United States Department of the Interior

FISH AND WILDLIFE SERVICE
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Memorandum

To: Regional Director, Region 2, Albuquerque, New Mexico

Through: Assistant Regional Director, Ecological Services, Region 2, Albuquerque, New Mexico

From: Field Supervisor, Austin Ecological Services Field Office, Austin, Texas

Subject: Biological and Conference Opinion for LCRA's Transmission Services Corporation's Habitat Conservation Plan – Permit TE-42299D (Consultation No. 02ETAU-2019-F-0402)

Enclosed is the U.S. Fish and Wildlife Service's (Service) biological and conference opinion for the proposed section 10(a)(1)(B) incidental take permit for LCRA's Transmission Services Corporation's (TSC, Applicant) Habitat Conservation Plan (HCP) to minimize and mitigate adverse effects to 22 listed and 1 unlisted species.

The basis for this biological and conference opinion comes from LCRA TSC's HCP and the accompanying Environmental Impact Statement pursuant to the National Environmental Policy Act of 1969, Service files, discussions with species experts, published and un-published literature available on the species and related impacts, and other sources of information available to the Service. A complete administrative record of this consultation is available at the Austin Ecological Service Field Office.

We appreciate your staff's assistance with this consultation. If you have any questions regarding this biological and conference opinion, please contact Christina Williams at 512-490-0057, extension 235.

Attachment

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Biological and Conference Opinion

This biological and conference opinion addresses the issuance of a U.S. Fish and Wildlife Service (Service) section 10(a)(1)(B) incidental take permit (Permit or ITP) to LCRA's Transmission Services Corporation (TSC, Applicant) for their programmatic Habitat Conservation Plan (HCP). The LCRA TSC HCP, which is incorporated by reference, will minimize and mitigate, to the maximum extent practicable, adverse effects from activities affecting the federally endangered golden-cheeked warbler (*Setophaga* [=*Dendroica*] *chrysoparia*), whooping crane (*Grus americana*), red-cockaded woodpecker (*Picoides borealis*), ocelot (*Leopardus pardalis*), Houston toad (*Anaxyrus* [=*Bufo*] *houstonensis*), Barton Springs salamander (*Eurycea sosorum*), Comal Springs riffle beetle (*Heterelmis comalensis*), Peck's cave amphipod (*Stygobromus pecki*), Bee Creek Cave harvestman (*Texella reddelli*), Tooth Cave spider (*Tayshaneta* [=*Neoleptoneta*] *myopica*), Tooth Cave ground beetle (*Rhadine persephone*), Madla Cave meshweaver (*Cicurina madla*), Government Canyon Bat Cave spider (*Tayshaneta* [=*Neoleptoneta*] *microps*), Helotes mold beetle (*Batrisodes venyivi*), and two ground beetles with no common names (*Rhadine exilis* and *Rhadine infernalis*); and federally threatened piping plover (*Charadrius melodus*), rufa red knot (*Calidris canutus rufa*), Jollyville Plateau salamander (*Eurycea tonkawae*), Salado Springs salamander (*Eurycea chisholmensis*), San Marcos salamander (*Eurycea nana*), and Georgetown salamander (*Eurycea naufragia*), pursuant to the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq., ESA). We are conferencing on the spot-tailed earless lizard (*Holbrookia lacerata*), a species which is petitioned for listing. Take authorization will only become effective if this species is listed. Collectively the 22 listed and 1 unlisted species are the "Covered Species." The issuance of a Service permit to authorize incidental take associated with the HCP is the proposed action for this intra-Service consultation pursuant to section 7 of the ESA.

In addition to the 23 Covered Species, we reviewed 93 endangered, threatened, and candidate species that may occur in the action area. We used the best scientific and commercial data available including information provided by the Applicant (analysis detailed in Appendix B and G of the HCP) and other sources of information available to us. We determined that the Covered Activities will not affect 31 species, thus we do not consider them further in this biological and conference opinion. Sixty-four species may be affected, but are not likely to be adversely affected. We describe the details of these determinations below. Finally, 23 species may be affected, and are likely to be adversely affected by the proposed action and we have analyzed the effects of the proposed action on these species in this biological and conference opinion. The Service's administrative file for this consultation contains documentation of each species' habitat, range and distribution notes, a brief description of what activities could affect each species, and the minimization measures to avoid adverse impacts to these species.

Seven of the species (listed below) that are not affected by the proposed action may be affected by future LCRA TSC projects, and those future projects may otherwise be covered by the LCRA TSC HCP. Three programmatic HCPs cover these species, and LCRA TSC is eligible to use them for their activities. Therefore, LCRA TSC has agreed to use them, if needed, for incidental take authorization. Accordingly, we have completed our biological opinions on these activities for these seven species at the time of each permit issuance. These HCPs are the Williamson County Regional HCP (Williamson RHCP, TE11840), Balcones Canyonlands HCP (BCCP,

TE788841), and Southern Edwards Plateau HCP (SEP, TE48571B). The seven species are: Bone Cave harvestman (*Texella reyesi*), Cokendolpher Cave harvestman (*Texella cokendolpheri*), Dragonfly Cave mold beetle (*Batrisodes cryptotexanus*), Government Canyon Bat Cave meshweaver (*Cicurina vespera*), Inner Space Cavern mold beetle (*Batrisodes texanus*), Kretchmarr Cave mold beetle (*Texamaurops reddelli*), and Tooth Cave pseudoscorpion (*Tartarocreagris texasna*).

While section 9 of the ESA does not prohibit incidental take of plants, it does have certain prohibitions specific to plants, including that the Service cannot issue a permit that would jeopardize the continued existence of any listed species, or adversely affect designated critical habitat (Service and National Marine Fisheries Service [NMFS] 2016).

Plants that Covered Activities may affect, but are not likely to adversely affect:

Scientific Name	**Common Name**	**Listing Status**
Echinocereus reichenbachii var *albertii*	black lace cactus	Endangered
Abronia macrocarpa	large-fruited sand verbena	Endangered
Spiranthes parksii	Navasota ladies'-tresses	Endangered
*Hibiscus dasycalyx**	Neches River rose-mallow	Threatened
Hoffmannseggia tenella	slender rush-pea	Endangered
Ambrosia cheiranthifolia	South Texas ambrosia	Endangered
Astrophytum asterias	star cactus	Endangered
Ayenia limitaris	Texas ayenia	Endangered
*Leavenworthia texana**	Texas golden gladecress	Endangered
Callirhoe scabriuscula	Texas poppy-mallow	Endangered
Hymenoxys texana	Texas prairie dawn-flower	Endangered
Styrax texanus	Texas snowbells	Endangered
Phlox nivalis ssp. *Texensis*	Texas trailing phlox	Endangered
Sclerocactus brevihamatus ssp. *tobuschii*	Tobusch fishhook cactus	Endangered
Manihot walkerae	Walker's manioc	Endangered
Physaria (*Lesquerella*) pallida	white bladderpod	Endangered

*Species with designated critical habitat.

It is our biological opinion that these 16 terrestrial plants may be affected by the proposed action, but are not likely to be adversely affected. LCRA TSC adopted the Service's recommendations and proposes species specific avoidance and minimization measures they would implement when Covered Activities could overlap with one or more of these plant species (detailed in 6.4.1.11 of the HCP). These include, but are not limited to, avoiding surface disturbance within 50 feet of any documented locality, mowing during non-flowering season, setting mow heights taller than the plant, marking off known populations for avoidance, and moving plants if in an unavoidable location. Additionally, during the required annual meeting to discuss all upcoming projects, we will have the opportunity to review those projects that may affect these plants. We will inform LCRA TSC of known locations, or if there is a likelihood their project will impact plants, providing the opportunity to adjust the project to avoid adversely affecting the species or their designated critical habitat. With the combination of the Service recommended species specific avoidance and minimization measures (HCP Chapter 6.4.4.11) and the annual meetings (HCP Chapter 8.2), the Service has determined that the Covered Activities may affect, but are not likely to adversely affect these 16 plants or their designated critical habitat.

Four endangered, fully aquatic species use the subterranean passages of the Edwards Aquifer and are largely disconnected from the surface. They are the Austin blind salamander (*Eurycea waterlooensis*), Texas blind salamander (*Typhlomolge* [*syn. Eurycea*] *rathbuni*), Mexican blindcat (*Prietella phreatophila*), and Comal Springs dryopid beetle (*Stygoparnus comalensis*). For those species with designated critical habitat, it is all subterranean. LCRA TSC believes they may affect, but will not adversely affect these species or their designated critical habitat, since the Covered Activities do not involve deep subsurface excavation, extensive additions of impervious cover to the surface, or require withdrawal of groundwater. Therefore, we determined that the Covered Activities may affect, but will not adversely affect the deep aquifer species or their designated critical habitat.

We have determined that the 15 terrestrial species in the table below may be affected, but are not likely to be adversely affected for the reasons provided.

Scientific Name	**Common Name**	**Explanation**	**Listing Status**
Thymophylla tephroleuca	ashy dogweed	Grows in south Texas brush, which will only minimally be cleared for access and pad sites, since vegetation is mostly shruby. Turning soil may actually benefit the species.	Endangered
Haliaeetus leucocephalus	bald eagle	LCRA TSC will mark rivers where eagles may feed and will consider measures to minimize collision and electrocution risk and to discourage nesting on towers.	Delisted
Sterna antillarum athalassos	Interior least tern	The species occurs on gravel and sand bars along rivers, and is not likely to overlap with Covered Activities.	Endangered
Falco femoralis septentrionalis	Northern aplomado falcon	The species is not likely to overlap with Covered Activities.	Endangered
Empidonax traillii extimus	Southwestern willow flycatcher	The species is in west Texas and in riparian areas likely to be avoided and spanned by Covered Activities.	Endangered
Leptonycteris nivalis	Mexican long-nosed bat	Species occurs in largely remote areas, but forage long distances. LCRA TSC will minimize removal of agave plants.	Threatened
Cicurina venii	Braken Bat Cave meshweaver*	This is no longer a valid taxon.	Endangered
Cicurina baronia	Robber Baron Cave meshweaver*	LCRA TSC is not authorized for incidental take of this species in Bexar County and the range is restricted to an area not likely to overlap with Covered Activities.	Endangered
Streptanthus bracteatus	Bracted twistflower	Occurs on rocky hillsides where Covered Activities are unlikely.	Candidate
Coryphantha ramillosa	Bunched Cory cactus	Limited in distribution, unlikely to overlap with Covered Activities.	Threatened
Echinocereus chisoensis var chisoensis	Chisos Mountains hedgehog cactus	Limited in distribution, unlikely to overlap with Covered Activities.	Threatened
Quercus hinckleyi	Hinckley's oak	Limited in distribution, unlikely to overlap with Covered Activities.	Threatened
Sclerocactus mariposensis	Lloyd's mariposa cactus	Limited in distribution, unlikely to overlap with Covered Activities.	Threatened

Trillium texanum	Texas trillium	Occurs in and adjacent to forested wetlands, likely to be avoided by Covered Activities.	Candidate
Physaria (*Lesquerella*) *thamnophila*	Zapata bladderpod*	Limited in distribution, unlikely to overlap with Covered Activities.	Endangered

*Designated critical habitat in Plan Area.

LCRA TSC can, in most cases, plan Covered Activities to avoid direct modification of freshwater surface habitats, such as rivers, streams, lakes, ponds, and wetlands. Therefore, we determined that the Covered Activities may affect, but will not adversely affect the following 27 aquatic and marshland species or their designated critical habitat.

Scientific Name	Common Name	Listing Status
Arkansia wheeleri	Ouachita rock pocketbook	Endangered
*Assiminea pecos**	Pecos assiminea snail	Endangered
*Cyprinodon bovinus**	Leon Springs pupfish	Endangered
Cyprinodon elegans	Comanche Springs pupfish	Endangered
*Dionda diabolic**	Devils River minnow	Threatened
*Etheostoma fonticola**	fountain darter	Endangered
Gambusia gaigei	Big Bend gambusia	Endangered
Gambusia heterochir	Clear Creek gambusia	Endangered
Gambusia nobilis	Pecos gambusia	Endangered
*Gammarus hyalelloides**	diminutive amphipod	Endangered
*Gammarus pecos**	Pecos amphipod	Endangered
Lampsilis bracteata	Texas fatmucket	Candidate
*Notropis buccula**	smalleye shiner	Endangered
Notropis girardi	Arkansas River shiner	Threatened
*Notropis oxyrhynchus**	sharpnose shiner	Endangered
Popenaias popeii	Texas hornshell	Endangered
Potamogeton clystocarpus	Little Aguja pondweed	Endangered
Pseudotryonia adamantina	Diamond tryonia	Endangered
*Pyrgulopsis texana**	Phantom springsnail	Endangered
Quadrula aurea	golden orb	Candidate
Quadrula houstonensis	smooth pimpleback	Candidate
Quadrula petrina	Texas pimpleback	Candidate
Scaphirhynchus platorynchus	shovelnose sturgeon	Threatened
Truncilla macrodon	Texas fawnsfoot	Candidate
*Tryonia cheatumi**	Phantom tryonia	Endangered
*Tryonia circumstriata**	Gonzales tryonia	Endangered
*Zizania texana**	Texas wild-rice	Endangered

*Designated critical habitat in Plan Area.

I. Consultation History

The Applicant submitted their HCP and application for an incidental take permit in April 2018. After multiple revisions to the HCP, we published a notice of availability of the permit application, availability of the HCP, and a draft Environmental Impact Statement (EIS) in the *Federal Register* on April 29, 2019 (84 FR 18075).

II. Proposed Action

The proposed federal action is for the Service to issue an ITP to the Applicant for otherwise lawful activities conducted within the 241 Texas counties (see Figure 1 of the HCP, Plan Area). Activities covered by the HCP include: construction, operation, upgrade, decommissioning, repair and maintenance of electrical transmission lines, substations, access roads, and related infrastructure and facilities and includes both surface and subsurface disturbances. LCRA TSC activities are classified as: 1) new construction; 2) upgrading and decommissioning; 3) operations and maintenance; and 4) emergency. For example, new construction typically involves the construction of new structures and the acquisition of new rights-of-way (ROW), whereas the other activities typically involve existing structures and ROWs on previously modified lands. LCRA TSC typically plans for new construction and upgrading and decommissioning well in advance, whereas operations and maintenance and emergency responses may occur on a routine or an "as-needed" basis (Covered Activities; detailed in Chapter 4 of the HCP). The LCRA TSC HCP establishes a conservation program that minimizes and mitigates, to the maximum extent practicable, the adverse effects of authorized take of the Covered Species including general avoidance and minimization measures and species specific conservation measures.

There are certain minimization measures that LCRA TSC has committed to do for all Covered Activities (detailed in Chapter 6 of the HCP). These include: 1) meeting annually with the Service to discuss upcoming LCRA TSC activities, updated distribution or occurrence information for Covered Species, opportunities for mitigation, and other concerns; 2) providing annual training to LCRA TSC staff and contractors working on Covered Activities regarding the implementation of the HCP; 3) clearing or managing vegetation within ROWs using aboveground means when practicable; 4) marking those sections of transmission lines that cross major rivers and may therefore be preferentially used as movement corridors by certain avian species; 5) limiting herbicide applications to woody vegetation that is a potential threat to the reliability of LCRA TSC facilities and observing the Service's Southwest Region's guidance for pesticide applications (Service 2007); 6) to the extent practicable, considering reasonable landowner preferences, using seed mixes composed solely of seeds of native plant species; 7) restoring preconstruction contours and revegetating construction sites and any other places where soil is disturbed within ROWs; 8) avoiding causing subsurface disturbances to wetlands, riparian areas, and aquatic habitats; 9) using erosion and sedimentation controls as required by the Texas Commission on Environmental Quality or local ordinances to address storm water discharges during construction; and 10) avoiding making subsurface disturbances within 50 feet of: a) the entrance or footprint (if known) of a karst feature known or assumed to be occupied by one or more of the karst invertebrates, or b) a spring outlet or associated spring run or lake or, where applicable, a well with known or assumed occupancy by one or more of the aquatic Covered Species. This biological and conference opinion summarizes these minimization and mitigation measures throughout. Where there are discrepancies, the Permit and then the HCP shall supersede any inconsistencies herein.

Section 7(a)(2) of the ESA's implementing regulations defines an action area to be all areas affected directly or indirectly by the federal action and not merely the immediate area affected by the proposed project (50 CFR § 402.02). Because the Plan Area includes 241 of the 254 counties

in Texas, and data presented for such a large area is typically at the state level, for the purposes of this biological and conference opinion, the action area is the State of Texas.

III. Status of the Species and Status of Critical Habitat

This section evaluates the range-wide condition of each species, the factors responsible for that condition, the survival and recovery needs, and the status of any designated critical habitat.

Critical habitat definitions previously defined Primary Constituent Elements (PCEs) as those specific elements of the physical and biological features that provide for a species' life history processes and are essential to the conservation of the species (50 CFR 424.12(b)). The new critical habitat regulations (81 FR 7414) discontinue use of the PCE term or reference to essential habitat features and rely exclusively on use of the term "physical or biological features" (PBFs) for that purpose. To be consistent with that shift in terminology and in recognition that the terms PBFs, PCEs, and essential habit features are synonymous in meaning, we are only referring to PBFs herein.

A. Golden-Cheeked Warbler

We emergency listed the golden-cheeked warbler (GCWA) as endangered on May 4, 1990 (55 FR 18844). We published the final rule listing the species on December 27, 1990 (55 FR 53160). There is no critical habitat designated for this species.

The GCWA winters in mountainous regions of Chiapas, Mexico, and Guatemala, Honduras, El Salvador, and Nicaragua (Ridgeway 1902, Oberholser 1974, Pulich 1976, Perrigo and Booher 1994, Rappole *et al*. 1999, Komar 2008). On the wintering grounds, GCWAs prefer foraging in deciduous trees in pine-oak forests (Thompson 1995, Rappole 1996). The GCWA migrates from Mexico and Central America and nests from March to August (Kroll 1974, Oberholser 1974, Pulich 1976) in mixed Ashe juniper/deciduous woodlands in approximately 35 counties across the Edwards Plateau, Lampasas Cut-Plain, and Llano Uplift regions of central Texas.

A comprehensive survey of GCWAs throughout their range does not exist, but various estimates of acres of habitat in the breeding range have been made. Morrison *et al*.'s (2010) habitat model estimated 4.4 million acres range-wide. The most recent habitat model estimates 3.9 million acres of potential habitat in the breeding range, and determined there was a 29 percent loss of habitat between 1999-2000 and 2010-2011 (Duarte *et al*. 2013).

Several estimates of population numbers have been made in the last 10 years. Groce *et al.* (2010) summarized surveys completed between 2005 and 2009 across the range and estimated there were at least 8,700 GCWAs. Mathewson *et al.* (2012) modeled range-wide GCWA habitat and estimated there could be as many as 263,330 males. However, independent peer review of this population model raises concerns with overestimation (The Wildlife Society 2011). Partners in Flight (2019) estimated the GCWA breeding population to be 110,000 individuals, based on data from seven routes in the North American Breeding Bird Survey, as described by Stanton *et al.* (2019).

According to the GCWA Recovery Plan (Service 1992), the breeding range has been divided into eight recovery regions, all of which occur in the action area. Groce *et al*. (2010) found no evidence to indicate that the amount of GCWA breeding habitat is increasing or stable due to continued loss and fragmentation from human development, shifts in land use, and construction of roads and utility transmission corridors. Because projected increases in human population will continue within the breeding range of the species, these threats are likely to intensify. A variety of public and private lands currently receive some level of protection from future land development activities, and some of these are managed as natural areas or wildlife preserves focusing on the protection and management of the GCWA.

The primary recovery criterion is protection of sufficient habitat to support 3,000 breeding pairs in each of the eight recovery regions (Service 1992). Groce *et al.* (2010) estimated the amount of GCWA habitat on state and federally owned lands, they include 77,198 acres of Department of Defense (DOD) lands (Fort Hood, Camp Bullis, and U.S. Army Corps Engineers); 39,428 acres on Texas Parks and Wildlife Department (TPWD) lands; 2,844 acres on LCRA properties; and 14,789 acres on the Balcones Canyonlands National Wildlife Refuge (NWR). Cities, counties, conservation organizations, and others, including several Service approved conservation banks for GCWAs, own an additional 50,000 acres across the breeding range. These properties will protect an additional 15,000 acres upon sale of all conservation credits. Progress is being made towards achieving the recovery criteria; however, as of 2014, none had been achieved (Service 2014a). Changes in the GCWA's distribution, abundance, and threats have occurred since publication of the recovery plan in 1992 (Service 2014a). Therefore, the criteria identified in the 1992 recovery plan do not adequately address all of the threats to the species nor do they reflect the current needs of the species based on the best available science.

We incorporate by reference the Golden-cheeked Warbler Recovery Plan (Service 1992) and 5-Year Review (Service 2014a). Additional information on this species' life history, range, migration, habitat, threats, recovery needs, and status can be found at the Service's endangered species page: https://ecos.fws.gov/.

B. Whooping crane

We listed the whooping crane (*Grus americana*) as endangered on June 2, 1970 (35 FR 8491). We designated critical habitat for the species on May 15, 1978, in seven states: Colorado, Idaho, Kansas, Nebraska, New Mexico, Oklahoma, and Texas (43 FR 20938). Then, on July 21, 1997, we removed designation of critical habitat from Colorado, Idaho, and New Mexico (62 FR 38931).

Whooping cranes currently occur only within Canada and the United States. There is only one self-sustaining wild population of approximately 505 individuals that nests in the Northwest Territories and adjacent areas of Alberta, Canada, primarily within the boundary of Wood Buffalo National Park (WBNP) (Johns 1998, Service 2018a). Current nesting areas are poorly drained wetlands interspersed with numerous potholes that vary considerably in size, shape, and depth (Timoney *et al*. 1997). Bulrush (*Scirpus validus*) is the dominant emergent in the potholes used for nesting, although cattail (*Typha* sp.), sedge (*Carex aquatilis*), musk-grass (*Chara* sp.), and other aquatic plants are common (Allen 1956; Novakowski 1965 and 1966; Kuyt 1976a,

1976b, and 1981). Whooping cranes migrate south through North and South Dakota, Nebraska, Kansas, and Oklahoma (Central Flyway) starting in September reaching the wintering grounds in Texas late October to mid-November. Whooping cranes stop throughout the Central Flyway where there is sufficient migratory stopover habitat available (Canadian Wildlife Service [CWS] and Service 2007). Most whooping cranes winter along the Gulf of Mexico coast at the Aransas NWR and adjacent estuarine marshes, shallow bays, and tidal flats (Allen 1952, Blankinship 1976). Whooping cranes migrate northward from late March to early May (CWS and Service 2007).

The primary threat to whooping cranes is human activity. This includes past and continued conversion of wetlands to agricultural production, urbanization, water diversion, and reductions in river flows (De Fraiture and Berndes 2009, Service 2012). According to the Whooping Crane Recovery Plan (CWS and Service 2007), recovery criteria include establishing two additional self-sustaining wild populations, or increasing the existing self-sustaining population to at least 1,000 individuals. To date the establishment of second and third wild self-sustaining populations has not been successful. Therefore, expanding the Aransas NWR population to 1,000 individuals is the most promising strategy for downlisting the whooping crane to "threatened" (Service 2012). The Service has not established delisting criteria because considerable time is needed to reach downlisting goals (CWS and Service 2007).

We designated critical habitat in four states: in Kansas on Quivira NWR and Cheyenne Bottoms State Waterfowl Management Area, in Nebraska within the Platte River bottoms within a three mile buffer from U.S. Highway 283 to the Buffalo-Hall county line, in Oklahoma within the Salt Plains NWR, and in Texas on the Aransas NWR and several surrounding parcels. Because the majority of the designated critical habitat is on state or federal land, or conservation organizations are managing specifically for the whooping crane (for example, along the Platte River), the designated critical habitat is currently stable or improving. However, there is concern that future climate change may inundate coastal areas or otherwise impact currently designated critical habitat (Service 2017). The critical habitat rule did not specifically describe PBFs, but we generally describe them as (43 FR 20938):

- Undisturbed wetlands, tidal flats, and marshes; and
- Open expanses for nightly roosting, typically on sand and gravel bars on rivers and lakes.

We incorporate by reference the Whooping Crane 5-Year Review (Service 2012) and Recovery Plan (CWS and Service 2007). Additional information on this species' life history, range, migration, habitat, threats, recovery needs, and status can be found at the Service's endangered species page: https://ecos.fws.gov/.

C. Red-cockaded woodpecker

We listed the red-cockaded woodpecker (*Picoides borealis*, RCW) as endangered on June 2, 1970 (35 FR 16047), and it received federal protection with the passage of the ESA in 1973. There is no critical habitat designated for this species.

The RCW inhabits open, park-like stands of pine forests in 11 southeastern states, with a known preference for older (>60 years) pines (DeLotelle and Epting 1988). Primary threats to species viability for RCWs are caused by a lack of suitable habitat. Serious threats stemming from the lack of suitable habitat include: 1) insufficient numbers of cavities and continuing net loss of cavity trees; 2) habitat fragmentation and its effects on genetic variation, dispersal, and demography; and 3) lack of foraging habitat of adequate quality (Service 2006a).

Currently, there are an estimated 14,000 RCWs living in an estimated 6,105 active clusters (Service 2016a). A cluster is an aggregate of cavity trees and may include 1 to 20 or more cavity trees on 3 to 60 acres. According to the Service's RCW Recovery Plan (2003a) there are 11 recovery units based on ecoregions. Recovery will require populations distributed among the recovery units to ensure representation of broad geographic and genetic variation in the species. Viable populations within each recovery unit, to the extent allowed by habitat limitations, are essential to the recovery of the species as a whole. The species status has been improving annually since the mid-1990s when implementation of artificial cavity construction, translocation, and extensive prescribed burning programs began (Copeyon 1990, Allen 1991, Costa and Kennedy 1994). Forty percent of the known RCWs on private lands are benefiting from management approved by the Service through Memorandum of Agreements, Safe Harbor Agreements (SHA), and HCPs (Service 2016a). Safe Harbor Agreements benefit landowners who improve habitat for a listed species, which then protects them from some of the regulatory requirements of the ESA that may restrict the use of their land if subsequently used by a listed species. These management practices provide the means to overcome the species' limiting factors, thereby resulting in increasing population trends.

We incorporate by reference the Red-cockaded Woodpecker 5-year Review (Service 2006a) and Recovery Plan (Service 2003a). Additional information on this species' life history, range, habitat, threats, recovery needs, and status can be found at the Service's RCW recovery page: https://www.fws.gov/rcwrecovery/ and the endangered species page: https://ecos.fws.gov/.

D. Piping Plover

On January 10, 1986, we listed the piping plover (*Charadrius melodus*, PIPL) as endangered in the Great Lakes watershed and threatened elsewhere within its range (50 FR 50720). We designated critical habitat in different places at various times: 2001 U.S. Great Lakes region, breeding (66 FR 22938); 2001 all wintering populations (66 FR 36037); 2002 Northern Great Plains, breeding (67 FR 57637); 2008 revised designation for North Carolina, wintering (73 FR 62816); and 2009 revised designation for Texas, wintering (74 FR 23476). No critical habitat has been designated for the Atlantic Coast breeding population, but we considered the habitat needs of all breeding populations in the original 2001 critical habitat designation (66 FR 22938) and in subsequent revisions in 2008 (73 FR 62816) and 2009 (74 FR 23476).

The PIPL breeds in Canada, the U.S. Northern Great Plains, and the Great Lakes (Gratto-Trevor *et al.* 2012). Both U.S. populations prefer sparsely vegetated beaches; however, the Great Lakes PIPLs tend to prefer sandy substrates associated with wide, unforested systems of dunes and inter-dune wetlands (66 FR 22960). Northern Great Plains PIPLs have an affinity for more gravelly substrates along alkali lakes, rivers, reservoirs, and inland lakes, with a notable absence

of dune systems (67 FR 57680). Observations of banded birds do not show movement between the Great Lakes and Northern Great Plains populations.

Southward migration from the breeding grounds to the wintering grounds occurs from late July through September and runs along the southern Atlantic coast to the Gulf of Mexico shoreline (Service 1996a, Service 2003b). Piping plovers spend up to 10 months (July to May) of their life-cycle on their migration and winter grounds. Wintering PIPLs utilize a mosaic of habitat patches and move among these patches in response to local weather and tidal conditions (Nicholls and Baldassarre 1990a and 1990b, Drake *et al.* 2001, Cohen *et al.* 2008). Preferred coastal habitats include sand spits, small islands, tidal flats, shoals (usually flood tidal deltas), and sandbars that are often associated with inlets (Nicholls and Baldassarre 1990b, Harrington 2008, Addison 2012). Primary foraging habitats for PIPLs are sandy mud flats, ephemeral pools, seasonally emergent seagrass beds, mud and sand flats with scattered oysters, and overwash fans (Nicholls and Baldassarre 1990b, Cohen *et al.* 2008). PIPLs leave the wintering grounds as early as mid-February and as late as mid-May with peak migration in March (Haig 1992).

Threats include development and construction, recreation, dredging and sand mining, inlet stabilization and relocation, and wrack removal and beach cleaning (Service 2015a, Gibson *et al.* 2018). According to the Service's PIPL Recovery Plan (2015a), the primary recovery goal is ensuring that the dynamic processes that create and maintain the habitat on which the species depends throughout its lifecycle can function so that the species can thrive without the need for extensive human intervention. To reach this goal sufficient habitat must be available on the coastal migration and wintering grounds in quantity and quality to support conservation. The Service did not include a population goal as part of the recovery criteria for the wintering grounds due to the difficulty and expense of accurately counting PIPLs. Conservation efforts on behalf of PIPLs in their non-breeding range have increased since the species listing and further accelerated since the early 2000s; however, focused management efforts attempting to recreate habitat lost by human alterations of river systems have fallen short of providing sufficient habitat to recover the species (Service 2015a).

For wintering PIPLs we designated 142 units total as critical habitat in North and South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas, totaling 66,881 acres (66 FR 36038). The PBFs are coastal areas that support intertidal beaches and flats (between annual low tide and annual high tide) and associated dune systems and flats above annual high tide. In the 2009 revised designation of critical habitat for Texas PIPLs we define the PBFs as:

- intertidal sand beaches (including sand flats) or mud flats with no, or very sparse, emergent vegetation;
- unvegetated or sparsely vegetated sand, mud, or algal flats above annual high tide;
- surf-cast algae;
- sparsely vegetated backbeach, which is the beach area above mean high tide seaward of the dune line, or in cases where no dunes exist, seaward of a delineating feature such as a vegetation line, structure, or road;
- spits, especially sand, running into water;
- salterns, or bare sand flats in the center of mangrove ecosystems that are above mean high water and are only irregularly flushed with sea water;

- unvegetated washover areas with little to no topographic relief; and
- natural conditions of sparse vegetation and little to no topographic relief mimicked in artificial habitat types (e.g., dredge spoil sites).

We incorporate by reference the Piping Plover 5-year Review (Service 2009) and Recovery Plan (Service 2015a). Additional information on this species' life history, range, migration, habitat, threats, recovery needs, and status can be found at the Service's endangered species page: https://ecos.fws.gov/.

E. Rufa Red Knot

On December 11, 2014, we listed the *rufa* subspecies of red knot (*Calidris canutus rufa*) as threatened (79 FR 73706). Throughout this document we use "rufa red knot" and "red knot" interchangeably to refer to the *rufa* subspecies. There is no designated critical habitat for this species.

Red knots generally nest in the Canadian Arctic and migrate annually to several wintering regions, including the southeastern United States, the Gulf of Mexico (particularly at Laguna Madre, which is in the southern part of the Texas coast), northern Brazil, and Tierra del Fuego at the southern tip of South America. Delaware Bay serves as the principal spring migration staging area for the red knot because of the availability of horseshoe crab eggs (Morrison and Harrington 1992, Harrington 1996 and 2001, Clark *et al.* 2009, Service 2015b). Departure from the breeding grounds begins in mid-July and continues through August (Harrington 2001, Niles *et al.* 2008). Rufa red knots have been documented migrating southward from July through November and returning northward from February through June depending on where they are migrating to and from (Newstead *et al.* 2013, Service 2015b).

In North America, red knots commonly occur along sandy, gravel, or cobble beaches, tidal mudflats, salt marshes, shallow coastal impoundments and lagoons, and peat banks (Harrington 2001, Truitt *et al.* 2001, Niles *et al.* 2008, Cohen *et al.* 2009 and 2010). Red knots occupy all known wintering areas from December to February, but may be present in some wintering areas as early as September or as late as May. Some nonbreeding red knots (those less than a year old) remain south of the breeding grounds during the breeding season (Newstead 2013, Niles *et al.* 2008).

There is no recovery plan for the rufa red knot, but there is a recovery outline (Service 2019). An important component of recovery is the Delaware Bay, which had population declines of approximately 70 percent from 1981 to 2012. Harvest restrictions and other conservation actions resulted in horseshoe crab populations showing signs of recovery in the early 2000s. Since about 2005, however, horseshoe crab population growth has stagnated for unknown reasons (Service 2015b). It is unknown if the horseshoe crab egg resource will continue to adequately support red knot populations over the next 5 to 10 years. Additionally, while the recovery outline notes that over the past 25 years the red knot conservation partnership constituency has grown and now spans the subspecies' range, new threats have come to light, including widespread threats to food quality and quantity and bank stabilization (Rice 2009), which results in the loss of beaches. In localized areas, however, red knots have shown some adaptive capacity to switch prey during

preferred prey species reductions (Musmeci *et al.* 2011, Escudero *et al.* 2012). In the U.S., the Service is working with partners to minimize the effects of shoreline stabilization on shorebirds and other beach species, and there are efforts in Delaware Bay to maintain horseshoe crab spawning habitat. At some key U.S. stopovers, including the Atlantic coast of Virginia, Delaware Bay, and Cape Cod, considerable habitat is in public or private conservation ownership. Researchers continue conducting wintering surveys and examining the origins of rufa red knots on the wintering grounds and their movement patterns up to the Artic, which will provide valuable information as the Service develops a recovery plan for the species (Service 2019).

We incorporate by reference the Red Knot Status of the Species (Service 2015b) and Recovery Outline (Service 2019). Additional information on this species' life history, range, migration, habitat, threats, recovery needs, and status can be found at the Service's endangered species page: https://ecos.fws.gov/.

F. Ocelot

On March 30, 1972, we listed the ocelot (*Leopardus pardalis*) as endangered with the passage of the ESA. Inadvertently, we only listed it in foreign countries. On August 26, 1982, we listed the ocelot as an endangered species, which extended U.S. protections to the species throughout its range in 22 countries, including the U.S. (Texas and Arizona), Mexico, and Central and South America (47 FR 31670). There is no designated critical habitat for the ocelot.

The ocelot occurs in southern Texas and southern Arizona and south through Central and South America into northern Argentina and Uruguay (Pocock 1941, Cabrera 1961, Hall 1981). Ocelots have been observed in thornscrub and semi-arid vegetation, coastal grasslands and coastal tropical forests, tropical dry forests, tropical rain forests, oaks and grasslands, piedmont/montane scrub, cloud forest, pine-oak forests, and fir forests (Caso 1994, Shindle and Tewes 1998, Cuarón 2000, Fernandez 2002, López- González *et al.* 2003, Servín *et al.* 2003, Iglesias *et al.* 2009, Bárcenas and Medellín 2010, Martínez-Calderas *et al.* 2011, Ávila-Villegas and Lamberton-Moreno 2012, Aranda *et al.* 2013 and 2014, López-González *et al.* 2014, Ávila-Nájera *et al.* 2015, Culver *et al.* 2016). There are no range-wide estimates of habitat.

As human population growth and development continue across much of the ocelot's range, habitat conversion, fragmentation, and loss still comprise the primary threats and cause other threats, such as vehicle mortality and reduced genetic diversity (Service 2016b). Additionally, because the ocelot occurs in 22 countries, it presents a significant challenge for recovery planning. Knowledge is limited regarding the status of the species in much of its range. The recovery plan establishes a framework to better understand the status and conservation needs of ocelots for recovery throughout their range (Service 2016b). The recovery plan focuses on two cross-border management units, the Texas/Tamaulipas Management Unit and the Arizona/Sonora Management Unit. Establishing management units is a useful tool for species occurring across wide ranges with multiple populations, varying ecological pressures, and different threats in different parts of their range. The recovery plan helps focus efforts to conserve and recover ocelot populations in the northern limits of the species' range by

establishing specific recovery criteria and actions that will conserve viable ocelot populations in the borderlands (Arizona, Sonora, Tamaulipas, and Texas).

We incorporate by reference the Ocelot Recovery Plan (Service 2016b) and 5-year Review (Service 2018b). Additional information on this species' life history, range, habitat, threats, recovery needs, and status can be found at the Service's endangered species page: https://ecos.fws.gov/.

G. Houston Toad

The Houston toad is endemic to Texas and is thought to currently occur in Austin, Bastrop, Brazos, Burleson, Colorado, Lavaca, Lee, Leon, Milam, and Robertson counties (Hillis *et al*. 1984; Yantis 1989, 1990, 1991, and 1992; Forstner and Dixon 2011; McCracken *et al.* 2017; MacLaren and Forstner 2017). Houston toad habitat primarily consists of uplands characterized by pine or oak woodlands underlain by deep, sandy soils (Kennedy 1962, Brown 1971, Seal 1994, Buzo 2008). Scientists have also documented toadlets dispersing across prairie habitat and feeding while within prairies. Prairie habitat provides more insects than forested habitat (Marsh and Forstner 2016). In woodland habitat tree species vary but typically include loblolly pine (*Pinus taeda*), post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*), and/or sandjack oak (*Q. incana*) (Forstner 2003). Houston toads live on land following metamorphosis and return to small pools of water and ephemeral ponds to breed from late January to June (Christein and Taylor 1978, Kennedy 1962, Brown 1971, Forstner 2003, Hillis *et al*. 1984). As adults, Houston toads may range widely through upland habitats (Price 1990 and 1992, Dixon *et al*. 1990, Yantis 1994, Vandewege *et al.* 2013). Aestivation, a state of dormancy, often follows breeding, but toads can emerge and be active during the non-breeding season (Dodd and Cade 1998, Dixon *et al.* 1990, Forstner 2002).

The Houston toad has been declining for decades mainly from habitat loss, fragmentation, and degradation; predation by red imported fire ants; fertilizer and chemical run off; agricultural practices; wildfire; and drought (McCracken *et al.* 2017). Drought has been an additional stressor for the Houston toad for many years, particularly during the extreme drought of 2011. Drought results in dessication, loss of breeding sites, and loss of eggs or tadpoles resulting from pond evaporation. Indirect consequences of drought include decreased prey availability and increased predation pressures as the overall productivity of the ecosystems declines under stress (Forstner and Dixon 2011). The catastrophic Bastrop County Complex wildfire followed the drought of 2011 and burned over 36,000 acres impacting approximately 40 percent of the remaining habitat within the county, including 95 percent of Bastrop State Park, a source population for Houston toads (Brown *et al.* 2014, Wallace *et al.* 2011). In 2015, the Hidden Pines fire burned an additional 4,500 acres of pine woodlands (McCracken *et al*. 2017).

While previously tested for success, headstarting efforts started in earnest in 2013 and are continuing to date, reaching one million eggs released into the wild in 2018 (Haskell *et al.* 1996; McCracken *et al.* 2017; J. Hill, Service, pers. comm. 2019). Headstarting is a management practice that protects wild individuals in early life-stages (eggs, tadpoles, etc.) in the field or in captivity. There is high variability in eggstrand survivorship for unknown reasons, but monitoring is revealing headstarting is successful with increasing male detections at ponds on the

Boy Scouts of America/Capitol Area Council's Griffith League Ranch [GLR] in Bastrop County (McCracken *et al.* 2017).

A population viability analysis conducted by Hatfield *et al.* (2004) concluded that a minimum of three connected, self-sustaining populations are required to prevent extinction of the Houston toad. Since 2004, remaining Houston toad populations have become more geographically isolated (Buzo 2008, McHenry and Forstner 2009, Forstner and Dixon 2011). Extant Houston toad populations, such as those at Bastrop State Park and GLR should act as sources for natural dispersal of toads. Houston toads may disperse from these source populations or newly populated lands from additional headstarting activities onto surrounding lands. To date the majority of conservation work is and has been done within Bastrop County. This includes the Boy Scouts of America's 4,800 acre GLR and 600 acre Scout Reservation, Bastrop County's Welsh preserve, TPWD's 5,926 acre Bastrop State Park and 1,017 acre Buescher State Park, and LCRA's approximately 2,100 acres adjacent to Lake Bastrop. Additionally, management for Houston toads is occurring as part of SHAs on almost 2,000 acres.

We did not describe habitat requirements when we designated critical habitat (43 FR 4022) because in the 1970's little was known about the Houston toad. Based on current information, we would define PBFs as:

- Seasonally flooded breeding ponds,
- uplands covered with pine or pine-oak forests,
- herbaceous plant diversity on the forest floor that supports arthropods,
- sandy soils; and
- prairie or forested habitat for dispersal and feeding.

It is important to note, however, that a large portion of designated critical habitat in Bastrop County is not Houston toad habitat. There are numerous subdivisions and commercial developments and a significant amount of agricultural land.

We incorporate by reference the Houston Toad 5-Year Reviews (Service 2011a and 2018c). Additional information on this species' life history, range, habitat, threats, recovery needs, and status can be found at the Service's endangered species page: https://ecos.fws.gov/.

H. Barton Springs Salamander

On May 30, 1997, we listed the Barton Springs salamander (*Eurycea sosorum*, BSS) as an endangered species (62 FR 23377). There is no critical habitat designated for this species.

The BSS is endemic to Central Texas and inhabits springs, spring-runs, and water-bearing karst formations of the Edwards Aquifer (Chippindale 1993). The primary location of the BSS is in Barton Springs, located in Zilker Park near downtown Austin, Texas, which is an aquifer-fed system consisting of four hydrologically connected springs: 1) Main Springs (also known as Parthenia Springs or Barton Springs Pool), 2) Eliza Springs (also known as Elks Pit), 3) Sunken Garden Springs (also known as Old Mill or Walsh Springs), and 4) Upper Barton Springs (Pipkin and Frech 1993). Humans have significantly modified these spring sites. Impoundment of Main

Springs occurred in the late 1920s to create Barton Springs Pool, which the City of Austin (COA) operates as a public swimming pool. Concrete structures surround Eliza and Sunken Garden Springs, forming small pools on either side of Barton Springs Pool (COA 1998; Service 2005, amended 2016). From 1993 to 2010, the highest percentage of BSSs found within the Pool occurred in and around the caves and fissures from which the groundwater emanates (COA 2013); they also have been found in the "beach" area, which is a man-made, underwater, gravel bench on the north side of the Pool; and more recently at locations remotely located from Barton Springs Pool (Bendik *et al.* 2013, Devitt and Nissen 2018). More recently surveyers have documented BSSs at 12 locations from 1.2 miles to 19.5 miles away from Barton Springs Pool in both springs and wells in Travis and Hays counties, referred herein as the remote locations (Devitt and Nissen 2018).

The BSS and Austin Blind Salamander (ABS) Recovery Plan (Service 2005, amended 2016) states conservation efforts should include developing and implementing comprehensive regional plans to address threats from degraded water quality and reduced water quantity. It calls for a plan to protect or enhance water quality including measures for projects constructed over contributing and recharge zones of the Aquifer. Such measures should include impervious cover limits, buffer zones for streams and other sensitive environmental features, low-impact developments, structural water quality controls, and other strategies to reduce pollutant loads. Land preservation through acquisition, conservation easements, or deed restrictions also can provide permanent protection for water quality and quantity. Additionally, the limited range of these species means that captive breeding is an important tool to help guard against extinction (Service 2005, amended 2016). Captive breeding, habitat management, and other efforts to increase numbers of existing viable populations is critical to the survival and recovery of this species, particularly as expanding urbanization continues to threaten habitat quality.

Barton Springs salamanders are benefitting from implementation of several local and regional conservation actions. For example, in 2018 the Barton Springs/Edwards Aquifer Conservation District (BSEACD) finalized its HCP for protecting and providing sufficient flows to Barton Springs during times of drought, committing to improving long-term water management practices, and seeking replacement water sources. Additionally, the COA, as part of their development code, requires implementation of multiple protective measures for projects over the Edwards Aquifer (COA 2019). The COA also oversees thousands of acres of land purchased through municipal bonds over the Edwards Aquifer; and, as part of their Barton Springs Pool HCP (COA 2013), has a captive breeding program and is protecting, managing, and restoring surface salamander habitat at the four spring sites. Of the 12 remote locations, 8 are within COA water quality protection lands, parks, or research management areas. Private lands support the remaining sites, two of which are within very large parcels leaving the possibility of preserving them in the future. Consistent and effective monitoring at Barton Springs Pool continues to yield valuable information regarding the recovery needs of this species, but the COA monitors the remote locations only intermittently.

We incorporate by reference the BSS 5-Year Review (Service 2006b) and the BSS and ABS Recovery Plan (Service 2005, amended 2016). Additional information on this species' life history, range, habitat, threats, recovery needs, and status can be found at the Service's endangered species page: https://ecos.fws.gov/.

I. Jollyville, Salado, and Georgetown Salamanders

On August 20, 2013, we listed the Jollyville Plateau salamander (*Eurycea tonkawae*) as threatened (78 FR 51277) and designated critical habitat on 4,451 acres in 32 units (78 FR 51328). On February 24, 2014, we listed the Salado (*Eurycea chisholmensis*) and Georgetown (*Eurycea naufragia*) salamanders as threatened (79 FR 10236). On August 7, 2015, we finalized a 4(d) special rule containing measures that provide for the conservation of the Georgetown salamander (79 FR 10077). There is no critical habitat for the Salado and Georgetown salamanders. We are describing the rangewide status of these three *Eurycea* species together because their ranges are geographically in close proximity relying on the same groundwater aquifer; and they are physiologically similar, share common life history characteristics, and face the same threats to their recovery.

The Jollyville, Salado, and Georgetown salamanders are endemic to central Texas, are neotenic (retaining juvenile characteristics at maturity), and rely on the Northern Segment of the Edwards Aquifer as the primary supply of water for their habitat (Cole 1995). Surface water infiltrates through the soil and stream beds into the aquifer, which discharges from springs as groundwater (Schram 1995). These salamanders can occur where water emerges from the ground as a spring-fed stream; however, some occur in caves with no immediate spring outlets. All of the salamanders depend on sufficient quantities and particular qualities of water to meet their life requirements for survival, growth, and reproduction. Within the spring ecosystem, proximity to the springhead is important because of the stable water chemistry and temperature, substrate, and flow regime. Scientists believe that these species use the underground aquifer for habitat (TPWD 2011, Bendik 2011). *Eurycea* salamanders move an unknown maximum depth into the interstitial spaces (empty voids between rocks) within the substrate, using these spaces for foraging habitat and cover from predators (Cole 1995, Pierce and Wall 2011). These spaces should have minimal sediment, as sediment fills interstitial spaces, eliminating resting places and also reducing habitat of the prey base (small aquatic invertebrates) (O'Donnell *et al*. 2006). A study using mark-recapture methods found marked individuals moved up to 262 feet both upstream and downstream from a spring opening, demonstrating that *Eurycea* salamanders in central Texas can travel greater distances from a discrete spring opening than previously thought, including upstream areas, if suitable habitat is present (N. Bendik, COA, pers. comm., 2011).

Our understanding of the distribution of the salamanders is evolving. Recently Devitt *et al.* (2019), using phylogenetic and population genetic analysis of genome-wide DNA sequence data, assigned some known spring sites to different species. For example, scientists originally considered San Gabriel Springs in the City of Georgetown a Georgetown salamander site based on distribution and distance from other Georgetown salamander sites. Devitt *et al.* (2019), however, assigned this site to Jollyville Plateau salamanders based on genetic analysis. According to their findings and our database of known locations, Jollyville Plateau salamanders occur in approximately 130 springs and caves in Travis and Williamson counties, Georgetown salamanders occur in approximately 11 springs in Williamson County, and Salado salamanders occur in 13 springs in Williamson and Bell counties.

There is no recovery plan for these species. The Service reviewed and analyzed the published effects of impervious cover on these salamanders in the final listings (78 FR 51277 and 79 FR 10236). While the effects of an increase in impervious cover for a given site depend on local conditions, the observed trend is a degradation of aquatic habitats that increases with greater levels of impervious cover within the watershed. We also describe the contaminants expected in urban runoff as a result of land applications of pesticides, fertilizers, and other chemicals. Adequate springflows and groundwater levels are essential to maintaining the known populations of salamanders, since the reduction or cessation of springflow at springs supporting salamanders may result in extirpation of that population. Boghici (2011) noted that the northern section of the Edwards Aquifer lacks a contributing zone and recharge is mostly from diffuse infiltration of rainfall on the Edwards Limestone outcrop. We expect that recovery will require, at a minimum, a geographically distributed set of preserved springs with low impervious cover and sufficient buffers to protect against water quality degradation and to maintain water quantity.

Jollyville Plateau salamander designated critical habitat (78 FR 51327) defines PBFs as:

- Water from the Trinity Aquifer, Northern Segment of the Edwards Aquifer, and local alluvial aquifers;
- Rocky substrate with interstitial spaces; and
- Aquatic invertebrates for food.

We incorporate by reference the final listing rules (78 FR 51277 and 79 FR 10236), critical habitat designation (78 FR 51327), and the 4(d) rule (80 FR 47418). Additional information on this species' life history, range, habitat, threats, recovery needs, and status can be found at the Service's endangered species page: https://ecos.fws.gov/.

J. Karst Invertebrates

On September 16, 1988, we listed the Bee Creek Cave harvestman (*Texella reddelli*), Tooth Cave spider (*Tayshaneta* [=*Neoleptoneta*] *myopica*), and Tooth Cave ground beetle (*Rhadine persephone*) as endangered (53 FR 36029). On December 26, 2000, we listed the Madla Cave meshweaver (*Cicurina madla*), Government Canyon Bat Cave spider (*Tayshaneta* [=*Neoleptoneta*] *microps*), Helotes mold beetle (*Batrisodes venyivi*), and two ground beetles with no common names (*Rhadine exilis* and *Rhadine infernalis*) as endangered (65 FR 81419). No critical habitat is designated for *T. reddelli*, *T. myopica*, or *R. persephone*. On April 8, 2003, we designated critical habitat for *C. madla*, *B. venyivi*, *R. exilis* and *R. infernalis* (68 FR 17156). On February 14, 2012, we revised these critical habitat designations, which included designating critical habitat for *T. microps* (77 FR 8450). We are describing these species as a group because their habitat, life history characteristics, and threats to their existence are similar across all species. We describe their similarities and differences in the following discussion.

All of these species are endemic to central Texas. Four of these species are insects: three ground beetles and one mold beetle. The remaining species are arachnids, including one harvestman and three spiders. All of these invertebrates are troglobites (spending their entire lives underground), have small or absent eyes, and pale coloration (National Speleological Society 1982, Barr 1968). Their habitat includes caves and mesocavernous voids in karst limestone (landforms and

subsurface features, for example, sinkholes and caves, produced by dissolution of bedrock) (Barr 1968). Within this habitat these animals depend on high humidity, stable temperatures, suitable substrates (for example, spaces between and underneath rocks), and surface-derived nutrients (Barr 1968). The absence of light in deep cave zones precludes photosynthetic activity by plants and associated primary production. Rather, nutrient sources found in these underground habitats are those actively (e.g., animals) or passively (e.g., gravity, water, or wind) transported in from overlying surface habitats (Barr 1967 and 1968, Culver 1982, Poulson 2012, Culver and Pipan 2009). Thus although these species spend their entire lives underground, their ecosystem is dependent on the overlying surface habitat.

We track the known locations of each species for progress towards recovery. The following are the known total number of caves from which each species occurs. From Bexar County currently we know of 54 caves that support *R. exilis*, 65 caves support *R. infernalis*, 24 caves support *C. madla*, 1 cave supports *T. microps*, and 6 caves support *B. venyivi*. In Travis and Williamson counties 62 caves support *R. persephone* and 13 caves support *T. myopica*. From Travis and Burnet counties currently we know 12 caves support *T. reddelli*. Each cave occurs in or near to a Karst Fauna Region (KFR), which is a geographic area delineated based on discontinuities of karst habitat that may reduce or limit interaction between troglobite populations. There are six KFRs in Bexar County: Stone Oak, University of Texas at San Antonio (UTSA), Helotes, Government Canyon, Culebra Anticline, and Alamo Heights (Veni 1994), and eight across Williamson and Travis counties: South Travis County, Rollingwood, Central Austin, Jollyville, McNeil/Round Rock, Cedar Park, Georgetown, and North Williamson County (Veni & Associates 1992).

The primary threat to these species is habitat destruction. Impacts to caves and karst habitat occur in several ways, including but not limited to 1) completely filling the cave during development, 2) quarrying activities, and 3) capping or sealing cave entrances. Other causes of habitat degradation include altering drainage patterns, altering native surface plant and animal communities, reducing or increasing nutrient flow, contamination, damage caused by excessive human visitation, and threats from red-imported fire ants. Red-imported fire ants impact karst invertebrates by competing with the beneficial cave crickets, feeding directly on karst invertebrates, and by competing with karst invertebrates for habitat resources (Service 2011b).

The recovery strategy for all listed karst invertebrates is to reduce threats to the species by protecting an adequate number of karst areas to ensure a high probability of the species' long-term survival (Service 2011b and 2018d). This includes protecting caves or cave clusters and the associated mesocaverns necessary to support populations that represent the range of the species potential genetic diversity. Maintenance of these karst preserves involves keeping them free from contamination, excessive human visitation, and nonnative fire ants by maintaining an ecologically healthy surface plant and animal community. Preserve managers need to regularly monitor and adaptively manage to control existing and new threats (Service 2011b and 2018d).

For the purposes of recovery, a karst fauna area (KFA) is an area known to support one or more locations of a listed species. There are three categories of KFAs: high, medium, and low quality. All preserved KFAs should be either medium (at least 40 acres) or high (at least 90 acres) quality as defined in the karst preserve recommendations (Service 2011b). To meet the downlisting

(Service 2011b) and proposed downlisting (Service 2018d) criterion for these karst species, preservation of at least the minimum number of KFAs in each KFR for each species must occur. To delist these species, the downlisting requirements must occur and the data from monitoring and research must support the conclusion that the KFAs will provide a high probability of species survival (greater than 90 percent over 100 years).

The following number of KFAs and potential KFAs (those areas that may meet KFA status but we have not recognized them as such) exist for each species. Because DOD cannot encumber their land permanently, which is a requirement of KFA status, we list those caves separately, since they still contribute to recovery.

- *C. madla* – 4 KFAs, 3 high quality, 1 medium quality, and 2 on DOD land.
- *B. venyivi* – 2 KFAs and 1 medium quality.
- *R. exilis* – 5 KFAs, 1 high quality, 1 medium quality, and 23 caves on DOD land.
- *R. infernalis* – 6 KFAs, 1 high quality, and 4 caves on DOD lands.
- *T. microps* – 1 KFAs.

We define designated critical habitat for the Bexar County karst invertebrates as:

- Karst-forming rock containing subterranean spaces (caves and connected mesocaverns) with stable temperatures, high humidity (near saturation), and suitable substrates (for example, spaces between and underneath rocks for foraging and sheltering); and
- Surface and subsurface sources (such as plants and their roots, fruits, and leaves, and animal (e.g., cave cricket) eggs, feces, and carcasses) that provide nutrient input into the karst ecosystem (77 FR 8450).

We designated 28 critical habitat units surrounding 57 caves (77 FR 8450), which are all located in Bexar County. The effects of the LCRA TSC HCP on Bexar County karst invertebrates can only occur in Medina County and there is no designated critical habitat in Medina County, thus no adverse effects on critical habitat will occur. No further discussion of Bexar County karst invertebrate critical habitat is included in this biological and conference opinion.

We incorporate by reference the recovery plans (Service 2011b and 1994, proposed revision 2018d) and 5-year reviews (Service 2018e, 2018f, 2018g). Additional information on this species' life history, range, habitat, threats, recovery needs, and status can be found at the Service's endangered species page: https://ecos.fws.gov/.

K. Edwards Aquifer Aquatic Species

1. Overview of Aquifers

Segments of the Edwards and Trinity aquifers are the source of the springflows required by the Comal Springs riffle beetle, Peck's cave amphipod, and San Marcos salamander, which are endemic to central Texas. These aquifers provide the groundwater resources for municipal, domestic, commercial, agricultural, industrial, and other uses (Edwards Aquifer Authority [EAA] 2019). The Southern Segment of the Edwards Aquifer underlies portions of southwest Texas

and is approximately 180 miles long and varies from approximately 5 to 40 miles in width. Water within the Southern Segment generally flows from areas of higher elevation in the southwest to areas of lower elevation to the northeast. The Southern Segment of the Edwards Aquifer is the primary water source for over two million people, primarily in the greater San Antonio area (EAA 2019).

The Southern Segment of the Edwards Aquifer has three distinct zones each with unique hydrogeological characteristics (EAA 2019). The contributing zone is approximately 5,400 square miles and is composed of the watersheds that cross the recharge zone, thereby providing the source of most of the water that will enter the aquifer as recharge. The recharge zone is approximately 1,250 square miles of exposed, porous Edwards Limestone. Recharge occurs when water enters the aquifer by infiltration through the soils and rock strata overlying the aquifer and through caves, sinkholes, faults, fractures, and other open cavities. Creeks and streams with these features can lose much or all of their baseflow to the aquifer as they cross the recharge zone. The artesian zone of the Southern Segment is a less permeable geologic formation that confines water and has high surface springflows resulting from the hydraulic pressure of the confined waters in this zone. Faults and fissures allow release of these pressurized waters at the surface in numerous springs and seeps, including Comal and Hueco springs in Comal County and San Marcos Springs in Hays County.

Threats include increases in sedimentation from runoff; cumulative impacts of urbanization (road runoff, leaking sewer lines, residential pesticide and fertilizer use, etc.), groundwater pollution from land-based hazardous material spills and leaking underground storage tanks; and surface, stormwater, and point and nonpoint source discharges into streams (Seal 1996). As water quantity decreases the spatial distribution of water quality parameters (temperature, pH, turbidity, conductivity, dissolved gases) increase in magnitude in a manner that may negatively impact listed species (Seal and Ellis 1997).

Sediment may affect aquatic organisms in a number of ways. Sediment deposition can physically reduce the amount of available habitat and protective cover for aquatic organisms. Large volumes of sediment can become anoxic (devoid of oxygen), thereby reducing the suitability of affected habitats for covered species. Silt and sediment can also clog the interstitial spaces of the substrates surrounding spring outlets and impact natural substrates downstream (Service 2005, Welsh and Ollivier 1998).

Overview of Springs

a. Comal Springs

The Comal Springs system is the largest spring system in Texas, and consists of numerous spring openings, collectively called Comal Springs, that originate from the Edwards Aquifer (Brune 1981). These springs provide flow to three short spring runs that empty into the western end of Landa Lake in Landa Park, a municipal recreational area owned by the City of New Braunfels, Comal County, Texas. Another smaller group of springs, referred to collectively as spring run 4, occur at the eastern end of Landa Lake near the confluence with Blieders Creek. Numerous

small springs and seeps occur in the spring runs, along the banks of Landa Lake, and beneath the Lake (Brune 1981).

b. Hueco Springs

Hueco Springs are a smaller group of springs on private property near the Guadalupe River about three miles north of New Braunfels, Comal County, Texas (Guyton and Associates 1979). The west spring (Hueco I) flows down a small ravine into a diversion canal to a small lake, from which it spills into the Guadalupe River. The east spring (Hueco II) rises from a deposit of stream gravels between a county road and the Guadalupe River and flows directly to the river. The Edwards Aquifer is the source of Hueco Springs, although the subset of the aquifer supplying Hueco Springs is likely smaller than that supplying Comal and San Marcos springs (Guyton and Associates 1979, Lindgren *et al.* 2004).

c. San Marcos Springs

The San Marcos spring system primarily occurs as a series of spring outlets that lie at the bottom of Spring Lake and along its shoreline in the City of San Marcos, Hays County, Texas (Guyton & Associates 1979). The landownership of San Marcos Springs consists entirely of state holdings: the surface water and bottom of Spring Lake are state-owned, and the state-affiliated Texas State University owns the surrounding land and buildings. The spring outlets associated with San Marcos Springs occur within the main part of the lake, excluding the slough portion that exists as an arm of the lake (Guyton & Associates 1979). San Marcos Springs is the second largest spring system in Texas and historically has exhibited the greatest flow dependability and environmental stability of any spring system in the southwestern United States. Records indicate that the San Marcos Springs have never ceased flowing, although the flow varies with fluctuations in water levels of the Southern Segment of the Edwards Aquifer.

Guyton & Associates (1979) determined the majority of recharge for San Marcos Springs was from an area of the aquifer southwest of Comal Springs that flows under Comal Springs and discharges at San Marcos Springs. These flows derive primarily from the same sources as Comal Springs, which likely include the recharge area from rivers and creeks north and west of the City of San Antonio.

Species

d. Comal Springs Riffle Beetle

We listed the Comal Springs riffle beetle (*Heterelmis comalensis*) as endangered on December 18, 1997 (62 FR 66295). Critical habitat was originally designated on July 17, 2007 (72 FR 39248) and revised on October 23, 2013 and is primarily restricted to surface water in the impounded portion of Comal Springs (Landa Lake, 38 acres) and San Marcos Springs (upstream portion of Spring Lake, 16 acres) (78 FR 63100).

The Comal Springs riffle beetle is an epigean (surface-dwelling) species that inhabits fast flowing waters with gravel and cobble substrates (Bowles *et al*. 2003). Their life history and

habitat is not well known (Bowles *et al*. 2003). BIO-WEST (2006) reported that riffle beetles may take six months to three years to complete their life cycle from egg, to larvae, to adult. Bowles *et al*. (2003) found all life stages of Comal Springs riffle beetles throughout the year. Comal Springs riffle beetles occur throughout the Comal Spring system, including in Landa Lake (BIO-WEST 2007). It was long thought that the single riffle beetle collected by Barr (1993) in Spring Lake was in error. However, Gibson *et al.* (2008) collected Comal Springs riffle beetles again from Spring Lake and found adults and larvae, indicating the presence of a reproducing population.

Because there is no recovery plan for the Comal Springs riffle beetle, there are no recovery criteria to measure progress towards downlisting or delisting. Furthermore, there is no population estimate for this species. We have data from sampling efforts between 2004 and 2010 that provide general density estimates at each of the three Comal Springs locations that suggest a general upward trend in density (BIO-WEST 2011). Two full comprehensive sampling efforts (spring and fall) and several critical period sampling efforts take place annually via drift nets at three locations in the Comal Springs system and at San Marcos Springs (Edwards Aquifer Recovery Implementation Program [EARIP] 2012, BIO-WEST 2015). During sampling events, specimens are collected and transferred to the San Marcos Aquatic Resource Center (SMARC) for captive rearing and research. Researchers continue to study and develop captive culture techniques (SMARC 2014) increasing the potential to use captive propagation as a tool for recovery.

As part of the EARIP HCP, the City of New Braunfels is restoring native riparian zones and increasing the amount of usable habitat and food sources in Comal Springs for Comal Springs riffle beetles (EARIP 2018). Additionally, as part of the EARIP HCP research continues in determining habitat requirements and responses; low-flow impacts; and the implications of the timing, frequency, and duration of multiple drought events in varying sequences to assess ecological model predictions (EARIP 2018).

The critical habitat designation (78 FR 63100) defines PBFs as:

- Springs, associated streams, and underground spaces immediately inside of or adjacent to springs, seeps, and upwellings that include:
  - high-quality water with no or minimal pollutant levels of soaps, detergents, heavy metals, pesticides, fertilizer nutrients, petroleum hydrocarbons, and semivolatile compounds such as industrial cleaning agents; and
  - hydrologic regimes similar to the historical pattern of the specific sites, with continuous surface flow from the spring sites and in the subterranean aquifer;
- spring system water temperatures that range from approximately 68 to 75 °F; and
- adequate food supply that includes, but is not limited to, detritus (decomposed materials), leaf litter, living plant material, algae, fungi, bacteria, other microorganisms, and decaying roots.

e. Peck's Cave Amphipod

We listed Peck's cave amphipod (*Stygobromus pecki*) as endangered on December 18, 1997 (62 FR 66295). We designated critical habitat on October 23, 2013 at Comal (38 acres of surface

habitat and 124 acres of subsurface habitat) and Hueco (0.4 acres of surface habitat and 138 acres of subsurface habitat) springs in Comal County, Texas (78 FR 63100).

Holsinger (1967) characterized the flagellatus species group to which Peck's cave amphipod belongs as largely cavernicolous (living in subterranean caves or passages) in habitat preference, having restricted ranges, and occupying deep groundwater niches. Gibson *et al*. (2008) found Peck's cave amphipod in gravel, rocks, and organic debris (leaves, roots, wood) immediately inside of or adjacent to springs, seeps, and upwellings of Comal Springs and their impoundment, Landa Lake. Gibson *et al*. (2008) collected Peck's cave amphipods in drift nets at Hueco and Comal springs, implying ejection from the spring mouth into the water column. BIO-WEST during annual monitoring continues to collect Peck's cave amphipods on lures placed near spring orifices or upwellings (BIO-WEST 2017 and 2018). At Panther Canyon Well, adjacent to Landa Lake, specimens were collected in a baited bottle trap, implying that free-swimming individuals entered the trap through the opening following the smell of the bait (Gibson *et al*. 2008).

There is no recovery plan for the Peck's cave amphipod. However, since 2004, monitoring of Peck's cave amphipod takes place twice yearly by netting the major spring openings and collecting with cotton cloth lures at Comal Springs (BIO-WEST 2018). The SMARC continues to collect specimens, develop captive propagation techniques, and conduct research on Peck's cave amphipod. Additionally, as part of the EARIP (2018) HCP, the long-term biological goal for the Peck's cave amphipod continues to focus on maintaining water quality at the spring flow outlets and continuing to collect demographic data to better manage the species and its habitat.

The critical habitat designation (78 FR 63100) defines PBFs as:

- Springs, associated streams, and underground spaces immediately inside of or adjacent to springs, seeps, and upwellings that include:
  - high-quality water with no or minimal pollutant levels of soaps, detergents, heavy metals, pesticides, fertilizer nutrients, petroleum hydrocarbons, and semivolatile compounds such as industrial cleaning agents; and
  - hydrologic regimes similar to the historical pattern of the specific sites, with continuous surface flow from the spring sites and in the subterranean aquifer;
- spring system water temperatures that range from approximately 68 to 75 °F; and
- adequate food supply that includes, but is not limited to, detritus (decomposed materials), leaf litter, living plant material, algae, fungi, bacteria, other microorganisms, and decaying roots.

f. <u>San Marcos salamander</u>

We listed the San Marcos salamander (*Eurycea nana*) as threatened on July 14, 1980 (45 FR 47355). We designated critical habitat also on July 14, 1980, which consists of Spring Lake and its outflow and the San Marcos River downstream 164 feet from Spring Lake Dam, approximately 20 acres (45 FR 47355).

The San Marcos salamander is a member of the family Plethodontidae (lung-less salamanders) and is a neotenic salamander, retaining its external gills (the larval condition) throughout life.

The salamander does not leave the water to metamorphose into a terrestrial form, but instead becomes sexually mature and breeds in the water. San Marcos salamanders occur near all of the major spring openings scattered throughout Spring Lake and downstream of the dam to about 500 feet. Habitat consists of algal mats (Tupa and Davis 1976), where rocks are associated with spring openings (Nelson 1993). Evidence suggests reproduction occurs throughout the year with a possible peak in May and June (Bogart 1967).

Several estimates of San Marcos salamanders show their numbers to be in the several thousands. Tupa and Davis (1976) estimated 17,000 to 21,000 individuals and Nelson (1993) found 53,200 salamanders in and just below Spring Lake. Seven years of quarterly monitoring of San Marcos salamander populations using visual surveys by divers showed stable visual counts (BIO-WEST 2011).

According to the San Marcos and Comal Springs and Associated Aquatic Ecosystems Recovery Plan (Service 1996b), which includes the San Marcos salamander, recovery tasks include: ensuring adequate flows and water quality in San Marcos Springs and the San Marcos River; maintaining genetically diverse reproductive populations in captivity and creating reintroduction techniques for use in the event of a catastrophic event; removing or reducing threats due to non-native species, recreational use of the river, and habitat alteration; and maintaining healthy, self-sustaining, reproductive populations in the wild. The SMARC actively collects wild specimens and continues to research and develop captive propagation techniques for the San Marcos salamander (SMARC 2014).

As part of the EARIP HCP, long-term biological goals for the San Marcos salamander include a qualitative habitat component and a quantitative population measurement. The habitat goal is to maintain silt-free habitat conditions via continued springflow, riparian zone protection, and recreation control (EARIP 2018). Additional measures of the HCP (EARIP 2012) that continue to date include the twice annual monitoring and aquatic gardening, maintaining silt-free substrates in reaches known to support the salamander, and implementing recreational control below Spring Lake Dam (EARIP 2018).

The critical habitat designation for San Marcos salamander predates the requirement for identification of PBFs that are essential for the conservation of this species. However, the rule designating critical habitat (45 FR 47355) does describe those actions that would adversely modify designated critical habitat, including any actions that would: lower the water table; expose algal mats, leading to the desiccation of the species sole habitat; and disturb algal mats or the bottom of the lake, such as from SCUBA divers. Based on the best available scientific and commercial data, we define the PBFs as:

- Thermally constant waters;
- flowing water;
- clean and clear water;
- sand, gravel, and rock substrates with little mud or detritus; and
- vegetation or rocks for cover.

4. Water Conservation

In an effort to protect water quality and quantity there are several laws and regulations that apply to the Edwards Aquifer. The Federal Safe Drinking Water Act of 1974, as amended, regulates pollution and sedimentation of public drinking water sources, including the Edwards Aquifer. This legislation mandates enforcement of drinking water standards established by the Environmental Protection Agency. The Texas Commission on Environmental Quality (TCEQ) is responsible for enforcement of these standards in Texas. The TCEQ requires developers to submit Aquifer protection plans for activities over the contributing, transition, or recharge zones of the Edwards Aquifer, and prohibits facilities such as municipal solid waste landfills and waste disposal wells from being built in the recharge or transition zones.

In 1997, the Texas State Legislature approved Senate Bill 1 to meet the State's water needs through 2050. This bill created 16 water planning regions and mandated the creation of regional water plans, which are updated every 5 years. Upon completion, each of the regional plans was sent to the Texas Water Development Board (TWDB) for review and approval and eventual combination into the State Water Plan (TWDB 2017). Each of these regions relies on varying water sources, different measures for determining drought status, and varying measures for meeting future water demands (TWDB 2017). Total water demands are projected to increase by 17 percent by 2070 and all needs are projected to be met by several different water management strategies, including conservation, brush control, and aquifer storage and recovery.

Under the authority provided by Texas Water Code (Chapter 36, Subsection 36.101), groundwater conservation districts may limit aquifer withdrawals under rules governed by Chapter 36 and by their enabling legislation to conserve, preserve, and protect groundwater or groundwater recharge, and to prevent waste of the groundwater resource or groundwater reservoirs in their jurisdiction as part of a comprehensive, approved groundwater management plan. There are a multitude of water conservation districts throughout Texas, but only two are charged with protecting the Comal and San Marcos springs. The EAA manages and issues permits for the withdrawal of groundwater from portions of the Edwards Aquifer for the purposes of water conservation and drought management and to make and enforce rules. The EAA was designated a special regional management district and charged with protecting terrestrial and aquatic life, including the endangered species at Comal and San Marcos springs; domestic and municipal water supplies; the operation of existing industries; and the economic development of the state. The Hays Trinity Groundwater Conservation District (HTGCD), whose water influences flows at Fern Bank and San Marcos springs, may exercise any and all statutory authority or power conferred by its enabling legislation, including the adoption and enforcement of rules under the Texas Water Code. The HTGCD works to conserve, preserve, recharge, and prevent waste of groundwater within western Hays County.

For all three species we incorporate by reference the recovery plan (Service 1996b), the final listing rules (62 FR 66295, 45 FR 47355), and the final critical habitat rules (78 FR 63100, 45 FR 47355). Additional information on these species' life history, range, habitat, threats, recovery needs, and status can be found at the Service's endangered species page: https://ecos.fws.gov/.

L. Spot-tailed Earless Lizard

On May 25, 2011, the Service published a notice of a petition finding and initiation of a status review for the spot-tailed earless lizard (*Holbrookia lacerata*) (76 FR 30082).

The spot-tailed earless lizard is actually two distinct subspecies (*Holbrookia lacerata lacerata* and *Holbrookia lacerata subcaudalis*), differentiated based on morphological differences and geographic separation (Conant and Collins 1991, Dixon 2000). The Balcones Escarpment, which is a geologic fault zone in central Texas, geographically separates the two and serves as a barrier to genetic exchange (Axtell 1968, Hammerson *et al.* 2007). The northern subspecies historically occurred throughout the Edwards Plateau, while the southern population historically occurred through south Texas into parts of Mexico's states of Coahuila, Nuevo Leon, and Tamaulipas (Axtell 1968, Conant and Collins 1991, Dixon 2000, TPWD 2005a, Hammerson *et al.* 2007).

Habitat typically includes flat and open prairies or meadows, prairie-brushland, chaparral-shrubland, mixed woodland areas, mesquite associations, and desert habitats (Axtell 1968, TPWD 2005a and b). They are also frequently observed using features such as graded roads and early states of vegetation encroachment (Axtell 1968, LaDuc *et al.* 2018). The spot-tailed earless lizard tends to burrow in soil, fallen logs, and other ground debris, and avoid obstructions, such as waterways, buildings, and pavement (Axtell 1968). The northern species prefers caliche soils, which are hardened deposits of calcium carbonate found in arid regions that cement together other materials, including gravel, sand, clay, and silt. The southern species is typically found in association with dark clay and clay-loam soils (TPWD 2005a). While we know of some threats, there are several presumed threats that require more study (LaDuc *et al.* 2018). Threats to the spot-tailed earless lizard throughout its range include urbanization; oil and gas development; and certain agricultural practices, such as application of herbicides, and the conversion of grasslands to row crops (LaDuc *et al.* 2018).

We incorporate by reference LaDuc *et al*. (2018) and the petition finding (76 FR 30082).

IV. Environmental Baseline

This section evaluates the past and present factors influencing the current condition of the species, its habitat, and ecosystem within the action area likely to be affected by the proposed action, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species

A. Golden-cheeked Warbler

Because the action area encompasses the entire known breeding range of the GCWA, we consider the environmental baseline to be the status of the species in the United States.

According to our consultations tracking database, there have been 73 formal section 7 consultations on the GCWA not including those developed as part of a 10(a)(1)(B) permit which are discussed below. The action area these consultations covered was over 65.4 million acres.

Multiple consultations are on Fort Hood, Camp Bullis, and Camp Stanley; however, we are only counting the action areas once for the total area covered by these formal consultations. The action areas for one brush control consultation covered almost half of Texas at 60 million acres, with another at 773,000 acres, and a prescribed fire consultation covered another 4.2 million acres. However, only 52,000 acres of GCWA habitat were actually authorized to be impacted by these 3 consultations with the majority of that acreage as indirect effects (i.e., the habitat remained intact). Of the remaining acreage of authorized take (almost 87,000 acres in total), almost 41,000 acres of impacts were on DOD lands are mostly in indirect effects. The result of all of these consultations is over 80,000 acres of GCWA habitat maintained on DOD or private land preserved or maintained for the benefit of the GCWA.

In addition to section 7 consultations for other federal agencies actions, we have issued 137 individual 10(a)(1)(B) incidental take permits covering the GCWA on more than 74 million acres (this is the permit area, not the actual acres of impacted habitat). In total we have authorized impacts to almost 58,000 acres of GCWA habitat range-wide. Of this total 37,400 acres were part of large scale HCPs (total habitat loss authorized indicated in parentheses): Williamson RHCP (6,000 acres), Oncor's programmatic HCP (3,000 acres), Hays County's Regional HCP (9,000 acres), LCRA's Compatible Renewable Energy Zone HCP (1,100 acres), Comal County's Regional HCP (9,000 acres), and the Southern Edwards Plateau HCP (9,300 acres). The conservation result of all HCPs if fully implemented is over 62,000 acres of land preserved for the benefit of the GCWAs.

B. Whooping Crane

While there are no recovery criteria regarding the migration stopover habitat, there are several recovery tasks that address locating and protecting stopover sites, particularly in Texas, as well as reducing collision risks and shootings (CWS and Service 2007). According to our siting data, the majority of whooping cranes along the Texas coast occur in Aransas, Brazoria, Calhoun, Galveston, Jackson, Matagorda, Nueces, Refugio, San Patricio, and Victoria counties in Texas. A more recent Service analysis of potential whooping crane habitat suggested as many as 723,381 acres of "high to medium" quality coastal marsh habitat is currently available along the Texas Gulf Coast from the Nueces River delta up to the Galveston Bay complex (Metzger et al. 2016) with designated critical habitat in Aransas, Calhoun, and Refugio counties consisting of almost 108,400 acres mostly centered on the Service's Aransas NWR. The wintering habitat consists of estuarine marshes, bays, and tidal flats (Allen 1952, Blankinship 1976). Some individuals occur occasionally on nearby privately owned pastures or croplands. The winter diet consists mainly of blue crabs (*Callinectes sapidus*), clams (*Tagelus constricta*), and Carolina wolfberry (*Lycium carolinianum*) (Allen 1952, Uhler and Locke 1970, Blankinship 1976 and 1987, Hunt and Slack 1987, Chavez-Ramirez 1996).

Threats to stopover habitat in the action area include the expanding human population, which degrades or destroys habitat; loss of flows needed to maintain riverine migration habitat; conversion of prairie habitat for agricultural use; drought, in particular the exceptional drought of 2011, which decreases habitat and food availability; and collision risks from towers, power lines, and wind turbines. Collisions have accounted for the death or serious injury of 45 whooping cranes since 1956 (Stehn and Wassenich 2008). Of the nine documented power line collisions of

whooping cranes from the Aransas-Wood Buffalo population, three were within Texas: Comanche, Coryell, and Lampasas counties.

Around half of wintering whooping cranes use the Aransas NWR (Service 2012) with much of the remaining portion of the population using coastal marsh habitat within a 25 mile radius of the refuge (W. Harrell, Service, pers. comm. 2019). Verified reports also demonstrate occasional winter use by a small portion of the population as far as 150 miles from Aransas NWR. With development occurring on private lands and ongoing coastal marsh loss due to sea level rise and erosion, the potential for future winter habitat use expansion may be limited unless there is a large effort to protect additional lands, both current whooping crane habitat and those expected to convert to whooping crane habitat due to inundation (Service 2017). When considering all salt marsh habitats within a 70 mile radius from Aransas NWR, past studies estimated approximately 139,500 acres of non-contiguous saltmarsh area could support a total flock size of 1,156 (Stehn and Prieto 2010). Metzger et al. (2016), however, predicted available habitat could support as many as 3,249 whooping cranes (Metzger *et al.* 2016). The Service estimates that between 84,000 and 323,000 additional acres of habitat are needed to meet the downlisting criteria from endangered to threatened status (Service 2017). Thus, to meet recovery goals, near-term habitat protection of coastal marsh areas that could provide future wintering whooping crane habitat, both current habitat and habitat expected to be created post-inundation, is crucial.

According to our consultations tracking database, there have been at least four section 7 consultations covering whooping cranes, not including those developed as part of a 10(a)(1)(B) permit which are discussed below. Three of these consultations were for residential development and channel dredging. We authorized a total of approximately 675 acres of direct effects, but expect this to be non-lethal, since activities will occur during the breeding season when Whooping cranes are not on the wintering grounds. An additional approximately 717 acres of indirect effects are expected, but again we expect those impacts to be non-lethal and conducted mostly during the breeding season. The results of these consultations at full implementation will be the permanent preservation of 519 acres of estuarine and palustrine wetlands, marsh, tidal flats, and seagrass beds. The fourth formal consultation was for a programmatic SHA covering coastal grazing lands. While some negative effects may occur from prescribed burning, brush removal, and managed grazing, among other activities; the expectation is a net benefit in conservation when the lands are restored and are able to support Whooping cranes.

According to our consultations tracking database, there has been one formal consultation authorizing impacts to whooping cranes or their habitat within the action area, which was for Oncor Electric's transmission HCP. The Permit authorized incidental take of one whooping crane during the 30-year permit term due to collision. As a way to minimize and mitigate whooping crane impacts, Oncor Electric agreed to initially route new transmission lines to avoid potential suitable stopover. However, if that is not possible, within one mile of any stopover habitat Oncor Electric will: mark all new transmission lines with bird flight diverters, place transmission or distribution lines underground, relocate or remove existing transmission or distribution lines, and mark existing transmission or distribution lines.

C. Red-cockaded Woodpecker

The RCW currently occurs in 12 Texas counties: Angelina, Cherokee, Houston, Jasper, Montgomery, Newton, Sabine, San Augustine, San Jacinto, Shelby, Trinity, and Walker counties (Lockwood and Freeman 2004; Reid and McCormick 2003; R. Allen, Service, pers. comm. 2019). According to the RCW Recovery Plan, Second Revision (Service 2003a), Texas is within the West Gulf Coastal Plain Recovery Unit. The majority of the known RCWs within the action area currently occur on public lands (R. Allen, pers. comm., 2019): Angelina, Davy Crocket, Sabine, and Sam Houston National Forests (all within the action area). Additionally, there are two State Forests that also support RCWs.

In Texas, commercial forestry (the predominant land use in this region) with short rotations (<40 years), was the major threat to RCWs by eliminating essential nesting and foraging habitat (Ortego and Lay 1988). These losses resulted in a variety of factors including loss and fragmentation of habitat, fire suppression and resultant changes in habitat structure, and vulnerability to environmental and demographic changes because of small population size. Since listing, studies have shown, however, that harvesting of timber can be compatible with RCW management (Rudolph and Conner 1996, Conner *et al*. 2001, Shackelford and Reid 1998).

Habitat conservation on national forests, where the majority of RCWs are, is continuing to benefit the species as numbers continue to increase. The delisting goal for primary core populations is 350 or more potential breeding groups where an adult female and adult male occupy the same cluster, with or without one or more helpers. Angelina and Sabine National Forests together comprise a single primary core population supporting approximately 120 potential breeding groups, Sam Houston National Forest is a core population and currently supports approximately 295 potential breeding groups. Davy Crockett National Forest is a secondary core population that can hold populations of 250 potential breeding groups, and create a stepping-stone corridor of habitat enhancing natural dispersal. Davy Crockett National Forest currently supports 80 potential breeding groups (R. Allen, pers. comm., 2019).

There are approximately 48 active clusters (potential breeding group data is not available) on private lands and 8 active clusters on state lands throughout east Texas. The majority of the active clusters on private lands are a result of the 1998 Service issued joint SHA to TPWD and Texas A&M Forest Service for RCWs covering 22 Texas counties. When participating in the SHA the landowners must agree to enhance or restore RCW nesting and foraging habitat. To date, 57 properties covering approximately 1,259,000 acres with 29 baseline RCW clusters have enrolled (R. Allen, pers. comm., 2019).

According to our consultations tracking database, there has been one formal consultation authorizing impacts to RCWs in the action area as part of Oncor Electric's HCP. The Permit authorized impacts to 514 acres, but Oncor Electric committed to avoiding impacts to RCWs altogether, if possible. If Oncor cannot avoid impacts then they will not take active clusters or nest trees. Instead, construction will occur during specific times of day and year (outside of breeding season), and mitigation will be implemented for any impacts to foraging habitat.

D. Piping Plover

Depending on the season, tides, and weather conditions, PIPLs will use ocean beaches, bay shorelines, or tidal flats scattered along the Texas coast from Louisiana to Mexico (Nicholls and Baldassarre 1990a and 1990b, Drake *et al*. 2001, Zdravkovic and Durkin 2011, Zonick 2000). High numbers of PIPLs are typically found along the sides of unjettied (i.e., without man-made channel barrier walls) inlets, such as: Bolivar Flats, San Luis, Wolfisland, Dacros Point, Cedar Bayou, and Mansfield Pass (R. Cobb, Service, pers. comm., 2010). Of the approximately 243,751 acres of PIPL habitat in Texas we designated critical habitat on 25,285 acres (66 FR 36037). This designation was along the Texas coast in Cameron, Willacy, Kenedy, Kleberg, Nueces, Aransas, Calhoun, Matagorda, Brazoria, and Galveston counties in 37 units (74 FR 23476). In 2009, we revised and increased the amount of designated critical habitat in Texas resulting in 18 units covering 139,029 acres (74 FR 23491). The increase in acreage is primarily attributable to a change in mapping methods. In 2001, land ownership estimates did not include intertidal areas, which were included in 2009. Designated critical habitat includes habitats that support roosting, foraging, and sheltering activities of PIPLs.

Threats on the wintering grounds include development, hardening of shorelines, dredging of inlets, recreation, contamination due to spills, and projects that alter sediment movement. These threats occur on ocean-facing beaches, inlets into bays from the Gulf of Mexico, island shorelines, washover passes, bayshore beaches (bay shorelines), and seasonally-emergent mud-sand flats, including those that support seagrasses and oysters (Service 2015). In Texas, the coastal area between the Gulf of Mexico and the line of vegetation (typically as part of a dune) is public property, and it is unlawful to prevent or impede access to public beaches (Open Beaches Act, Chapter 61 of the Texas Natura Resources Code). While the birds are highly mobile and can quickly move out of harm's way, repeated flushing can deplete required energy and hinder the acquisition of energy reserves necessary to maintain body condition and survive winter and migration (Nudds and Bryant 2000, Maillet and Weber 2006, Service 2009). LeDee *et al*. (2010) found Mustang Island, was in immediate need of attention due to exceptionally high foot traffic and high vehicular densities limiting PIPL access to roosting locations. They also noted that improved monitoring to identify the sites receiving high use by PIPLs, careful enforcement of leash laws, limiting beach access, restricting the amount of beach traffic, and educating visitors to understand the meaning of restrictive signage would improve PIPL management at these sites.

The PIPL benefits from some state laws and grant programs. For example, The Dune Protection Act (Sections 63.001-63.181 of the Texas Natural Resources Code), enacted in 1973 and amended in 1991, requires the commissioners court of any county with public beaches bordering on the Gulf of Mexico to establish a dune protection line on the Gulf shoreline. Additionally, the Texas Coastal Management Program has a series of goals and policies to protect the coastal environment through federal grants. These funds go towards restoring dunes, replacing public access points through dunes with boardwalks and restoring the access point, and local government dune protection and beach access certifications. The Texas General Land Office implements the Open Beaches Act, Dune Protection Act, and Texas Coastal Management Program and owns a lot of PIPL habitat. They also oversee and permit any work done on the beach, dunes, or baysides.

The majority of PIPL critical habitat we designated in Texas is on the barrier island parallel to the mainland of Texas (74 FR 23476). Of the 139,029 acres of designated critical habitat, over 106,000 acres is federally or state owned or in a reserve. The majority is beach or tidal flats that are not near cities with the main threat due to oil and gas activities in these remote areas (74 FR 23476). As of December 2011, development has occurred on 14 percent of Texas beaches but 86 percent are undeveloped with 41 percent of that in preserves benefitting the PIPL (Service 2015).

Recovery criteria call for spatially distributing PIPL habitat from Galveston Bay west and southwest along the coast of Texas to Mexico. Management for the benefit of PIPLs is occurring in Texas. For example, TPWD installed bollards and cables to prevent vehicles from accessing and damaging PIPL habitat areas, requires leashing of pets, and does not mechanically rake beaches (K. Keyes, TPWD, pers. comm., 2011; A. Sipocz, TPWD, pers. comm., 2011). Results of surveys in Texas between 1991 and 2011 have shown increases in PIPL numbers from 1,900 to over 2,100 (Service 2015).

According to our consultations tracking database, there have been no HCPs covering PIPLs, but there have been 8 formal section 7 consultations on PIPLs in Texas. Many of them were for beach maintenance and renourishment. Others were for marina construction, Padre Island storm damage reduction and environmental restoration, dredging, seismic activities, and roads near beaches. Many of these were temporary in nature and incorporated minimization and avoidance measures while others with greater impacts restored or created PIPL habitat as mitigation. We required many of the beach nourishment projects to include beach quality sand that can benefit PIPLs by creating additional beach habitat or reducing shoreline erosion.

E. Rufa Red Knot

Texas red knots follow an inland flyway to and from the breeding grounds, using spring and fall stopovers along western Hudson Bay in Canada and in the northern Great Plains (Skagen *et al.* 1999, Newstead *et al.* 2013). In Texas, red knots occur along the Laguna Madre and concentrations also occur at the Bolivar Flats in Galveston County. Along the Texas coast, red knots forage on beaches, oyster reefs, and exposed bay bottoms and roost on high sand flats, reefs, and other sites protected from high tides on approximately 243,751 acres (Service 2015, SWCA Environmental Consultants 2019).

Except for localized areas, there have been no long-term systematic surveys of red knots in Texas. Records compiled by Skagen *et al*. (1999) give peak counts of 2,838 red knots along the coast of Texas between January and June from 1980 to 1996. In contrast, Morrison *et al*. (2006) estimated about 300 red knots wintering along the Texas coast, based on January 2003 survey data (Niles *et al*. 2008). Additionally, Foster *et al.* (2009) found from 1979 to 2007 the mean abundance of red knots on Mustang Island decreased 54 percent, while the mean number of people on the beach increased fivefold. It is difficult to accurately estimate how many winter in Texas since it is difficult to know if observed birds are wintering or migrating.

Mechanical beach cleaning is a threat to red knots in Texas. Cleaning occurs on approximately 20 of the 367 shoreline miles (5.4 percent) (Service 2015). Other threats include invasive vegetation, harmful algal blooms, oil spills, and human uses. As of December 2011, 14 percent

of Texas beaches had been developed, and 86 percent are undeveloped with 41 percent of that in preserves benefitting red knots (Service 2015).

There have been no formal section 7 consultations or HCPs for rufa red knots in the action area.

F. Ocelot

Since 1980, individual ocelots have only been documented in Cameron, Hidalgo, Willacy, Kenedy, and Jim Wells counties in Texas (Tewes and Hughes 2001). As of August 2015, 53 individuals were known in two separate populations in south Texas (Service, unpubl. data, 2015; M. Tewes, Texas A&M Kingsville, pers. comm., 2015). A third and much larger population of the Texas-Tamaulipas ocelot (*L. p. albescens*) occurs in Tamaulipas, Mexico (Caso 1994, Carvajal-Villarreal *et al.* 2012, Stasey 2012, Conservación y Desarrollo de Espacios Naturales 2014), but it is likely isolated from ocelots in Texas (Walker 1997, Janečka *et al.* 2014). Within Texas one population occurs in Willacy and Kenedy counties, primarily on private property (Navarro-Lopez 1985), and the other in Cameron County primarily on the Laguna Atascosa NWR (LANWR) (Laack 1991). There has been no state-wide estimate of ocelot habitat; however, SWCA (2019) estimated the amount of thornscrub available in Cameron, Kenedy, and Willacy counties to be approximately 78,289 acres.

Habitat conversion, fragmentation, and loss, comprise the primary threats to the ocelot today. In Texas, conversion to agriculture, rangelands, or urban land uses has occurred to over 95 percent of the dense thornscrub habitat in the Lower Rio Grande Valley (Service 2018b). Small population sizes in Texas and isolation from conspecifics in Mexico endanger the ocelot in Texas with genetic impoverishment and increased susceptibility to stochastic events. The proliferation of highways and subsequent increases in road mortality among dispersing ocelots as road building increases has reduced connectivity among ocelot populations and colonization of new habitats (Service 2018b). Issues associated with developing and patrolling the border between the U.S. and Mexico may further exacerbate the isolation of ocelots in Mexico from those in Texas.

Laguna Atascosa NWR located in Cameron and Willacy counties is over 86,000 acres and the Lower Rio Grande Valley NWR (LRGVNWR) located in Starr, Hidalgo, Willacy, and Cameron counties is over 105,000 acres with a goal of over 132,000 acres (Service 2014b, Service, unpubl. data, 2019). Both LANWR and LRGVNWR are restoring agricultural land to native thornscrub with LRGVNWR reforesting about 600 acres per year through cooperative farming agreements (Service 1997). LANWR set aside almost 1,000 acres of farmland in the 1980s where the planting of native shrubs (Young and Tewes 1994) and natural plant colonization from surrounding thornscrub has occurred. Ocelots are now using these re-established thornscrub areas (Service, unpubl. data, 2015). A separate but parallel habitat restoration program, the Burned Area Emergency Response (BAER) Program, provides funding for restoration of areas impacted by wildfires. From 2004 to 2014, the BAER Program applied herbicide treatments for invasive grass control and replanted with native brush species at 9 sites totaling 750 acres. TNC and The Conservation Fund have also acquired thousands of acres to help protect ocelot habitat and create corridors between existing habitats.

Consultations on ocelots have covered prescribed fires, a SpaceX Launch facility, several tick treatments on trails within NWRs, and several roads, some of which authorized minimal incidental take of ocelots because of the killing of ocelots by vehicles on those roads. Minimization and mitigation measures included plans to install eight highway underpasses for ocelots along Farm-to-Market Road 106 and Buena Vista Boulevard in Cameron County, three large bridge style crossings on State Highway 77 between Raymondville and Sarita, Texas, and four wildlife crossings between Los Fresnos and Laguna Vista on State Highway 100, with corresponding fencing to lead ocelots to wildlife underpasses.

G. Houston Toad

Because the action area encompasses the entire known range of the Houston toad, we consider the environmental baseline to be the status of the species.

According to our consultations tracking database, there have been at least 29 formal section 7 consultations on the Houston toad (not including those developed as part of a 10(a)(1)(B) permit, which are discussed below) in the action area. These projects included cell tower installations, federal highway construction and repair projects, wildfire restoration and recovery efforts, storm debris cleanup, and road improvements. There were also several large pipeline projects that went through Houston toad habitat, including the 407-mile Bridge Tex crude oil pipeline, the 449-mile Kinder Morgan pipeline, Targa's 500 mile Grand Prix natural gas pipeline, the 138-mile Magellan-Sirius petroleum pipeline, the 142-mile Vista Ridge potable water pipeline. These consultations incorporated avoidance and minimization measures, and where impacts could not be avoided the project proponent mitigated for the impacts, including over $5.8 million to fund research and recovery efforts for Houston toads, including headstarting and captive rearing. More recently the Service finalized a formal section 7 consultation with the U.S. Army Corps of Engineers for the construction of a petroleum pipeline through a portion of Houston toad habitat in Bastrop County.

The Service has issued approximately 250 section 10(a)(1)(B) permits for the Houston toad. Of these 188 were part of the 46-subdivision HCP, which covered over 13,000 acres, but only authorized impacts to 94 acres before expiring. Mitigation resulted in $260,500 to preserve and manage lands for the Houston toad. Three other regional HCPs cover the Houston toad: Bastrop County's Lost Pines HCP, the four utility companies HCP, and Oncor Electric HCP. All of these require avoidance and minimization measures, revegetation and management prescriptions, and mitigation, if avoidance of take is not possible, through protection and restoration of Houston toad habitat.

The Service has also issued four section 10(a)(1)(A) permits for Houston toad SHAs to improve Houston toad habitat. These include the Long Family SHA, a 10-year agreement for implementing conservation activities to improve Houston toad habitat within five management areas on a 540-acre property in Bastrop County; the Jim Small SHA, a 10-year agreement for the creation, restoration, and enhancement of Houston toad habitat on an 836 acre ranch in Bastrop County; the Boy Scouts of America/Capital Area Council SHA, a 15-year incidental take permit on 541 acres for conservation activities conducted on the GLR in Bastrop County; and to TPWD to implement a SHA across the Houston toad's range.

H. Barton Springs Salamander

Because the action area encompasses the entire known range of the BSS, we consider the environmental baseline to be the status of the species.

Two previous formal consultations not including those developed as part of a 10(a)(1)(B) permit, which are discussed below, have been completed for actions within the Barton Springs Pool complex. In 2010, we concluded consultation on proposed flood debris removal from Barton Springs Pool. This consultation covered incidental take of three BSSs for a one time removal of debris deposited in the deep end of the Pool during flooding. In 2011, we concluded consultation on the proposed reconstruction of the bypass tunnel that diverts Barton Creek around Barton Springs Pool and minor repairs needed to the downstream dam in Barton Springs Pool. This consultation covered incidental take of 385 BSSs.

We have concluded three formal consultations as part of HCPs. Two were for issuance (1998) and subsequent renewal and amendment (2013) of an HCP to the City of Austin for operation of the Barton Springs Pool. The amount of incidental take covered under the original permit was 224 to 1,652 Barton Springs salamanders per year. The newer permit authorizes 38,365 BSSs over a 20-year term (1,918 per year) with lethal take not to exceed 5 percent of the total take amount (1,918 BSS). The BSEACD received their permit for protecting and providing for adequate flows to Barton Springs. The take numbers for this HCP are "incidents," not total mortality, since salamanders will be exposed to different levels of drought conditions that may harm salamanders once or multiple times, but eventually could result in death. We authorized 6,450 incidents to BSS over the 20-year permit term.

I. Jollyville, Salado, and Georgetown Salamanders

Because the action area encompasses the entire known ranges of the Jollyville, Salado, and Georgetown salamanders, we consider the environmental baseline to be the status of the species.

1. Jollyville Plateau salamander
    a. There have been no formal section 7 consultations (except associated with an HCP, which we discuss below) on Jollyville Plateau salamanders.
    b. There have been three HCPs covering Jollyville Plateau salamanders. All three were for residential subdivisions covering over 1,100 acres, which was the permit area, not the area disturbed. Impacts were due to potential water quality degradation, but all Permittees agreed to minimization measures to reduce the potential for degradation. Additionally, lands were set-aside up stream of springs or placed in permanent preserves.
2. Salado salamander
    a. We have conducted one formal section 7 consultation on the Salado salamander for construction of a wastewater line immediately upstream of a complex of springs supporting Salado salamanders. Implementation of best management practices will reduce sedimentation and other contaminants from entering the waterway; a biologist

will monitor the spring complex during and after construction; and an older, less environmentally clean, treatment plant will be taken offline.

b. There have been no applications for 10(a)(1)(B) permits covering Salado salamanders.

3. Georgetown salamander

a. We have conducted two formal section 7 consultations for the Georgetown salamander. One on issuance of the 4(d) rule covering the Georgetown salamander within the City of Georgetown, which addresses a process for minimizing water quality impacts due to development within city limits. The other consultation was with the U.S. Army Corps of Engineers for the issuance of a Clean Water Act section 404 permit for the placement of fill into jurisdictional waters during the construction of a residential housing development known as Shadow Canyon. We determined that the development of this tract could cause harm or death of up to 50 percent of the Georgetown salamanders inhabiting springs on the tract through the reduction of water quality associated with polluted run-off and potential hydrological changes.

b. There have been no applications for 10(a)(1)(B) permits covering Georgetown salamanders.

J. Karst Invertebrates

Because the action area encompasses the entire known range of the karst invertebrates, we consider the environmental baseline to be the status of the species.

According to our consultations database for the Travis and Williamson counties karst invertebrates we have conducted one section 7 consultations not including those written as part of a 10(a)(1)(B) permit, which are discussed below), for *T. reddelli*, *T. myopica*, and *R. persephone*. This consultation covered construction by Texas Department of Transportation (TXDOT) of a new 0.4 mile arterial road connecting RM 620 to RM 2222 through known endangered karst invertebrate habitat. While there are no known listed species within the project right-of-way (ROW), upon acquiring the land, TXDOT will conduct surveys of any features present. Mitigation to support the conservation of karst invertebrates and other covered species will be to the BCCP in the amount of $190,655. Additionally, TXDOT will provide up to $200,000 to the BCCP to fund studies and contribute to the restoration of caves managed by the Balcones Canyonlands Preserve.

We have issued nine section 10(a)(1)(B) incidental take permits, including the associated intra-Service section 7 consultation, for karst invertebrates in Travis and Williamson counties. The action area for these HCPs was over 879,800 acres, which is the permit area, not the impacted area. Two of these consultations were for regional HCPs covering Travis and Williamson counties (over 877,880 acres). The remaining were for commercial or residential development. Authorized incidental take for all nine consultations was 38,680 acres and impacts to approximately 212 caves. The results of these consultations at full implementation will be at least 81 to 87 mitigation caves protected, the majority of which will be medium or high quality preserves.

According to our consultations database for the Bexar County karst invertebrates there have been no formal section 7 consultations that were not associated with a HCP for *B. venyivi* or *T. microps.* There have been five consultations for road projects covering one or more of *C. venii, C. madla*, *R. exilis*, or *R. infernalis*. Four projects have been constructed and resulted in the filling in of one cave, 1,644 acres of direct surface impacts, and 1,659 acres of indirect impacts. These adverse effects were minimized by the preservation of a medium quality preserve that is expected to be incorporated into a KFA, and the funding of biota and genetics research on *Cicurina* species.

We have issued three section 10(a)(1)(B) incidental take permits, including the associated intra-Service section 7 consultation, that covered *R. infernalis, R. exilis*, and *C. madla*. One consultation authorized the filling of one cave and impacts to two caves that are within one-acre setbacks. Mitigation for the take authorized in this permit consisted of the purchase of 7 karst preserves totaling 181 acres. The second permit was to Bexar County and the City of San Antonio for their Southern Edwards Plateau HCP and authorizes impacts to 21,086 acres of karst zones 1 and 2. Mitigation will result in 1,000 new acres of karst preserves resulting in approximately 10 to 15 KFAs protected for the recovery of these species. The final permit was for a water line that would impact 68 acres of karst habitat and result in a 58 acre permanent preserve for karst invertebrates.

K. Edwards Aquifer Aquatic Species

Because the action area encompasses the entire known range of the Comal Springs riffle beetle, Peck's cave amphipod, and San Marcos salamander, we consider the environmental baseline to be the status of the species.

According to our consultation tracking database, there have been six formal section 7 consultations covering all three species not including those developed as part of a 10(a)(1)(B) permit, which are discussed below. All six consultations were regulating pumping by federal agencies (four on DOD lands in San Antonio and two on SMARC and the Service's Uvalde National Fish Hatchery). These resulted in the agencies committing to annual reductions on Edwards Aquifer water use and seeking other water sources over time. Additionally, SMARC committed to maintaining a captive propagation program for the species.

In addition to those six formal consultations, we have formally consulted five times on the Comal Springs riffle beetle. All five consultations involved restoration and bank stabilization within Landa Lake, the Comal River, Spring Lake, and the San Marcos River (all five also covered the fountain darter, four included the San Marcos salamander and Texas wild-rice, and two included the Comal Springs dryopid beetle). Two additional formal consultations included Peck's cave amphipod. Both were for bank stabilization and restoration work in Landa Lake and the spring runs. All of these consultations included minimization measures, and while we expected take of these species, we also expected recolonization after restoration resulting in long-term benefits.

We have issued one 10(a)(1)(B) incidental take permit with an associated intra-Service section 7 consultation for the EARIP HCP, which is a multi-permittee HCP covering pumping from the

Edwards Aquifer. The permit authorized take of 11,179 Comal Springs riffle beetles, 18,224 Peck's cave amphipod, and 263,857 San Marcos salamanders mainly due to authorized pumping during drought. As a result of permit issuance, the Permittees agreed to pursue a Voluntary Irrigation Suspension Program where purchase and retirement of existing water rights occurs, restore riparian and aquatic habitat for the covered species, plan and implement regional water conservation measures, reduce pumping during drought, monitor water quality, and fund refugia and research to further our knowledge of these species.

L. Spot-tailed Earless Lizard

TPWD's (2005b) original range map identified 75 counties where the spot-tailed earless lizard potentially occurs, which was approximately the same distribution as Axtell (1968). A more recent review identified only 60 counties as potentially having spot-tailed earless lizard occurrences (TPWD 2019). Surveys across 57 of those counties in the last several years found the lizard in only 19 counties (LaDuc *et al.* 2018). The northern sub-species prefers caliche soils in moderately open prairie-brushland with oak-juniper woodlands and mesquite. The southern sub-species is typically in flatter areas in association with dark clay, clay-loam soils, and in mesquite-prickly-pear associations (TPWD 2005a). Based on LaDuc *et al*. (2018), we estimate the total area of high suitability habitat within 41 counties as approximately 5.1-5.3 million acres and the total area of low suitability habitat as approximately 13.7-14.5 million acres.

There have been no conference opinions on this species.

V. Effects of the Action

This section assesses the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on the species.

As detailed in Chapters 6.6 and 6.7 of the HCP, LCRA TSC will use a tiered approach for assessing impacts and applying varying mitigation ratios. A mitigation ratio is the number of acres that will be preserved for every one acre of habitat that is adversely impacted by the Covered Activities. Ratios are based on the significance of the impacted habitat to the species and the biological value of protected habitat compared to what will be lost. The first tier of mitigation ratios are for impacts to suitable habitat with presumed occupancy. This category is where potential habitat exists, usually based on maps and aerial photography, but not based on ground surveys that have been conducted to confirm the species is present. Suitable habitat with presumed occupancy has the lowest mitigation ratio because presuming occupancy will result in LCRA TSC mitigating for more habitat than is actually used by the species. In other words, this method overestimates occupancy of the species but can be assessed more rapidly. The second tier of mitigation ratios is for confirmed occupied habitat verified by previous study or through a survey conducted by LCRA TSC for this purpose. These areas require a higher mitigation because the species is confirmed present. The third and much higher level of mitigation is for Covered Activities that may result in a disproportionately greater impact on the Covered Species. For example, impacts that occur within designated critical habitat, within existing conservation lands, or within 50 feet of a karst or spring species location. These impacts should rarely, if ever, occur, due to the minimization measures in the LCRA TSC HCP. One minimization measure in

particular, the annual meeting between LCRA TSC and the Service, will be an opportunity to discuss upcoming projects and how they are implementing the HCP with regard to each species, at which time the Service can ensure these events are truly rare. There are also two additional multipliers to the mitigation ratios, if they occur: 1) if LCRA TSC does not implement one or more of the minimization measures, and 2) 25 percent when Covered Activities begin before mitigation is in place with an additional 5 percent for every year LCRA TSC does not provide this mitigation. The multipliers incentivize providing full and timely mitigation while allowing LCRA to carry out its operations.

A. Golden-cheeked Warbler

Direct effects due to implementation of the LCRA TSC HCP are habitat loss and fragmentation, which can reduce habitat patch sizes below the threshold used by the GCWA. Indirect effects are those occurring in GCWA habitat within 300 feet of a Covered Activity, and could occur due to increased edge, which can increase the presence of nest predators and parasites and reduce patch quality and overall habitat suitability, causing GCWAs to avoid these areas. Issuance of the requested permit will cause the loss of up to 1,399 acres of GCWA habitat and will indirectly affect up to 6,997 acres of GCWA habitat, which is 0.22 percent of all potential GCWA habitat based on Duarte *et al*.'s (2013) range-wide habitat estimate.

In an effort to reduce the impacts to the GCWAs, thereby reducing the amount of mitigation required, LCRA TSC will implement several species specific minimization measures including: 1) avoiding clearing during the breeding season from March 1 through July 31; 2) following established oak wilt prevention methods in areas where oak wilt is known to occur; and 3) avoiding stringing of transmission lines (conductor and shield wires) during the breeding season from March 1 through July 31 across GCWA habitat unless using a land-based tensioning system that will prevent transmission lines from sagging into treetops.

When take avoidance is not possible, LCRA TSC will mitigate for potential GCWA habitat that is assumed to be occupied (no survey conducted) for direct impacts at a 2:1 ratio (i.e., 2 acres of mitigation for each acre of direct impact) and 0.5:1 for indirect effects. For habitat confirmed to be occupied GCWA habitat LCRA TSC will mitigate at a 3:1 ratio for direct effects and a 0.5:1 ratio for indirect effects. Based on the amount of incidental take in acres requested by the applicant, if all of the take is used, the minimum amount of conservation would be 4,198 acres and the maximum would be 25,188 acres, depending on the specifics of future projects. While considered to be an extremely rare situation, LCRA TSC will mitigate for direct effects to protected conservation lands benefitting the GCWA at a 4:1 ratio and for indirect effects at a 1:1 ratio. These levels of mitigation are consistent with the GCWA Recovery Plan (Service 1992) by contributing to recovery by permanently preserving more acreage than is removed and by focusing mitigation in single parcels when acreage impacted will likely come from patches spanning linear projects.

Mitigation (as detailed in Chapter 6.5.2 of the HCP) will occur through one or more of the following: 1) a Service-approved conservation bank with priority given to banks that have the Covered Activities within their service area, 2) Service-approved in-lieu fee programs, 3) third-party Conservation Providers implementing Service-approved conservation actions, or 4)

Permittee-implemented Service-approved conservation actions. Whatever mitigation delivery method LCRA TSC uses, the result will be the permanent preservation of existing occupied breeding habitat that will contribute to the resiliency and redundancy of the species for persistence and recovery.

We have not designated critical habitat for the GCWA; therefore, no adverse modification of critical habitat will occur.

B. Whooping Crane

Direct effects due to implementation of the LCRA TSC HCP could occur from a collision with an existing or new line, or when habitat modification of wintering habitat occurs. Indirect effects are those occurring in whooping crane wintering habitat within 1,000 feet of a Covered Activity, and could occur by placing a line too close to wintering habitat forcing whooping cranes to use suboptimal habitat or fly farther to find more suitable habitat and potentially avoiding suitable habitat due to the structures, or from flushing cranes due to the presence of people or equipment. Impacts to whooping cranes can be refined through surveys (by either the Service or LCRA TSC), which could reduce impacts to only those acres being directly or indirectly impacted within 2,000 feet of a whooping crane detection. LCRA TSC has not requested incidental take from collisions, but only for impacts to wintering habitat. Issuance of the requested permit will cause the loss of up to 23 acres and will indirectly effect up to 1,950 acres of whooping crane wintering habitat, which is 0.56 percent of all potential wintering habitat, based on SWCA's habitat estimate (2019).

While we do not consider suitable stopover habitat to be a limiting factor within the action area (CWS and Service 2007), LCRA TSC has committed to marking those sections of new or significantly upgraded transmission lines that occur within one mile of potential migration stopover habitat within the 80 miles on either side of the center line of the migration corridor. Markers will be traditional marker balls, spiral vibration dampeners, air flow spoilers, or similar technologies and are expected to deter the whooping crane from flying near the lines.

In an effort to reduce the impacts to whooping cranes and their wintering habitat, thereby reducing the amount of mitigation required, LCRA TSC will implement several species specific minimization measures: 1) avoiding Covered Activities within potential whooping crane habitat during the overwintering period (October 15 through April 14) without the presence of an environmental monitor; 2) during the overwintering period (October 15 through April 14), embedding environmental monitors with construction crews during active construction to ensure minimization measures are implemented as intended; and 3) temporarily ceasing Covered Activities when environmental monitoring detects a whooping crane within 1,000 feet of the Covered Activity, and resuming Covered Activities when whooping cranes move beyond 1,000 feet of the Covered Activity.

When take avoidance is not possible, LCRA TSC will mitigate for potential wintering whooping crane habitat that is assumed to be occupied (no survey conducted) for direct effects at a 1:1 ratio (i.e., 1 acre of mitigation for each acre of direct impact) and 0.25:1 for indirect effects. For confirmed to be occupied whooping crane habitat LCRA TSC will mitigate at a 2:1 ratio for

direct effects and a 0.5:1 ratio for indirect effects. Based on the amount of incidental take in acres requested by the applicant, if all of the take is used, the minimum amount of conservation would be 493 acres and the maximum would be 3,946 acres, depending on the specifics of future projects. While considered to be an extremely rare situation, LCRA TSC will mitigate at a 4:1 ratio for direct effects and at a 1:1 ratio for indirect effects for a Covered Activity performed within conservation lands benefiting whooping cranes. Additionally, the LCRA TSC HCP includes a changed circumstance (HCP Chapter 9.1.1) in the event LCRA TSC confirms a whooping crane collided with an LCRA TSC structure, causing injury or death, and will notify the Service within 24 hours.

Mitigation (as detailed in Chapter 6.5.2 of the HCP) will occur through one or more of the following: 1) a Service-approved conservation bank with priority given to banks that have the Covered Activities within their service area, 2) Service-approved in-lieu fee programs, 3) third-party Conservation Providers implementing Service-approved conservation actions, or 4) Permittee-implemented Service-approved conservation actions, all with the focus of conservation on wintering habitat, including currently unoccupied but potential future wintering habitats.

We do not expect Covered Activities to occur in designated critical habitat, because: 1) the majority of critical habitat is at Aransas NWR, and 2) those areas not within the NWR system are sparsely inhabited and would likely only receive distribution lines, not transmission lines. Transmission lines are the larger structures transferring power from a power generating station to substations that then reduce the wattage of energy, so that smaller distribution lines can power homes and businesses. Therefore, we do not expect adverse effects on the PBFs of whooping crane designated critical habitat.

C. Red-cockaded Woodpecker

Direct effects due to implementation of the LCRA TSC HCP are habitat removal, degradation, or fragmentation forcing some individuals to select less-suitable locations where the species' habitat may already be at its carrying capacity. Indirect effects are those occurring within 300 feet of a Covered Activity, and could occur due to vehicular activity within active clusters, which can result in excessive soil compaction, damage to cavity tree roots, groundcover disturbance, and noise disturbance. Issuance of the requested permit will cause the loss of up to 88 acres of RCW habitat and indirectly affect up to 440 acres of RCW habitat, which is 0.02 percent of all habitat available in Texas based on SWCA's (2019) estimate.

In an effort to reduce the impacts to the RCW, thereby reducing the amount of mitigation required, LCRA TSC will implement several species specific minimization measures including: 1) avoiding Covered Activities requiring mechanical equipment within 50 feet of a cavity tree or 200 feet of a cavity tree during the breeding season (April 1 through July 31); 2) avoiding clearing of RCW habitat during the breeding season (April 1 through July 31); 3) avoiding performing Covered Activities within one hour after sunrise and one hour before sunset inside an Active Cluster; and 4) restricting vehicle use to existing access roads and avoid construction of new access roads outside of ROWs within active clusters. All of these measures are to reduce flushing of RCWs from their roost cavities, which can increase exposure to predators.

When take avoidance is not possible, LCRA TSC will mitigate for potential RCW habitat that is assumed to be occupied (no survey conducted) for direct effects at a 1:1 ratio (i.e., 1 acre of mitigation for each acre of direct impact) and 0.5:1 for indirect effects. For habitat confirmed to be occupied RCW habitat LCRA TSC will mitigate at a 2:1 ratio for direct effects and a 1:1 ratio for indirect effects. Based on the amount of incidental take in acres requested by the applicant, if all of the take is used, the minimum amount of conservation would be 264 acres and the maximum would be 1,056 acres, depending on the specifics of future projects. While considered to an extremely rare situation, LCRA TSC will mitigate at a 3:1 ratio for direct effects and at a 1:1 ratio for indirect effects for Covered Activities occurring within an active cluster, Covered Activities where the amount of suitable foraging habitat within 0.5-mile of the center of an Active Cluster falls below a threshold of 75 acres, or Covered Activities that occur on conservation lands benefitting the RCW. These levels of mitigation will contribute to overall recovery by permanently preserving more acreage than is removed and by focusing mitigation in single parcels when acreage impacted will likely come from patches spanning linear projects. Additionally, LCRA TSC will prioritize conservation actions that are of a similar type as the form of take (i.e., in-kind mitigation, where removal of cavity trees is balanced by actions that create new cavities or where modifications of foraging habitat is balanced by actions that control understory brush in foraging habitat).

We have not designated critical habitat for the RCW; therefore, no adverse effects on critical habitat will occur.

D. Piping Plover

Direct effects due to implementation of the LCRA TSC HCP are habitat loss and degradation and collision with power lines. Indirect effects are those occurring in PIPL habitat within 1,000 feet of Covered Activities and include noise and activity disturbance causing PIPLs to avoid an area for roosting or foraging. Issuance of the requested permit will cause the loss of up to 7 acres of PIPL habitat and will indirectly affect up to 122 acres of PIPL habitat, which is 0.05 percent of all habitat available in Texas, based on SWCA's (2019) estimate.

In an effort to reduce the impacts to the PIPL, thereby reducing the amount of mitigation required, LCRA TSC will implement species specific minimization measures including: 1) conducting Covered Activities in habitat during the PIPL breeding season (March 1 through August 31), when the species is not typically present in Texas; 2) establishing 15-mile-per-hour speed limits within habitat during overwintering period (September 1 through February 28 or 29) to avoid collisions; 3) restoring surface elevations after any ground disturbance, including levelling deep ruts in habitat following construction; 4) avoiding altering topography, which may cause PIPLs to avoid the area; 5) avoiding altering naturally vegetated dunes adjacent to habitat to the maximum extent practicable, since this is where PIPLs roost; and 6) because LCRA TSC has existing lines within designated critical habitat, marking those sections of the transmission line when performing new construction or upgrades. Markers will be traditional marker balls, spiral vibration dampeners, air flow spoilers, or similar technologies and are expected to deter the PIPL from flying near the lines.

When take avoidance is not possible, LCRA TSC will mitigate for potential PIPL habitat that is assumed to be occupied (no survey conducted) for direct effects at a 1:1 ratio (i.e., 1 acre of mitigation for each acre of direct impact) and 0.1:1 for indirect effects. For habitat confirmed to be occupied PIPL habitat LCRA TSC will mitigate at a 1.5:1 ratio for direct effects and a 0.2:1 for indirect effects. Based on the amount of incidental take in acres requested by the applicant, if all of the take is used, the minimum amount of conservation would be 13 acres and the maximum would be 194 acres, depending on the specifics of future projects. While considered to an extremely rare situation, LCRA TSC will mitigate at a 2:1 ratio for direct effects and 0.4:1 ratio for indirect effects for Covered Activities performed within designated critical habitat or if Covered Activities are performed within conservation areas benefitting the PIPL. These levels of mitigation will contribute to overall recovery by permanently preserving more acreage than is removed and by focusing mitigation in single parcels when acreage impacted will likely come from patches spanning linear projects.

Currently, LCRA TSC owns a 15-mile transmission line and substation that connects Port Aransas to Corpus Christi along Mustang Island, of which 0.8 miles of the line is in PIPL designated critical habitat. We do not expect adverse effects on designated critical habitat from this existing line in Nueces County because: 1) the total amount of take authorized from direct effects is 0.027 percent of all designated critical habitat in Texas, 2) we do not expect all 7 acres of direct effects to occur within the 0.8 mile ROW within designated critical habitat, and 3) LCRA TSC expects to only replace the ground wire, which does not typically have any ground disturbance (E. Huebner, LCRA TSC, pers. comm. 2019).

Of the remainder of the designated critical habitat 76 percent is either federally (in NWRs or National Seashores) or state owned (General Land Office and State Parks) where the threats are due to oil and gas development and recreation, not transmission lines. The remaining privately owned land is largely undeveloped and remote, with a smaller portion as residential or oil and gas production. We expect only smaller distribution, not transmission, lines that provide power to homes to extend into this remaining designated critical habitat due to the sparse populations in these remote areas. Therefore, we do not expect adverse effects on the PBFs of PIPL designated critical habitat.

E. Rufa Red Knot

Direct effects due to implementation of the LCRA TSC HCP are habitat loss and degradation. Indirect effects are those that occur in red knot habitat within 1,000 feet of Covered Activities and include noise and activity disturbance causing them to avoid an area for roosting or foraging. Issuance of the requested permit will cause the loss of up to 7 acres of rufa red knot habitat and will indirectly affect up to 122 acres of rufa red knot habitat, which is 0.05 percent of all habitat available, based on SWCA's (2019) habitat estimate.

In an effort to reduce the impacts to the rufa red knot, thereby reducing the amount of mitigation required, LCRA TSC will implement several species specific minimization measures including: 1) conducting Covered Activities in habitat during the red knot breeding season (April 1 through November 31), when the species is not typically present in Texas; 2) establishing 15-mile-per-hour speed limits within habitat during the wintering period (December 1 through March 31), so

that red knots can avoid collisions; 3) restoring surface elevations after any ground disturbance, including smoothing out any deep ruts in habitat following construction; 4) avoiding altering topography, which may cause red knots to avoid the area; and 5) avoiding altering naturally vegetated dunes adjacent to habitat to the maximum extent practicable, since this is where red knots roost.

When take avoidance is not possible, LCRA TSC will mitigate for potential red knot habitat that is assumed to be occupied (no survey conducted) for direct effects at a 1:1 ratio and 0.1:1 for indirect effects. For habitat confirmed to be occupied red knot habitat LCRA TSC will mitigate at a 1.5:1 ratio for direct effects and a 0.2:1 ratio for indirect effects. Based on the amount of incidental take in acres requested by the applicant, if all of the take is used, the minimum amount of conservation would be 13 acres and the maximum would be 194 acres, depending on the specifics of future projects. While considered to an extremely rare situation, LCRA TSC will mitigate at a 2:1 ratio for direct effects and at a 0.4:1 ratio for indirect effects for Covered Activities performed within conservation areas benefitting the red knot. These levels of mitigation will contribute to overall recovery by permanently preserving more acreage than is removed and by focusing mitigation in single parcels when acreage impacted will likely come from patches spanning linear projects.

We have not designated critical habitat for the rufa red knot; therefore, no adverse effects on critical habitat will occur.

F. Ocelot

Direct effects due to implementation of the LCRA TSC HCP are from habitat removal, fragmentation, edge effects, and collision. Indirect effects are those occurring within 500 feet of Covered Activities and could be due to noise causing ocelots to avoid areas of their territories. Issuance of the requested permit will cause the loss of up to 25 acres of ocelot habitat and indirectly affect up to 205 acres of ocelot habitat, due to indirect effects, which is 0.02 percent of all estimated ocelot habitat based on SWCA's (2019) estimate.

In an effort to reduce the impacts to the ocelot, thereby reducing the amount of mitigation required, LCRA TSC will implement several species specific minimization measures including: 1) conducting Covered Activities during daylight hours to avoid light and noise disturbances during the night; 2) directing artificial lighting on facilities towards the facility and shield them to minimize night-time disturbance; 3) containing and removing all garbage and foodstuff daily from work sites to prevent attracting prey species; 4) establishing 25-mile-per-hour speed limits within, or within 500 feet of, habitat to avoid collisions; and 5) embedding environmental monitors with construction crews during active construction to ensure minimization measures are implemented as intended.

When take avoidance is not possible, LCRA TSC will mitigate for direct effects to ocelots due to Covered Activities at a 3:1 ratio (i.e., 3 acres of mitigation for each acre of direct impact) and for indirect effects at 0.5:1. Based on the amount of incidental take in acres requested by the applicant, if all of the take is used, the minimum amount of conservation would be 112 acres and the maximum would be 675 acres, depending on the specifics of future projects. While

considered to an extremely rare situation, LCRA TSC will mitigate at a 6:1 ratio for direct effects and at a 1:1 ratio for indirect effects for Covered Activities performed within conservation areas benefitting the ocelot. These levels of mitigation will contribute to overall recovery by permanently preserving more acreage than is removed and by focusing mitigation in single parcels when acreage impacted will likely come from patches spanning linear projects.

We have not designated critical habitat for ocelots; therefore, no adverse effects on critical habitat will occur.

G. Houston Toad

Direct effects due to implementation of the LCRA TSC HCP are habitat loss and fragmentation; edge effects; and crushing by vehicles, machinery, or equipment when conducted in Houston toad habitat, which could result in mortality and reduced reproduction of Houston toads. Indirect effects are those occurring in Houston toad habitat within 50 feet of a Covered Activity, which can reduce dispersal of Houston toads or inhibit access to ponds, increase the favorability of the habitat for red-imported fire ants, or open the adjacent canopy causing the surrounding area to become more susceptible to drought. Issuance of the requested permit will cause the loss of up to 362 acres and will indirectly affect 662 acres of Houston toad habitat, which is 0.08 percent of potential Houston toad habitat, based on Buzo's (2008) habitat estimate, which is thought to be an underestimate of potential habitat, since Houston toads were found in areas designated as low suitability (J. Hill, Service, pers. comm. 2019). While this may make the impacts an even smaller percentage of all estimated habitat, there are varying levels of habitat quality throughout the range. It will be imperative that we take that into account when reviewing future projects and avoid those areas that are part of or contiguous with the few remaining high quality patches of habitat. We anticipate effects to dispersal habitat to be largely temporary, since Houston toads could use ROWs for dispersal after restoration is completed. However, the removal of breeding habitat would potentially affect the species on a longer timeframe, as appropriate vegetation, soil, and access to water features are all limiting factors for breeding activity.

In an effort to reduce the impacts to the Houston toad, thereby reducing the amount of mitigation required, LCRA TSC will implement several species specific minimization measures including: 1) installing toad exclusion fencing at the ROW perimeter when crossing habitat (also closing the ends with flap gates or similar barriers) to keep toads from entering the work area; 2) using Service-permitted biologists to search for and remove any individuals from the exclusion zone; 3) daily monitoring of the integrity of the exclusion fencing by Service-permitted monitors, and daily repairs of such; 4) avoiding application of pesticides or herbicides within habitat; 5) establishing 25-mile-per-hour speed limits within habitat during the breeding season (January to June) to avoid collisions; 6) performing, to the maximum extent practicable, clearing and ground disturbing activities outside of the Houston toad breeding season when Houston toads are most active; and 7) staying at least 300 feet from known breeding ponds.

When take avoidance is not possible, LCRA TSC will mitigate for direct effects to Houston toads due to Covered Activities at a 1:1 ratio (i.e., 1 acre of mitigation for each acre of direct impact) and 0.5:1 for indirect effects. Based on the amount of incidental take in acres requested by the applicant, if all of the take is used, the minimum amount of conservation would be 349

acres and the maximum would be 698 acres, depending on the specifics of future projects. While considered an extremely rare situation, LCRA TSC will mitigate at a 5:1 ratio for direct effects and at a 2:1 ratio for indirect effects for Covered Activities performed within 300 feet of a known breeding pond or conservation areas benefitting the toad. These levels of mitigation will contribute to overall recovery by permanently preserving more acreage than is removed, focusing mitigation in single parcels when acreage impacted will likely come from patches spanning linear projects, and focusing mitigation on high quality breeding and dispersal habitat. Additionally, we expect LCRA TSC to revegetate any new and existing ROWs such that Houston toads will be able to again disperse across them. We anticipate the host of minimization measures will limit direct mortality, but disruption of access to feeding, sheltering habitat, and breeding sites is possible, but likely temporary. Conservation measures will minimize this effect with limiting the time of Covered Activities in habitat and through restoration and other mitigation actions.

LCRA TSC is already party to a four utilities HCP whose permit area includes 67,214 acres of designated critical habitat in Bastrop County, and expects to continue to use the four utilities HCP when Covered Activities overlap this permit area. As of January 2018, LCRA TSC has 86 acres of mitigation credits available under the utilities HCP and has not used all of the take authorized. LCRA TSC has 50 miles of existing infrastructure in designated critical habitat in Bastrop County, including that portion covered by the utilities HCP. We consider these ROWs already impacted and analyzed under the utilities HCP. For the remaining 30,786 acres of designated critical habitat not covered under the utilities HCP, LCRA TSC does not expect to add any new lines, since they are likely not necessary with the amount of existing infrastructure (E. Huebner, pers. comm., 2019), and they have committed to avoiding activities, to the maximum extent practicable, within 300 feet of breeding ponds. While there may be some adverse effects within designated critical habitat, we do not expect those impacts to rise to the level of adverse modification due to the fact that a large portion of designated critical habitat is no longer Houston toad habitat. Additionally, we expect to discuss any potential effects on Houston toads or their designated critical habitat at the annual meetings between LCRA TSC and the Service where we can discuss whether Houston toad PBFs occur within or near the Covered Activities and possible project alterations, if necessary, to avoid those areas most important to Houston toad recovery.

The closest facility to the Burleson County designated critical habitat is over 13.7 miles from any existing infrastructure. Considering the minimization measures, in particular the annual meeting where we can discuss avoidance measures, we do not expect adverse effects to designated critical habitat from the Covered Activities in Burleson County.

H. Barton Springs Salamander

We are defining habitat here as the area within 984 feet of a spring or well, which was derived from the designated subsurface critical habitat for the Jollyville Plateau salamander. We delineated the subsurface critical habitat based on evidence that suggests the salamander population can extend at least 984 feet from the spring opening through underground conduits (78 FR 51328). We find this to be reasonable because of the biological and behavioral similarities between the BSS and Jollyville Plateau salamander, so both species are likely to

move similar distances. These similarities include, but are not limited to: deriving from the same *Eurycea* genus; occurring in the Edwards Aquifer; occurring in similar habitats of limestone karst caves, springs, and the subterranean aquifer; and having similar physiological and life history characteristics.

LCRA TSC has committed to avoiding impacts within 50 feet of a BSS spring. Direct effects due to implementation of the LCRA TSC HCP are from subsurface disturbance within 984 feet of an occupied or assumed occupied feature, which could result in the degradation of the spring site and reduce recharge to the feature. Indirect effects are those occurring out to 984 feet from a feature from Covered Activities and could occur due to surface disturbances and from the addition of impervious cover where subsurface disturbance is not necessary. These activities could result in altering flow paths of recharge to the spring, increasing the possibility of contaminated runoff from vehicles, and drying out of areas near the spring by opening the canopy. We do not expect LCRA TSC to have any impacts within 984 feet of the Barton Springs Pool locations, since there are no existing LCRA TSC structures currently. The issuance of the requested permit will cause the loss of up to 5 acres from direct and indirect effects, which is 0.2 percent of all acreage within 984 feet of the remote locations.

In an effort to reduce the impacts to the BSS, thereby reducing the amount of mitigation required, LCRA TSC will implement several species specific minimization measures including: 1) avoiding activities within 50 feet of a feature to avoid damaging the feature itself; 2) erecting erosion and sediment controls, such as silt fencing, at the boundary of the 50-foot avoidance zone around an occupied feature that will remain for the duration of the construction and any post-construction restoration to avoid sediment from reaching the feature; 3) scheduling grading and earthmoving operations to expose the smallest practical area for the shortest possible time to reduce sedimentation and erosion; 4) implementing a materials management plan to address the safe handling, storage, treatment, and disposal of materials brought within 984 feet of a feature to avoid spills and contamination of the feature; 5) avoiding application of pesticides and herbicides within 984 feet of a feature to avoid contamination of the feature; 6) embedding environmental monitors with construction crews during active construction to ensure minimization measures are implemented as intended; and 7) submitting a description of proposed Covered Activities that will occur within 984 feet of a feature, measures to minimize impacts, and necessary conservation credits for review and approval by the Service, so that we can ensure that all possible avoidance and minimization measures will be implemented.

When take avoidance is not possible, LCRA TSC will mitigate for direct effects at a 5:1 ratio (i.e., five acres of mitigation for each acre of impact) and at a 0.5:1 ratio for indirect effects to BSS due to Covered Activities. While considered to an extremely rare situation, LCRA TSC will mitigate for direct effects at a 20:1 ratio and 1:1 for indirect effects if Covered Activities occur within 50 feet of a feature or within conservation lands benefitting the BSS. These levels of mitigation will contribute to overall recovery by permanently preserving more acreage than is removed and by focusing mitigation in single parcels when acreage impacted will likely come from patches spanning linear projects.

We have not designated critical habitat for BSS; therefore, no adverse effects to critical habitat will occur.

I. Jollyville Plateau, Salado, and Georgetown Salamanders

As with the BSS, we are defining habitat as the area within 984 feet of a spring or cave where one of these species occurs. LCRA TSC has committed to avoiding impacts within 50 feet of a feature. Direct effects due to implementation of the LCRA TSC HCP could occur from subsurface disturbance within 984 feet of an occupied or assumed occupied feature, which could result in the degradation of the spring site and reduce recharge to the feature. Indirect effects could occur due to surface disturbances within habitat that are limited to the addition of impervious cover where subsurface disturbance is not necessary. Issuance of the requested permit will cause the loss of up to 16 acres of Jollyville Plateau salamander habitat from direct and indirect effects, which is 0.0014 percent of all Jollyville Plateau salamander habitat. Issuance of the requested permit will cause the loss of up to 1 acre of Salado salamander habitat from direct and indirect effects, which is 0.001 percent of all Salado salamander habitat. Issuance of the requested permit will cause the loss of up to 3 acres of Georgetown salamander habitat from direct and indirect effects, which is 0.004 percent of all Georgetown salamander habitat.

In an effort to reduce the impacts to the salamanders, thereby reducing the amount of mitigation required, LCRA TSC will implement several species specific minimization measures including: 1) avoiding activities within 50 feet of an occupied feature; 2) erecting erosion and sediment controls, such as silt fencing, at the boundary of the 50-foot avoidance zone around an occupied feature that will remain for the duration of the construction and any post-construction restoration to avoid sediment from reaching the feature; 3) scheduling grading and earthmoving operations to expose the smallest practical area for the shortest possible time to reduce sedimentation and erosion; 4) implementing a materials management plan to address the safe handling, storage, treatment, and disposal of materials brought within the 984 feet of an occupied or assumed occupied feature to avoid spills and contaminating the feature; 5) avoiding application of pesticides and herbicides within the 984 feet of an occupied or assumed occupied feature to avoid contaminating the feature; 6) embedding environmental monitors with construction crews during active construction to ensure minimization measures are implemented as intended; 7) reclaim and restore the footprint of any existing structure within designated critical habitat that is removed and not occupied by a replacement structure with a priority for matching natural cover types and native plants; and 8) submitting a description of proposed Covered Activities that will occur within 984 feet of an occupied or assumed occupied feature, measures to minimize impacts, and necessary conservation credits for review and approval by the Service, so that we can ensure that all possible avoidance and minimization measures will be implemented.

When take avoidance is not possible, LCRA TSC will mitigate for direct effects due to Covered Activities on the Jollyville, Salado, and Georgetown salamanders between 50 and 984 feet of an occupied or assumed occupied feature at a 5:1 ratio (i.e., five acres of mitigation for each acre of impact) and 0.5:1 ratio for indirect effects. While considered to an extremely rare situation, LCRA TSC will mitigate 20:1 for direct effects and 1:1 for indirect effects if Covered Activities occur within designated critical habitat, within 50 feet of an occupied or assumed occupied feature, or if within conservation areas benefitting the species. LCRA TSC will prioritize mitigation within 984 feet of an occupied or assumed occupied feature for habitat modification

that occurs within 984 feet of an occupied or assumed occupied feature. These levels of mitigation will contribute to overall recovery by permanently preserving more acreage than is removed and by focusing mitigation in single parcels when acreage impacted will likely come from patches spanning linear projects.

We have not designated critical habitat for Salado or Georgetown salamanders; therefore, no critical habitat will be affected. While some adverse effects to PBFs could occur in designated critical habitat for the Jollyville Plateau salamander, we do not expect it to rise to the level of adverse modification, since we will coordinate during annual meetings with LCRA TSC to avoid this possibility.

J. Karst Invertebrates

Take coverage for the Bexar County karst invertebrates is in Medina County only, since LCRA TSC will participate in the Southern Edwards Plateau (SEP) HCP if they work within the SEP HCP's Plan Area. Direct effects due to implementation of the LCRA TSC HCP could occur from collapsing cave ceilings; altering natural drainage patterns (by altering topography, increasing impervious cover, installing berms or water collecting devices) resulting in drying or flooding; loss or degradation of the surface plant and animal communities resulting in changes to the moisture, temperature, or nutrient regimes of the karst ecosystem and increasing predation and competition; and pollution. Indirect effects could occur due to a loss of connectivity with other features, which limits dispersal and genetic diversity, a reduction in the quality of the habitat over time (e.g. drying of a feature, less cave crickets, etc.), and less abundant vegetation for foraging cave crickets. Issuance of the requested permit will cause the loss of up to: 68 acres of Bee Creek Cave harvestmen habitat and will indirectly affect up to 20 acres, which is 0.004 percent of available habitat; 7 acres of Tooth Cave ground beetle habitat and indirectly affect up to 7 acres, which is 0.0006 percent of available habitat; 5 acres of Tooth Cave spider habitat and indirectly affect no more than 5 acres, which is 0.0006 percent of available habitat; and 5 acres of Madla Cave meshweaver, Government Canyon Bat Cave spider, Helotes mold beetle, *Rhadine exilis*, and *Rhadine infernalis* habitat each and indirectly affect no more than 5 acres each, which is 0.0005 percent of available habitat. The basis for the percentages is the amount of karst zones 1 and 2 in Medina County.

In an effort to reduce the impacts to the karst invertebrates, thereby reducing the amount of mitigation required, LCRA TSC will implement several species specific minimization measures including: 1) avoiding Covered Activities within 50 feet of an entrance or footprint, if known, to avoid damaging the entrance; 2) applying and monitoring erosion and sediment control best management practices before, during, and after construction to prevent sediment from flowing into an occupied or assumed occupied feature; 3) scheduling grading and earthmoving operations to expose the smallest practical area for the shortest possible time to have the least amount of subsurface impacts as possible; 4) implementing a materials management plan to address the safe handling, storage, treatment, and disposal of materials brought within 345 feet of a feature to avoid contamination of the feature; 5) avoiding application of pesticides and herbicides within 345 feet of a feature to avoid contamination of the feature; and 6) submitting a description of proposed Covered Activities that will occur within 345 feet of a feature, measures to minimize

impacts, and necessary conservation credits for review and approval by the Service, so that we can ensure that all possible avoidance and minimization measures will be implemented.

When take avoidance is not possible, LCRA TSC will mitigate impacts in karst zones 1 and 2 but outside of 345 feet an occupied or assumed occupied feature for direct effects at a 0.25:1 ratio (i.e., one quarter of an acre of mitigation for each acre of direct impact) and 0.1:1 for indirect effects. For impacts within 345 feet of an occupied or assumed occupied feature mitigation will be at a 10:1 ratio for direct effects and a 1:1 ratio for indirect effects. While considered to an extremely rare situation, LCRA TSC will mitigate at a 20:1 ratio for direct effects and at a 2:1 ratio for indirect effects for Covered Activities performed within 50 feet of an occupied or assumed occupied feature, or within conservation areas benefitting the covered karst invertebrates. LCRA TSC will first prioritize mitigation opportunities that contribute to the creation of a karst fauna area or that contributes to the creation or expansion of a KFA. These levels of mitigation will contribute to overall recovery by permanently preserving more acreage than is removed and by focusing mitigation in single parcels when acreage impacted will likely come from patches spanning linear projects.

We have not designated critical habitat for the Travis or Williamson county karst invertebrates; therefore, there will be no adverse effects to critical habitat. There is no critical habitat designated in Medina County; therefore, no adverse effects to designated critical habitat for the Bexar County karst invertebrates will occur.

K. Edwards Aquifer Aquatic Species

As with the other spring species, we are defining habitat as the area within 984 feet of a spring, spring run, well, or lake where at least one of these species occurs. LCRA TSC has committed to avoiding impacts within 50 feet of a spring, spring run, well, or lake with these species and within surface designated critical habitat. Direct effects due to implementation of the LCRA TSC HCP could occur from subsurface disturbance within 984 feet of a spring, spring run, well, or lake, which could result in the degradation of the site and reduce recharge to the feature. Indirect effects could occur due to surface disturbances within 984 feet that are limited to the addition of impervious cover where subsurface disturbance is not necessary and could result in altering flow paths of recharge to the spring, spring run, well, or lake, increasing the possibility of contaminated runoff from vehicles, and drying out of areas near the spring by opening the canopy. Issuance of the requested permit will cause the loss of up to one acre of Comal Springs riffle beetle habitat, one acre of Peck's cave amphipod habitat, and two acres of San Marcos salamander habitat due to direct and indirect effects. The expectation is that there will be no increase in impervious cover within this 984 feet, since Covered Activities will likely be restricted to operations and maintenance activities, and because LCRA TSC will restore any pad sites replaced with new pad sites in another area to a natural condition.

In an effort to reduce the impacts to the these species, thereby reducing the amount of mitigation required, LCRA TSC will implement several species specific minimization measures including: 1) avoiding impacts within 50 feet of the spring, spring run, well, or lake; 2) erecting erosion and sediment controls, such as silt fencing, at the boundary of the 50-foot avoidance zone around spring, spring run, well, or lake that will remain in place for the duration of the construction and

during any post-construction restoration; 3) implementing a materials management plan to address the safe handling, storage, treatment, and disposal of materials brought within 984 feet of a spring, spring run, well, or lake; 4) avoiding application of pesticides and herbicides within 984 feet of a spring, spring run, well, or lake; 5) embedding environmental monitors with construction crews during active construction to ensure minimization measures are implemented as intended; 6) within 984 feet reclaim and restore the footprint of any existing structure that is removed and not occupied by a replacement structure with a priority for matching natural cover types and native plants; and 7) submitting a description of proposed Covered Activities that will occur within 984 feet of a location with the species, measures to minimize impacts, and necessary conservation credits for review and approval by the Service, so that we can ensure that all possible avoidance and minimization measures will be implemented.

When LCRA TSC cannot avoid working within 984 feet of a spring, spring run, well, or lake, they propose to mitigate for direct effects at a 5:1 (i.e., five acres of mitigation for each acre of indirect impact) ratio and at a 0.5:1 ratio for indirect effects due to Covered Activities. While considered to be an extremely rare situation, LCRA TSC will mitigate at a 20:1 ratio for direct effects and at a 1:1 ratio for indirect effects for Covered Activities performed within 50 feet of a spring, spring run, well, or lake; within designated critical habitat; or within conservation areas benefitting the Edwards Aquifer aquatic species. LCRA TSC will prioritize available opportunities in the following manner: 1) lands within the spring shed of the feature; 2) lands within the spring shed of another known feature for that Covered Species; 3) lands within the range of the associated Covered Species; and 4) lands within the recharge zone of the segment of the Edwards Aquifer that contains the Covered Species.

While LCRA TSC has committed to avoiding working in wetted areas, they chose the Comal Springs riffle beetle, Peck's cave amphipod, and San Marcos salamander as Covered Species because they could occur near the banks where work may need to be done, for example trimming vegetation that overhangs the waterways to prevent interfering with the existing overhead electrical lines or restringing of the lines that currently span Comal and San Marcos springs. These types of activities will not have equipment within the spring, spring run, well, or lake, but could be immediately adjacent on the banks.

We have determined that Covered Activities are unlikely to occur in surface designated critical habitat, since these are wetted areas, but could occur over these areas. While work may occur above subsurface designated critical habitat, we do not expect LCRA TSC activities to intersect subsurface critical habitat. In addition, LCRA TSC has committed to restoring pad sites they replace with pad sites at different locations resulting in no additional impervious cover.

Considering the minimization measures, the limited amount of Covered Activities expected over subsurface designated critical habitat, avoidance of surface designated critical habitat, the limited amount of take being authorized, and the annual meeting where we will discuss avoidance measures, we do not expect adverse effects to designated surface critical habitat for Comal Springs riffle beetle, Peck's cave amphipod, or San Marcos salamander or to subsurface designated critical habitat for Peck's cave amphipod.

L. Spot-tailed Earless Lizard

Direct effects due to implementation of the LCRA TSC could occur from habitat removal, crushing by equipment and vehicles, and application of herbicides. Indirect effects could occur from flushing lizards from an area or when they avoid an area because of construction. Issuance of the requested permit will cause the loss of up to 253 acres of spot-tailed earless lizard habitat and indirectly effect up to 1,497 acres. This is 0.03 percent of all estimated high quality habitat available to the species based on LaDuc *et al*. (2018).

In an effort to reduce the impacts to the spot-tailed earless lizard, thereby reducing the amount of mitigation required, LCRA TSC will implement several minimization measures including: 1) avoiding application of pesticides or herbicides within 50 feet of suitable or occupied habitat to avoid altering their habitat or having the species come in contact with pesticides or herbicides, and 2) establishing 25-mile-per-hour speed limits within 50 feet of suitable or occupied habitat to reduce the potential for collision.

When take avoidance is not possible, LCRA TSC will mitigate for different levels of effects to spot-tailed earless lizards due to Covered Activities. For potential habitat that is assumed to be occupied (no survey conducted) mitigation for direct effects will be at a 1:1 ratio (i.e., 1 acre of mitigation for each acre of direct impact) and 0.25:1for indirect effects. For habitat confirmed to be occupied spot-tailed earless lizard habitat LCRA TSC will mitigate at a 2:1 ratio for direct effects and a 0.5:1 ratio for indirect effects. While considered to be an extremely rare situation, LCRA TSC will mitigate at a 3:1 ratio for direct effects and at a 0.75:1 ratio for indirect effects for Covered Activities performed within conservation areas benefitting the spot-tailed earless lizard. These levels of mitigation will benefit this species by permanently preserving more acreage than is removed and by focusing mitigation in single parcels when acreage impacted will likely come from patches spanning linear projects.

VI. Cumulative Effects

Cumulative effects those effects of future state or private activities not involving federal activities that are reasonably certain to occur in the action area of the federal subject to consultation (50 CFR 402.02). We considered cumulative effects in this biological and conference opinion. We do not consider future federal actions that are unrelated to the proposed action in this section because they require separate consultation pursuant to section 7 of the ESA.

An undetermined number of future land use and habitat conversions that are not subject to federal authorization or funding that may alter the habitat or increase incidental take of species covered by this opinion are, therefore, cumulative to the proposed project. These additional cumulative effects for aquatic species include: 1) increased pumping demands due to urbanization; 2) increased impervious cover due to urbanization, (e.g., roads and subdivisions); 3) recreational activities; 4) contaminated runoff from agriculture and urbanization; 5) aquatic habitat modification (e.g., dams, bank stabilization, flood control); and, 6) habitat alteration by invasive or exotic/non-native species. Cumulative effects for coastal species include: 1) beach and dune restoration and erosion control; 2) residential and commercial development; 3) oil and gas exploration; and 4) transportation and infrastructure improvements. Cumulative effects for

terrestrial species include: 1) increased habitat destruction and fragmentation due to expanding urbanization, 2) expanding oil and gas exploration and extraction, and 3) increased habitat destruction and fragmentation from agricultural conversion.

The increase in population and associated infrastructure in the action area will continue to increase the production of greenhouse gases, which in turn will impact the climate. The term climate refers to a "complex, interactive system consisting of the atmosphere, land surface, snow and ice, oceans and other bodies of water, and living things" (Le Treut *et al*. 2007). Different factors can act to change the climate; there are natural factors, such as volcanic eruptions and solar variations, as well as human factors, such as changes in atmospheric composition (Le Treut *et al*. 2007). Climate change refers to a major shift in weather patterns over a number of years due to these factors. One of these major shifts is a spike in global temperatures caused by an excess of carbon dioxide in the atmosphere (Le Treut *et al*. 2007). The reason the Earth's surface is warm is the presence of greenhouse gases, which act as a partial blanket keeping heat in. One of the most important greenhouse gases is carbon dioxide. Studies have shown that human activities have intensified the blanketing effect through the release of greenhouse gases, primarily through the combustion of fossil fuels and removal of forests (Le Treut *et al*. 2007). A continuing warming trend and increasing intensity of weather events (such as drought, tornados, hurricanes, and floods) could degrade or destroy Covered Species habitat and could wound or kill individuals that are not able to avoid such catastrophes. The Southern Great Plains region of the United States, which includes the state of Texas, is expected to experience a combination of increasing temperature, extreme drought, reduced streamflow, extreme precipitation, unprecedented flooding, sea level rise, and stronger hurricanes by the end of the century (Kloesel *et al*. 2018).

Expected beneficial cumulative effects reasonably expected to occur in the Plan Area include continued state, local government, and private lands preservation. While conservation of these lands may not be specifically for the Covered Species, to some degree they are likely to benefit them if the Covered Species occur on them or they protect water quality or quantity within the aquifer or springshed. Additional expected benefits include preservation of Covered Species habitat due to implementation of HCPs, which in turn could benefit the aquatic species, if the preserves are over the contributing or recharge zones. Continued coordination with state and local governments to protect roosting and foraging areas of coastal species habitat will reduce threats to those species while on their wintering grounds. Habitat restoration and captive breeding programs for many of the aquatic species will continue to contribute to our understanding of their biology and guard against possible drying of springs during drought.

VII. Conclusion

This concludes our review of the current status of the golden-cheeked warbler, whooping crane, red-cockaded woodpecker, ocelot, Houston toad, Barton Springs salamander, Comal Springs riffle beetle, Peck's cave amphipod, Bee Creek Cave harvestman, Tooth Cave spider, Tooth Cave ground beetle, Madla Cave meshweaver, Government Canyon Bat Cave spider, Helotes mold beetle, two ground beetles with no common names (*Rhadine exilis* and *Rhadine infernalis*), piping plover, rufa red knot, Jollyville Plateau salamander, Salado Springs salamander, San Marcos salamander, Georgetown salamander, and spot-tailed earless lizard; the

environmental baseline for the action area; the effects of the proposed project; and the cumulative effects. As described in the "Effects of the Action" section above we expect there to be adverse effects to the Covered Species from the Covered Activities. These adverse effects could be from direct killing, disruption of the ability to disperse, habitat removal or fragmentation, and increases in competition for habitat and food.

As detailed in Chapter 6.4 of the HCP, LCRA TSC has committed to several minimization measures to reduce impacts from Covered Activities, including, but not limited to, meeting annually with the Service to discuss minimizing and avoiding the effects of projects, and implementing best practices and other measures to reduce environmental impacts before, during, and after construction. Additionally, LCRA TSC has committed to mitigation where take avoidance is not possible by applying a multi-level tier of ratios and multipliers expected to encourage reducing impacts from Covered Activities. These ratios will result in permanently preserving more acreage than is removed and by focusing mitigation in single parcels when acreage impacted will likely come from patches spanning linear projects. We believe that the measures LCRA TSC proposes will greatly reduce the likelihood of lethal take, and while potentially damaging to the local subpopulations of the Covered Species in a worst-case scenario, the HCP will result in consequential benefits to the species as a whole. As a result, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Covered Species or adversely modify designated critical habitat.

VIII. Incidental Take Statement

Section 9 of the ESA and federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined by the Service as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is further defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding and sheltering (50 CFR §17.3). Harm is also further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns, including breeding, feeding, and sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are nondiscretionary and must be implemented by the Service so that they become binding conditions of any authorization issued to implement a project covered by this biological opinion, as appropriate, in order for the exemption in section 7(o)(2) to apply. The Service has a continuing duty to regulate the activity covered by this incidental take statement. If the Service: 1) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the authorizations, and/or 2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of

section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Service must report the progress of the action and its effect on the species. [50 CFR 402.14(i)(3)].

A. Amount or Extent of Take

Based on the results of the "Effects of the Action" analysis above, the Service anticipates incidental take of golden-cheeked warbler, whooping crane, red-cockaded woodpecker, ocelot, Houston toad, Barton Springs salamander, Comal Springs riffle beetle, Peck's cave amphipod, Bee Creek Cave harvestman, Tooth Cave spider, Tooth Cave ground beetle, Madla Cave meshweaver, Government Canyon Bat Cave spider, Helotes mold beetle, two ground beetles with no common names (*Rhadine exilis* and *Rhadine infernalis*), piping plover, rufa red knot, Jollyville Plateau salamander, Salado Springs salamander, San Marcos salamander, Georgetown salamander, and spot-tailed earless lizard will occur as a result of the proposed action. Because quantifying take of individuals of these species is difficult, this biological and conference opinion instead evaluates acres of habitat directly and indirectly affected as a surrogate for the level of incidental take. The use of habitat as a proxy for take of individuals of a species is consistent with existing case law. Courts have recognized that as a general matter "Congress wanted incidental take to be stated in numbers of animals, where practical, not in terms of habitat markers" (*Miccosukke Tribe of Indians or Florida v. US*, 566 F.3d 1257 [11th Cir. 2009]). However, courts have also explained that "While Congress indicated its preference for a numerical value; it anticipated situations in which impacts could not be contemplated in terms of a precise number.… In the absence of a specific numerical value, however, the Fish and Wildlife Service must establish that no such numerical value could be practically obtained" (see *Arizona Cattle Growers' Association v. U.S. Fish and Wildlife Service*, 273 F.3d 1229, 1249-50 [9th Cir. 2001]). See also *Oregon Natural Resources Council v. Allen*, 476 F.3.d 1031, 1037 [9th Cir. 2007] in which the Service was directed to explain why it was unable to numerically quantify the level of take. The incidental take due to the proposed action is expected to occur in the form of harm through direct and indirect adverse effects. This take will be authorized through issuance of an incidental take permit pursuant to 10(a)(1)(B) of the ESA. The following amounts of incidental take are the sum of both direct and indirect take described in the "Effects of the Action" section above and will be authorized by the proposed Permit:

1. No more than 8,396 acres of golden-cheeked warbler habitat may be adversely affected;
2. No more than 1,973 acres of whooping crane wintering habitat may be adversely affected;
3. No more than 528 acres of red-cockaded woodpecker habitat may be adversely affected;
4. No more than 129 acres of piping plover wintering habitat may be adversely affected;
5. No more than 129 acres of rufa red knot wintering habitat may be adversely affected;
6. No more than 230 acres of ocelot habitat may be adversely affected;
7. No more than 1,024 acres of Houston toad habitat may be adversely affected;
8. No more than 5 acres of Barton Springs salamander habitat may be adversely affected;
9. No more than 16 acres of Jollyville Plateau salamander habitat may be adversely affected;
10. No more than 1 acre of Salado Springs salamander habitat may be adversely affected;
11. No more than 3 acres of Georgetown salamander habitat may be adversely affected;
12. No more than 88 acres of Bee Creek Cave harvestman habitat may be adversely affected;
13. No more than 14 acres of Tooth Cave ground beetle may be adversely affected;

14. No more than 10 acres of Tooth Cave spider habitat may be adversely affected;
15. No more than 10 acres of Madla Cave meshweaver habitat may be adversely affected;
16. No more than 10 acres of Government Canyon Bat Cave spider habitat may be adversely affected;
17. No more than 10 acres of Helotes mold beetle habitat may be adversely affected;
18. No more than 10 acres of *Rhadine exilis* habitat may be adversely affected;
19. No more than 10 acres of *Rhadine infernalis* habitat may be adversely affected;
20. No more than 1 acre of Comal Springs riffle beetle habitat may be adversely affected;
21. No more than 1 acre of Peck's cave amphipod habitat may be adversely affected;
22. No more than 2 acres of San Marcos salamander habitat may be adversely affected; and
23. No more than 1,750 acres of spot-tailed earless lizard habitat may be adversely affected.

B. Effect of the Take

In the accompanying biological and conference opinion, the Service has determined that this level of anticipated take is not likely to result in jeopardy of the Covered Species.

C. Reasonable and Prudent Measures and Terms and Conditions

The HCP permit contains all measures necessary to avoid, minimize, and mitigate incidental take of the Covered Species to the maximum extent practicable and requires that the HCP be fully implemented. Monitoring will be conducted as stated in Section 6.4 of the HCP. Therefore, no additional reasonable and prudent measures and terms and conditions are necessary for the Covered Species.

IX. Conservation Recommendations

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered or threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or designated critical habitat, to help implement recovery plans, or to develop information.

1. Assist with implementing recovery tasks for those species with recovery plans.

To keep the Service informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

X. Reporting Requirements

An annual report will be submitted by LCRA TSC by September 1 each year to the Austin ESFO and will describe the previous year's activities, including compliance with all conservation measures, issues with implementation of conservation measures, how issues were resolved, an accounting for the incidental take that occurred, mitigation that was put in place, and any other compliance issues in implementing the Permit and the HCP (described in detail in HCP Chapter

8). Upon expiration of the Permit, LCRA TSC must submit a final annual report summarizing full compliance with the Permit and HCP.

XI. Reinitiation Notice

This concludes formal consultation on the issuance of a Service 10(a)(1)(B) permit for the LCRA TSC Habitat Conservation Plan to minimize and mitigate, to the maximum extent practicable, adverse effects to the Covered Species for Covered Activities described in the LCRA TSC HCP over a period of 30 years. As provided in 50 CFR Sec. 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of authorized incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this consultation; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species not considered in this biological opinion; or, (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Approved:

Adam Zerrenner, Field Supervisor **Austin Ecological Services Field Office**	**Date**

Concur:

Deputy Regional Director **Region 2**	**Date**

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