to occur or is likely to occur within the Plan Area.

Listing Status: The species is either:

- Listed under the federal ESA as threatened or endangered, or proposed for listing;
- Expected to be listed under the ESA within the permit term.

Impact: The species or its habitat would be adversely affected by Covered Activities that may result in take of the species.

Data: Sufficient data exist on the species' life history, habitat requirements, and occurrence in the study area to adequately evaluate impacts on the species and to develop conservation measures to mitigate these impacts to levels specified by regulatory standards.

[b] **Listing Status**

E = federally listed as endangered
T = federally listed as threatened
PE = proposed endangered
Pet. / UR = petitioned for federal listing / currently under review
Pet. W = petition withdrawn
NL = Not Listed

Recommendations to Remove Covered Species

There are two Covered Species in the current EAHCP not recommended for continued coverage under this amendment (Table 2). As previously mentioned, the San Marcos gambusia is not recommended for coverage because USFWS has concluded that this species is extinct (Federal Register; 86 FR 54298) resulting in the USFWS delisting proposal on September 30, 2021.

The Comal Springs salamander is not recommended for continued coverage because of a very low likelihood of listing in the future due to a change in taxonomic status. Additionally, the petition to list the Comal Springs salamander was withdrawn by the petitioners (WildEarth Guardians) in 2020 based on new genetic data. Work from Devitt et al. (2019) determined the Comal Springs salamander to be genetically identical to the Fern Bank salamander (*Eurycea pterophila*) which has no federal status. Therefore, Fern Bank salamander appears to be genetically similar to other relatively common Texas Hill Country salamanders.

Species Requiring Further Evaluation

For eight species listed in Table 2, a recommendation for coverage cannot be made at this time and more evaluation is needed. These species include Bexar County deep aquifer species, Barton Springs Segment of the Edwards Aquifer salamanders, and riverine species.

The status of all three Bexar County deep aquifer species are under review by USFWS, and the agency anticipates a 12-month finding for the toothless blindcat and widemouth blindcat in 2023 to determine whether listing is warranted, listing is warranted but precluded, or listing is not warranted. Should listing be deemed warranted for these aquifer species, further evaluation will be needed to determine if there is sufficient scientific data on the species life history to allow for adequate evaluation of impacts and the development of conservation measures to mitigate for those impacts.

The Barton Springs salamander and Austin blind salamander have not been documented from the San Antonio (or Southern) segment of Edwards Aquifer (BSEACD 2018). However, both salamander species are federally listed as endangered and flow path investigations have documented that during extreme drought, the potential exists for some portion of groundwater to flow past San Marcos Springs toward Barton Springs (Land et Al. 2011). In particular, the Blanco River may contribute to the Barton Springs segment of the Edwards Aquifer during drought (Hunt et al. 2019). It is important to highlight that both salamander species are covered under the Barton Springs / Edwards Aquifer Conservation District Habitat Conservation Plan (BSEACD 2018). Regardless, further investigation of these potential hydrologic interactions need to occur prior to making a formal recommendation on covering these species.

USFWS identified six freshwater mussel species potential affected by Covered Activities (Attachment 1). The Texas fatmucket (occurring in the Colorado River basin), Texas fawnsfoot (occurring in the Colorado River, Brazos River, and Trinity River basins), and the Texas pimpleback (occurring in the Colorado River basin) do not occur within the Plan Area. The Guadalupe orb, the false spike, and the Guadalupe fatmucket were proposed to be listed as endangered under the ESA on August 26, 2021 (USFWS 2021) and a final rule to list these species is expected in 2023. These three freshwater mussel species located in the Guadalupe River basin within the EAHCP Plan Area are currently state

listed as threatened (TPWD 2022). The Guadalupe orb is considered endemic to the Guadalupe River drainage in two separate and isolated populations (USFWS 2021). Recent phylogenetic research indicates the false spike is restricted to the lower Guadalupe River drainage (Smith et al. 2021). The Guadalupe fatmucket is believed to only occur in the Guadalupe River drainage within the Edwards Plateau (above the Balcones fault line) (Inoue et al. 2020). Given the likelihood that USFWS will list these riverine species, further evaluation is needed to determine if they will be affected by Covered Activities at a level that is reasonably likely to result in take and if there is sufficient data for the development of Conservation Measures for these species.

Species Evaluated but not Recommended for Coverage

An additional five species were considered (Table 2) but are not recommended for coverage in the amended HCP at this time. These species include several Edwards plateau salamanders a terrestrial plant and a coastal bird.

The USFWS is currently working on a Species Status Assessment (SSA) for the petitioned Texas salamander and Cascade Caverns salamander. Early results from tissue analysis suggest that the Texas, Cascade Caverns, and Fern Bank salamanders are all genetically similar. If these early results prove accurate, federal listing of these Texas Hill Country salamanders would be unlikely. These species have a low likelihood of being federally listed, are not documented in the immediate Comal and San Marcos Springs systems; and have limited to no potential for take from Covered Activities. However, should listing be proposed for either of these species, a further evaluation of potential impacts specific to Covered Activities may be warranted.

In March 2022, USFWS announced that the Blanco blind salamander did not warrant listing (Federal Register; 87 FR 14227). We do not recommend covering this species because the USFWS has concluded that the one record for this species in the EAHCP Plan Area was either misidentified or this species is extinct.

On April 11, 2023, the final rule for the bracted twistflower as a threatened species was published (Federal Register; 88 FR 21844). This terrestrial plant is found within the EAHCP Plan Area in Uvalde, Medina and Bexar Counties. However, based on activities that impact the bracted twistflower, (Attachment 1) there is no indication that any Covered Activities would result adverse effects to the species, so we do not recommend it for inclusion as a Covered Species at this time. If there is potential for adverse effects to occur to this species from Covered Activities, avoidance and minimization measures for the species could be included in the amended EAHCP.

The whooping crane is not recommended for coverage as it occurs outside of the Plan Area, and it cannot be determined that the Covered Activities affect this species at a level that is reasonably likely to result in take. Although the USFWS notes that reduction in freshwater inflows to habitat are an impact to this species (Attachment 1), it is not possible given best available data and information to attribute a certain amount of take of this migratory coastal avian species due to the pumping of the Edwards Aquifer that is covered under the EAHCP.

Recommendations to Add Covered Species

Following the HCP Handbook guidance, evaluation criteria, and assessment of projected Covered Activities, there are presently no new species recommended for coverage in the amended HCP.

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Attachment 1

U.S. Fish and Wildlife Service Species List

***Note**: The U.S. Fish and Wildlife identified the species in the table below as those potentially affected by the EAHCP's Covered Activities. Best available scientific data and information about these species will be identified throughout the permit renewal process to determine if they should be included as EAHCP Covered Species.*

Species	Status	Activities that Impact Taxa or their Habitat
Birds		
Golden-Cheeked Warbler (*Setophega chrysoparia*)	Endangered	• Habitat removal, degradation, or fragmentation • Construction: heavy machine work within or within 300' of habitat during the breeding season, understory thinning in habitat, introduction of new (increase predators) or "hard" (buildings) edge
Whooping Crane (*Grus americana*)	Endangered	• Reduction of freshwater inflows to habitat. Upstream reservoir construction, water diversions for agriculture, and human use reduce freshwater inflows. Groundwater withdrawals may also reduce freshwater inflows. • Collision with utility lines, wind turbines, or fences during migration. • Noise and activity disturbances during the wintering season that could temporarily displace WHCR from preferred feeding or resting sites, limiting their ability to obtain food resources. • Unintended chemical (e.g., oil) releases in or around WHCR habitat, including contaminants associated with runoff from agricultural and industrial activities.
Piping Plover (*Charadrius melodus*)	Threatened	• In this area, only wind related projects within migratory route and wind energy projects
Red Knot (*Calidris canutus rufa*)	Threatened	• In this area, only wind related projects within migratory route and wind energy projects

Species	Status	Activities that Impact Taxa or their Habitat
Springs and Aquifer Species		
Southern Edwards Aquifer Listed Species: • San Marcos Salamander (*Eurycea nana*) • Texas Blind Salamander (*E. rathbuni*) • Fountain Darter (*Etheostoma fonticola*) • Peck's Cave Amphipod (*Stygobromus pecki*) • Comal Springs Riffle Beetle (*Heterelmis comalensis*) • Comal Springs Dryopid Beetle (*Stygoparnus comalensis*) • Texas Wild-Rice (*Zizania texana*) • San Marcos Gambusia (*Gambusia georgei*)	Threatened, Endangered	• Any in-stream and adjacent bank work in the Comal and San Marcos rivers • Any activities near Fern Bank Spring or Hueco Springs • Water drawdown • Decreases in water quality, including due to development • Sedimentation • Floods that scour surface habitat • Vegetation removal, including riparian for some species • Nonnative species • Habitat disturbance including recreation • Alteration of stream morphology • Subsurface species that are pumped out of groundwater wells in areas that they occur • Catastrophic spills, including chemical spills and treated and untreated water
Under Review Species: • Edwards Aquifer diving beetle (*Haideoporus texanus*) • Texas troglobitic water slater (*Lirceolus smithii*)	Under Review	• Individuals that are pumped out of groundwater wells in areas that they occur • Water drawdown • Decreases in water quality, including due to development and storm water runoff • Catastrophic spills, including chemical spills and treated and untreated water
Bexar County Deep Aquifer Species: • Widemouth Blindcat (*Satan eurystomus*) • Toothless Blindcat (*Trogloglanis pattersoni*) • Mimic Cavesnail (*Phreatodrobia imitata*)	Under Review	• Individuals that are pumped out of groundwater wells in areas that they occur • Water drawdown and pollution • Oil and gas wells may be a threat
Barton Spring Segment Salamanders: • Austin Blind Salamander (*E. waterlooensis*) • Barton Springs Salamander (*E. sosorum*)	Endangered	• Any in-stream and adjacent bank work near spring habitat Water drawdown • Decreases in water quality, including due to development and storm water runoff • Sedimentation • Floods that scour surface habitat • Vegetation removal, including riparian for some species • Nonnative species • Habitat disturbance including recreation

Species	Status	Activities that Impact Taxa or their Habitat
		• Alteration of stream morphology • Individuals that are pumped out of groundwater wells in areas that they occur (this may be rare) • Catastrophic spills, including chemical spills and treated and untreated water
Cascade Caverns Salamander (*Eurycea latitans*) & Texas Salamander (*Eurycea neotenes*)	Under Review	• Any in-stream and adjacent bank work near spring habitat • Water drawdown • Decreases in water quality, including due to development and storm water runoff • Sedimentation • Floods that scour surface habitat • Vegetation removal, including riparian for some species • Nonnative species • Habitat disturbance including recreation • Alteration of stream morphology • Individuals that are pumped out of groundwater wells in areas that they occur (this may be rare) • Catastrophic spills, including chemical spills and treated and untreated water
Devil's River Minnow (*Dionda diaboli*)	Threatened	• Habitat loss • Reduction of water quality and contamination due to adjacent urban setting • Catastrophic spills • Reduction of water to habitat, through aquifer and/or surface withdrawals • Introduction of nonnative species • Industrial and agricultural development for populations in Mexico
Freshwater Mussels		
Central Texas Mussels: • Guadalupe Fatmucket (*Lampsilis bergmanni*) • Texas Fatmucket (*Lampsilis bracteata*) • Texas Fawnsfoot (*Truncilla macrodon*) • Guadalupe Orb (*Cyclonaias necki*) • Texas Pimpleback (*Cyclonaias petrina*) • False Spike (*Fusconaia mitchelli*)	Proposed and Under Review	• Increased fine sediment • Changes in water quality • Altered hydrology in the form of inundation • Altered hydrology in the form of loss of flow and scour of substrate • Predation and collection • Barriers to fish movement

Species	Status	Activities that Impact Taxa or their Habitat
Reptiles		
Plateau Spot-Tailed Earless Lizard (*Holbrookia lacerata*)	Under Review	• Disturbances that increase fire ant prevalence • Urbanization and roads • Invasive species (mostly red imported fire ants and exotic grasses) • Conversion of grasslands to agriculture and other uses
Terrestrial Invertebrates		
Bexar County Karst Invertebrates: • Government Canyon Bat Cave Meshweaver (*Cicurina vespera*) • Government Canyon Bat Cave Spider (*Tayshaneta microps*) • Cokendolpher Cave Harvestman (*Texella cokendolpheri*) • Madla Cave Meshweaver (*C. madla*) • Robber Baron Cave Meshweaver (*C. baronia*) • [no common name] Beetle (*Rhadine exilis*) • [no common name] Beetle (*R. infernalis*) • Helotes Mold Beetle (*Batrisodes venyivi*)	Endangered	• Subsurface disturbances associated with construction activities or other development in karst habitat. Potential effects can include crushing or injuring individuals; and/or altering or destroying caves or mesocaverns. • Surface alterations that affect the surface hydrology (e.g., parking lots, roads, buildings, or other impervious covers) and alter the surface runoff regime within in karst habitat. • Alteration of shrub/canopy around Cave entrance and footprint, if known - Vegetation removal that may impact temperature regimes and/or runoff into cave entrance. • Chemical releases, other hazardous materials, or illegal dumping in karst habitat.
American Bumble Bee (*Bombus pennsylvanicus*) & Variable Cuckoo Bumble Bee *(Bombus variabilis*)	Under Review	• Habitat destruction especially from agriculture, livestock grazing • Pesticide use • Competition from non-native bees
Monarch Butterfly (*Danaus plexippus*)	Candidate	• Pesticide and insecticide use • Conversion of grasslands to agriculture • Urban development • Loss of milkweed and nectar resources
Mammals		
Tricolored Bat (*Perimyotis subfalvus*)	Endangered	• Wind energy • Spread of white-nose syndrome (e.g., from interaction with bat habitat or bats) • Loss of suitable roosting and foraging habitat, such as forest removal or conversion • Disturbance of winter locations for hibernation

Species	Status	Activities that Impact Taxa or their Habitat
Terrestrial Plants		
Black Lace Cactus (*Echinocereus reichenbachii* var. *albertii*)	Endangered	• Competition from introduced invasive grasses • Clearing of native vegetation • Use of herbicides for brush control • Collection • Activities that disturb habitat and increase prevalence of red imported fire ants • Pesticides that affect pollinators • Trampling by livestock and feral hogs
Tobusch Fishhook Cactus (*Sclerocactus brevihamatus* ssp. *tobuschii*)	Threatened	• Infestations by insect larvae have caused catastrophic population declines • Juniper encroachment • Feral hogs • Collection
Bracted Twistflower (Streptanthus bracteatus)	Threatened	• Primary threat to habitats & survival: urban and residential development • Herbivory from over-abundant ungulate herds, • Decreased wildfire frequency (BRTF is likely a fire-dependent spp.) • Increased juniper density • Demographic and genetic effects of small population sizes • Habitat deterioration from recreational activities • Powdery mildew infections
Big Red Sage (*Salvia penstemonoides*)	Under Review	• Aquifer drawdown/lowering of the water table • Commercial uses • Flooding • Herbicides • Erosion • Habitat disturbance