

Appendix C2 – Habitat Modeling

Lower Guadalupe Feasibility Study
(Guadalupe and Blanco Rivers), TX
Integrated Draft Feasibility Report and Environmental Assessment

October 2019



**US Army Corps
of Engineers®**
Fort Worth District

Lower Guadalupe Feasibility Study

Habitat Modeling Appendix

July 2019

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- Attachment A: Photos of Bear Creek
- Attachment B. Qualitative Habitat Evaluation Index Field Data Sheet
- Attachment C: Future-Without the Project Data and Calculations
- Attachment D: Future-With the Project Data and Calculations

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1.0 INTRODUCTION

This appendix provides documentation of the habitat evaluation and quantification process that was conducted to evaluate the benefits of various habitat types for the Lower Guadalupe River Feasibility Study (LGRFS). Quantification is needed in the project planning process to evaluate beneficial and/or adverse impacts of project features.

The action modeled in this report is a detention dam perpendicular to Bear Creek. The Bear Creek detention dam will be engineered to help reduce flooding downstream of the Guadalupe River. The dam is designed to allow normal water flows, but will slow down significant flood waters. The max inundation for this project is estimated at the 500 year flood plain.



Figure 1. River Conditions in the Guadalupe River Basin

1.1 Study Area

The greater Lower Guadalupe River Basin study area is comprised of the Guadalupe and Blanco River basins under the stewardship of the Guadalupe–Blanco River Authority (GBRA) and includes the Guadalupe River from Victoria, Texas, downstream of Canyon Lake Dam, the San Marcos River from its confluence with the Guadalupe River near Gonzales, Texas, upstream to its headwaters, and the Blanco River from its confluence with the San Marcos River upstream to where it crosses the Hays/Blanco County line. The study area lies within Victoria, De Witt, Gonzales, Guadalupe, Caldwell, Comal and Hays Counties and covers approximately 4,300 square miles

The area of interest is located in the Lower Guadalupe River Basin near San Marcos and New Braunfels, TX (Figure 2). A flood control structure is being evaluated on Bear Creek, which is located west of San Marcos, TX and northwest of New Braunfels, TX.

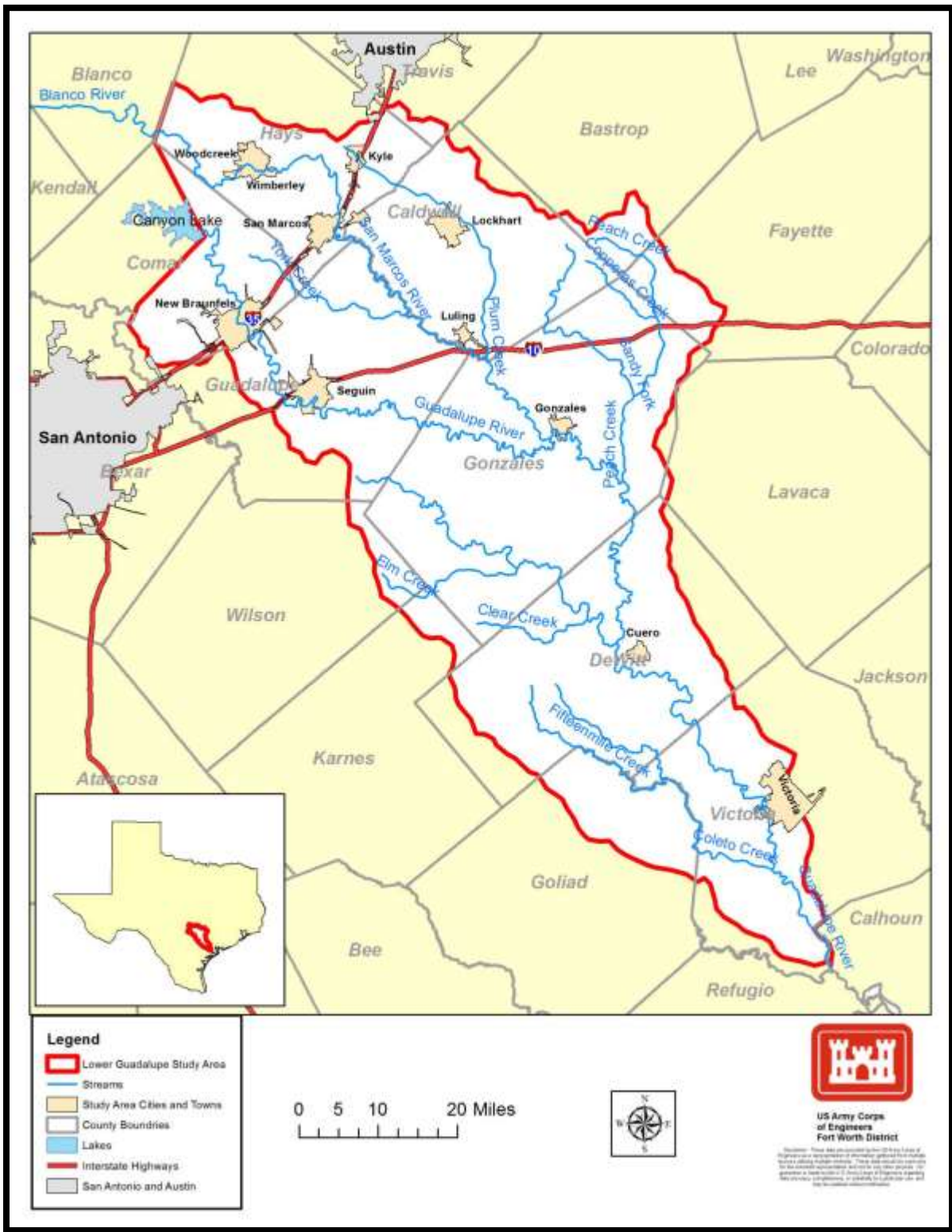


Figure 1. Lower Guadalupe River Study Area



Figure 2. Bear Creek Study Area Limits

1.2 Existing Conditions

Bear Creek is located in the Comal River-Guadalupe River watershed, Middle Guadalupe River Basin. The watershed is northwest of New Braunfels, and lies completely within Comal County. The headwaters of Bear Creek begin in the east central part of Comal County and flow east. It joins the Guadalupe River approximately 3 miles downstream of Canyon Lake Dam.

Bear Creek is roughly 4.3 miles long, the average width is between 100-140 feet and it drains directly into the Guadalupe River. Numerous low-lying dams, riffle-run complexes characterize the rivers in this area. The Bear Creek detention dam lies within the contributing zone of Edwards Aquifer. The aquifer is characterized by the presence of water wells, caves, springs, and sinkholes. Water reaching this area may flow further south into the Edwards Aquifer recharge zone. (Edwards Aquifer Authority [EAA] 2019).

The Edwards Plateau is characterized by grasslands, juniper/oak woodlands, and plateau live oak (*Quercus fusiformes*). The Bear Creek project area supports hardwood forest of varying species including pecan (*Carya illinoensis*), sugar hackberry (*Celtis laevigata*), American sycamore (*Platanus occidentalis*), cedar elm (*Ulmus crassifolia*), black willow (*Salix nigra*), and green ash (*Fraxinus pennsylvanica*). Shrub species such as: post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), Texas ash (*Fraxinus texensis*), Texas persimmon (*Diospyros texana*), Texas sophora (*Sophora affinis*), and Ashe juniper (*Juniperus ashei*) may be observed dominating the understory of a site within the project area. Herbaceous species include switchgrass (*Panicum virgatum*) and several species of bluestem (*Andropogon spp.*), eastern gamagrass (*Tripsacum dactyloides.*), Texas wintergrass (*Nassella leucotricha*), curly mesquite grass (*Hilaria belangeri*), buffalograss (*Bouteloua dactyloides*), and Indiangrass (*Sorghastrum nutans*). Common upland and hillside vegetation include yucca (*Yucca spp.*) and prickly pear (*Opuntia spp.*). On disturbed upland sites, forbs, vines, and shrubs are intermixed with noxious and/or invasive species such as several species of ragweed (*Ambrosia spp.*), cocklebur (*Xanthium spp.*), broomweed (*Gutierrezia sarothrae*), and Johnsongrass (*Sorghum halepense*) (NatureServe 2018).

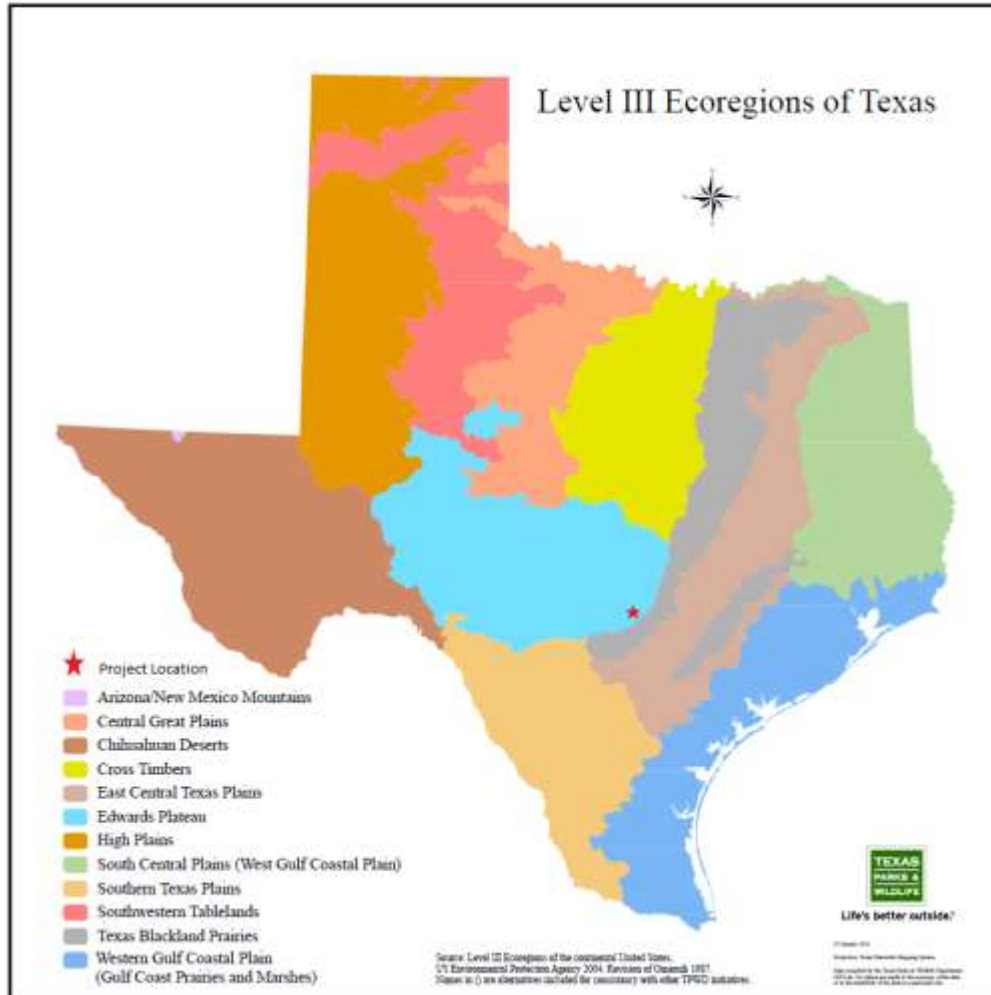


Figure 3. Map of ecoregions within Texas and Project Location (Texas Ecoregions 2019)

1.2.1 Fish and Wildlife Resources

Although the Bear Creek area is relatively small, wildlife diversity is estimated to be high due to various topographic features includes flatlands, ridges, rock outcrops, and various vegetation covers near a consistent water source. The lack of accessibility for human foot traffic, recreation, and lack of urbanization in the area helps to create a vegetative buffer to decrease disturbance compared to similar areas within Comal County.

Comal County is home to various warblers, waterfowl and birds of prey. Other wildlife species include fox squirrels (*Sciurus niger*), wild turkey (*Meleagris gallopavo*), Virginia opossum (*Didelphis virginiana*), cattle egret (*Bubulcus ibis*), white-tailed deer (*Odocoileus virginianus*), and gray fox (*Urocyon cinereoargenteus*). Fish such as minnows (*Phoxinus spp.*) and other similarly sized fish are the predominate species that can be found within the project area (Loarie et al. 2019).

1.2.1.1 Threatened and Endangered Species

The purpose of the Endangered Species Act is to provide protection for Endangered and Threatened Species. Protection is not limited to the species itself but also to the ecosystems upon which they depend on for survival. The United State Fish and Wildlife Service (USFWS) is the primary agency responsible for implementing the Endangered Species Act, and is

responsible for birds and other terrestrial and freshwater species. USFWS responsibilities under the Endangered Species Act include (1) the identification of threatened and endangered species; (2) the identification of critical habitats for listed species; (3) implementation of research on, and recovery efforts for, these species; and (4) consultation with other Federal agencies concerning measures to avoid harm to listed species.

An endangered species is a species officially recognized by USFWS as being in danger of extinction throughout all or a significant portion of its range. A threatened species is a species likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Proposed species are those that have been formally submitted to Congress for official listing as threatened or endangered. Species may be considered eligible for listing as endangered or threatened when any of the five following criteria occur: (1) current/imminent destruction, modification, or curtailment of their habitat or range; (2) overuse of the species for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; and (5) other natural or human-induced factors affecting their continued existence.

In addition, USFWS has identified species that are candidates for listing as a result of identified threats to their continued existence. The candidate designation includes species for which USFWS has sufficient information to support proposals to list as endangered or threatened under the Endangered Species Act. Until the species has gone through the entire review process it will not be listed as either endangered or threatened. Although not afforded protection by the Endangered Species Act, candidate species may be protected under other Federal or state laws.

The USFWS's Information for Planning and Consultation (IPaC) database provided three official species lists (2019A, 2019B, and 2019C), one for each of the study's action areas (Guadalupe River, Bear Creek, San Marcos). The Sections below describe each species and their habitats. The project does not entail wind energy development, therefore the red knot (*Calidris canutus rufa*), piping plover (*Charadrius melodus*), and least tern (*Sterna antillarum*) were intentionally left out from further discussions.

Whooping Crane

Whooping crane (*Grus Americana*) is white, tall, has black legs and a reddish black head. Its habitat consists of marshes, shallow lakes, lagoons, salt flats, grain and stubble fields, and barrier islands (AOU, 1983; Matthews and Moseley 1990; NatureServe, 2018J). Autumn migration normally begins in mid-September flying from Wood Buffalo National Park in central Canada, with most birds arriving on wintering grounds at Aransas National Wildlife Refuge between late October and mid-November. Spring migration occurs during March and April. It has a diverse diet consisting of crabs, snails, fish, frogs, lizards, worms, insects, berries, grains, and acorns.

Golden-cheeked Warbler

Golden-cheeked warbler (*Setophaga chrysoparia*) warbler habitat consists of old-growth and mature growth Ashe juniper-oak woodlands in rocky terrain (NatureServe, 2018D). Within the U.S, the species can only be found with the Edwards Plateau Ecoregion. It is a migratory species that spends its winters in Honduras and Guatemala. The species is a small yellow-and-black songbird that preys on insects. There have been numerous sightings of the species in the surrounding areas of the project area.

San Marcos Salamander

The San Marcos salamander (*Eurycea nana*) occurs in Spring Lake and in rocky areas up to 500 feet downstream of the dam at Spring Lake (USFWS, 2013A). Moss and algae provide hiding places for the salamanders and habitat for small animals that serve as their food. Clean, clear, and flowing water of constant temperature is required for suitable habitat. The San Marcos salamander eats tiny aquatic crustaceans, aquatic insects, and snails. The total population size was estimated to be 53,200 individuals, with at least 5,200 individuals occurring downstream of Spring Lake (USFWS, 2013A).

Preferred San Marcos salamander habitat consists of algal mats (Tupa and Davis, 1976), where rocks are associated with spring openings (Nelson 1993). Specimens are occasionally collected from beneath stones in predominantly sand and gravel areas. In view of the abundance of predators (primarily larger fish, but also crayfish, turtles, and aquatic birds) in the immediate vicinity of spring orifices, protective cover such as that afforded by algal mats and rocks is essential to the survival of the salamander. The flowing spring waters in the principal habitat are near neutral (pH 6.7 to 7.2), range from 69.8 to 73.4°F, and are clear with low DO levels (Tupa and Davis 1976, Najvar 2001, Guyton and Associates 1979, Groeger et al. 1997).

Prey items for the San Marcos salamander include amphipods, larvae and pupae, other small insect pupae and naiads (an aquatic life stage of mayflies, dragonflies, damselflies, and stone flies), and small aquatic snails (USFWS, 2013A).

Reduced flow of water from the springs is the greatest threat to the survival of the San Marcos salamander. The growth of cities has led to higher water use by people and increased problems with water pollution and silt accumulation. Introduction of invasive species is also a threat because they may destroy aquatic vegetation, prey on endangered animals, or compete with them for food. San Marcos salamanders have been recorded and are likely to still occur in and around the sediment plume at the mouth of Sessoms Creek (16 miles southeast in San Marcos).

Texas Blind Salamander

Texas blind salamander (*Typhlomolge rathbuni*) is small, white, blind, and translucent with red external gills. It lives in the dark caves, with clear cool waters within the Edwards Aquifer near San Marcos, Texas (TPWD, 2018E). Its diet consists of small crustaceans and invertebrates.

Austin Blind Salamander

Austin blind salamander (*Eurycea waterlooensis*) habitat consists of spring outlets and subterranean cavities of Edwards Aquifer, specifically within Barton Springs (Hillis et al., 2001; and USFWS, 2015) and (NatureServe, 2018A). It is a two inch, blind, semi-transparent purple salamander with feathery gills. It primarily feeds on small amphipods, ostracods, copepods, and plant material.

Barton Springs Salamander

Barton springs appearance, diet, and habitat is very similar to the Austin Blind Salamander (USFWS, 2016) as well as the only occurrence being within Bartons Springs (TPWD, 2018A).

Fountain Darter

Fountain darters (*Etheostoma fonticola*) are a small brown-and-white fish that can only be found within the San Marcos and Comal River headwaters (TPWD, 2018B). Within these areas they

can be found in and around dense vegetation, preferably algal mats in slow moving waters. Their diets consists of small aquatic invertebrates.

San Marcos Gambusia

San Marcos gambusia (*Gambusia georgei*) can only be found in the clear headwaters of the San Marcos River, its diet consists of small invertebrates. It is a one inch gold colored fish with a black stripe that runs down its back. The last known sample was collected in 1983 and it is believed to be extinct (TPWD, 2018D).

Golden Orb

The golden orb (*Quadrula aurea*) is a small round-shaped freshwater mussel with known occurrence in the Guadalupe-San Antonio and the Nueces-Frio river basins, with some occurring in the upper stretches of the Guadalupe River but with higher abundance occurring around Lake Gonzales and Lake Wood (Hammontree et.al 2012, Howells 2006; and Karatayev & Burlakova 2008). And within these streams they occur in nine separate distant patches. Data indicate that the golden orb has declined significantly throughout its former range and is now known to occur four streams. The golden orb is currently listed as a candidate species under the ESA.

The golden orb is restricted to flowing waters with sand, gravel, and cobble bottoms at depths of less than an inch to over 9 feet. It is intolerant of scouring floods that produce swept bedrock and boulder bottoms or excess sand/mud deposition. The golden orb is primarily threatened by habitat destruction and modification from impoundments that scour river beds and consequently remove mussel habitat, decrease water quality, modify stream flows, and prevent fish host migration (USFWS, 2012). Other threats include sedimentation, dewatering, sand/gravel mining, chemical contaminates, and the current and projected effects of climate change, population fragmentation, and nonnative species (USFWS, 2012).

Texas Fatmucket

Texas fatmucket (*Lampsilis bracteata*) is a small, ovate, brown, freshwater mussel. It occurs in the Colorado and Guadalupe-San Antonio drainage basins with a possibility of occurring in the Central Brazos river basins. Its habitat consists of shallow (<1m) flowing creeks, rivers, and streams that flow over sand and gravel beds with bedrock underneath (NatureServe, 2018I). This species is intolerant of impounded waters.

Texas Fawnsfoot

Texas fawnsfoot (*Truncilla macrodon*) is a small brown rhomboidal freshwater mussel. It occurs in the Colorado, Trinity, and Brazos River drainages in Central Texas (Howells et al., 1996). Its habitat consists of sand, gravel, and sandy-mud bottoms with water flowing over it. These conditions are not very well studied but are rather drawn from an inference (NatureServe, 2018H).

Texas Pimpleback

The Texas pimpleback (*Quadrula petrina*) is a large freshwater mussel with a moderately thick and inflated shell that generally reaches 2.4 to 3.5 inches in length. With the exception of growth lines, the shell of the Texas pimpleback is generally smooth (Howells, 2002). The Texas pimpleback typically occurs in moderately sized rivers, usually in mud, sand, gravel, and cobble, and occasionally in gravel-filled cracks in bedrock slab bottoms (Horne and McIntosh, 1979; Howells, 2002). The species has not been found in water depths greater than 6.6 feet. Texas pimplebacks have not been found in reservoirs, which indicates that this species is intolerant of

deep, low-velocity waters created by artificial impoundments (Howells, 2002). Texas pimplebacks appear to tolerate faster water more than many other mussel species (Horne and McIntosh 1979).

The Texas pimpleback is endemic to the Colorado and Guadalupe-San Antonio River basins of central Texas (Howells, 2002). In the Colorado River basin, the Texas pimpleback occurs throughout most of the mainstem, as well as numerous tributaries, including the Concho, North Concho, San Saba, Llano, and Pedernales Rivers; and Elm and Onion Creeks (Howells, 2010; Randklev et al., 2010; Ohio State University at Marion [OSUM], 2011). The species occurs throughout most of the Guadalupe River, as well as in the San Antonio, San Marcos, Blanco, and Medina Rivers (Horne and McIntosh 1979, Howells 2010, OSUM 2011). The Texas pimpleback has declined significantly rangewide. Four streams: San Saba, Concho, Guadalupe, and San Marcos Rivers, are known to harbor persisting populations of the species. These populations are disjunct, small, and isolated. The species has been extirpated from the remainder of its historical range (76 FR 62166).

Only two populations appear large enough to be stable, and evidence of recruitment in the Concho River population is limited. The San Saba River population may be the only remaining recruiting population of Texas pimpleback. The remaining populations in the San Marcos and Guadalupe Rivers are represented by very few individuals (76 FR 62166). In the San Marcos River near the confluence with the Blanco River in Hays County, repeated surveys between 1992 and 2000 yielded no evidence of Texas pimpleback (76 FR 62165). However, in 2003, two shells were collected (76 FR 62165), and in 2004 a single live individual was found.

Comal Springs Dryopid Beetle

Comal Springs dryopid beetle (*Stygoparnus comalensis*) is a small brown eyeless subterranean beetle. Its habitat consist of the headwaters of springs with hard-packed gravel beds with shallow running waters (NatureServe, 2018B). It has been found in Comal & Fern Bank Springs (USFWS, 2014). The critical habitat designation for this species has high water quality, relatively consistent water flow and water temperatures ranging from 68 to 75 °F (USFWS, 2013B).

Comal Springs Riffle Beetle

Comal Springs riffle beetle is a small brown eyeless subterranean beetle. It can only be found in Comal and San Marcos Springs (NatureServe 2018C), of which it inhabits within subterranean areas with leaves, roots, and detritus in which it is believed to consume. The critical habitat designation for this species has high water quality, relatively consistent water flow and water temperatures ranging from 68 to 75 °F 78 (USFWS, 2013B).

Peck's Cave Amphipod

Peck's cave amphipod (*Stygobromus (=Stygonectes) pecki*) is a small yellowish semi translucent eyeless amphipod. Habitat consist of subterranean springs of the Comal, Fern Bank, and Hueco Springs (NatureServe, 2018F). The critical habitat designation for this species has high water quality, relatively consistent water flow and water temperatures ranging from 68° to 75° F (USFWS, 2013B).

Bracted Twistflower

Bracted twistflower (*Streptanthus bracteatus*) is a 3-6ft tall annual herb that produces a purple flower. Habitat consists of slopes and canyon valleys with low density oak-juniper forests on

shallow, well drained, gravelly clays and clay loams over limestone bedrock (NatureServe, 2018E).

Texas Wild-rice

When Texas wild-rice (*Zizania texana*) was first described in 1933, it was found in abundance in the San Marcos River and Spring Lake, as well as in contiguous irrigation ditches (Terrell et al., 1978; Silveus, 1933). Following its discovery, abundance of Texas wild-rice declined substantially, and the species was listed as endangered in 1978.

Spring flow is critical for growth and survival of Texas wild-rice (Saunders et al., 2001). Texas wild-rice relies on CO₂ as its inorganic carbon source for photosynthesis rather than the more commonly available bicarbonate used by most other aquatic plants (Seal and Ellis, 1997). Water from the Edwards Aquifer contains relatively high levels of dissolved CO₂ due to the calcium carbonate makeup of the region’s karstic geology, and springflows transport the dissolved gas- enriched water downstream.

The current distribution of Texas wild-rice extends from the upper reaches of the San Marcos River to just below the wastewater treatment plant in San Marcos. The heaviest concentration occurs in Spring Lake and on upstream side of the associated dam. The most recent range wide estimate of Texas wild-rice coverage is 39,417 square feet from September 2011 (Bio-West 2012, and USFWS 2013A). Data indicate that while the total areal coverage of Texas wild-rice has generally increased in recent years, the distribution of the species has contracted (Poole, 2002). Texas wild-rice is now only found in the upper 3.5 miles of the San Marcos River, including Spring Lake. All examples of Texas wild-rice now found in Spring Lake are the result of reintroduction efforts (USFWS, 1996).

Increased sedimentation, water depth and turbidity, and a decrease in current velocities have contributed to a loss of habitat for Texas wild-rice throughout the lower portions of its historic range (Poole and Bowles, 1999). While water depth and current velocity are primarily dependent on the rate of spring flow into the San Marcos River, dams and other modifications have substantially altered local conditions of depth and current velocity. The impacts of increased sedimentation and turbidity on Texas wild-rice are largely a result of urbanization within the contributing watershed. Other threats to Texas wild-rice include direct damage to plants and substrates as a result of recreation and herbivory by waterfowl.

Table 1 provides a list of every species listed within the three action areas. In addition, it notes the likelihood of presence of each species for each action area based on species distributions, abundance, and habitat needs in order help determine species effect determinations and guide impact assessments in the Lower Guadalupe River Feasibility Study Report and Integrated Environmental Assessment and any informal and/or formal consultation under the Endangered Species Act.

Table 1. Federally Listed Threatened and Endangered Species within the Area

Common Name	Scientific Name	Federal Status	Occurrence within Project Action Areas		
			San Marcos	Bear Creek	Guadalupe River

Whooping Crane	<i>Grus americana</i>	Endangered	Not likely to Occur		
Golden-cheeked Warbler	<i>Setophaga chrysoparia</i>	Endangered	Not Likely to Occur	Potential to Occur	
San Marcos Salamander	<i>Eurycea nana</i>	Threatened	Not Likely to Occur		
Texas Blind Salamander	<i>Typhlomolge rathbuni</i>	Endangered	Not Likely to Occur		
Austin Blind Salamander	<i>Eurycea waterlooensis</i>	Endangered	Not Likely to Occur	Not Listed for the Site	
Barton Springs Salamander	<i>Eurycea sosorum</i>	Endangered	Not Likely to Occur	Not Listed for the Site	
Fountain Darter	<i>Etheostoma fonticola</i>	Endangered	Not Likely to Occur		
San Marcos Gambusia	<i>Gambusia georgei</i>	Endangered	Not Likely to Occur	Not Listed for the Site	
Golden Orb	<i>Quadrula aurea</i>	Candidate	Not Likely to Occur		
Texas Fatmucket	<i>Lampsilis bracteata</i>	Candidate	Not Likely to Occur		
Texas Fawnsfoot	<i>Truncilla macrodon</i>	Candidate	Not Likely to Occur		
Texas Pimpleback	<i>Quadrula petrina</i>	Candidate	Not Likely to Occur		
Comal Springs Dryopid Beetle	<i>Stygoparnus comalensis</i>	Endangered	Not Likely to Occur		
Comal Springs Riffle Beetle	<i>Heterelmis comalensis</i>	Endangered	Not Likely to Occur	Not Listed for the Site	Not Likely to Occur

Peck's Cave Amphipod	<i>Stygobromus</i> (= <i>Stygonectes</i>) <i>pecki</i>	Endangered	Not Likely to Occur	
Bracted Twistflower	<i>Streptanthus</i> <i>bracteatus</i>	Candidate	Not Likely to Occur	
Texas Wild-rice	<i>Zizania texana</i>	Endangered	Potential to Occur (Designated Critical Habitat)	Not Likely to Occur

1.2.1.2 Invasive Species

Canyon Lake, owned and operated by USACE, is located approximately 3 miles north of Bear Creek and flows directly in to the Guadalupe River. USACE (2018) compiled a list of invasive species that have been detected in the past, or are currently present. Due to proximity of Canyon Lake, the same invasive species, presented in Table 2, may be present within or along the Guadalupe River below Canyon Dam and/or Bear Creek.

Table 2. *Invasive Species Found at Canyon Lake*

Common Name	Scientific Name
Tree of heaven	<i>Ailanthus altissima</i>
Yellow star thistle	<i>Centaurea solstitialis</i>
Chinaberry tree	<i>Melia azedarach</i>
Chinese tallow tree	<i>Triadica sebifera</i>
Castor beans	<i>Ricinus communis</i>
King Ranch bluestem	<i>Bothriochloa ischaemum</i>
Ashe juniper	<i>Juniperus ashei</i>
Willow baccharis	<i>Baccharis salicina</i>
Feral hog	<i>Sus scrofa</i>
Feral cat	<i>Felis catus</i>
Zebra mussel	<i>Dreissena polymorpha</i>
Armored Catfish	<i>Hypotomus plecostomus</i>
Eurasian sparrow	<i>Passer montanus</i>
European starling	<i>Stumus vulgaris</i>
Fire ant	<i>Solenopsis invicta</i>

Source: U.S. Army Corps of Engineers (USACE) 2018

2.0 HABITAT ASSESSMENTS

A baseline habitat assessment using the Habitat Evaluation Procedure (HEP) was conducted to assess and project potential impacts to habitat in the study area from prospective. HEP involves defining the study area, delineating habitats (i.e. cover types) within the study area, selecting HEP models and/or evaluation species, and characterizing the study area based on the results of the HEP.

HEP was developed by the USFWS in order to quantify the impacts of habitat changes resulting from land or water development projects (USFWS 1980). HEP is based on suitability models that provide a quantitative description of the habitat requirements for a species or group of species. HEP models use measurements of appropriate variables to rate the habitat on a scale from 0.0 (unsuitable) to 1.0 (optimal).

Habitat quality was estimated through the use of species models developed specifically for each habitat type(s). Each model consists of a list of variables that are considered important in characterizing fish and wildlife habitat; a Suitability Index graph for each variable, which defines the assumed relationship between habitat quality and different variable values; and a mathematical formula that combines the Suitability Index for each variable into a single value for habitat quality. The single value is referred to as the Habitat Suitability Index (HSI).

The Suitability Index graph is a graphic representation of how fish and wildlife habitat quality or “suitability” of a given habitat type is predicted to change as values of the given variable change. It also allows the model user to numerically describe, through the Suitability Index, the habitat quality of an area for any variable value. The Suitability Index ranges from 0.1 to 1.0, with 1.0 representing optimal condition for the variable in question.

After a Suitability Index has been developed, a mathematical formula that combines all Suitability Indices into a single HSI value is constructed. Because the Suitability Indices range from 0.1 to 1.0 the HSI also ranges from 0.1 to 1.0, and is a numerical representation of the overall or “composite” habitat quality of the particular habitat being evaluated. The HSI formula defines the aggregation of Suitability Indices in a manner that is unique to each species depending on how the formula is constructed.

A combination of TPWDs Ecological Mapping Systems habitat classification data and aerial imagery was used as baseline data to define the existing habitat within the study area.

2.1.1 *Habitat Types and Acreage*

The six habitat categories include: farmland, grassland, residential, riparian forest, riverine, and upland forest. There are 23.3 acres of farmland, 92.74 acres of grassland, 0.5 acres of residential, 117.94 acres of riparian forest, 52.14 acres of riverine, and 153.54 acres of upland forest (see Figure 5). ArcMap was utilized to calculate all acreages mentioned within this report.

2.2 Habitat Evaluation

The areas evaluated for habitat suitability will be directly impacted by the Bear Creek detention dam, which include the construction footprints of proposed features and staging areas. These areas include 3.91 acres of grassland, 7.29 acres of riparian forest, 1.3 acres of riverine, and 3.23 acres of upland forest. Because residential and farmland habitat will not be directly impacted by construction, they will not be discussed in this report.

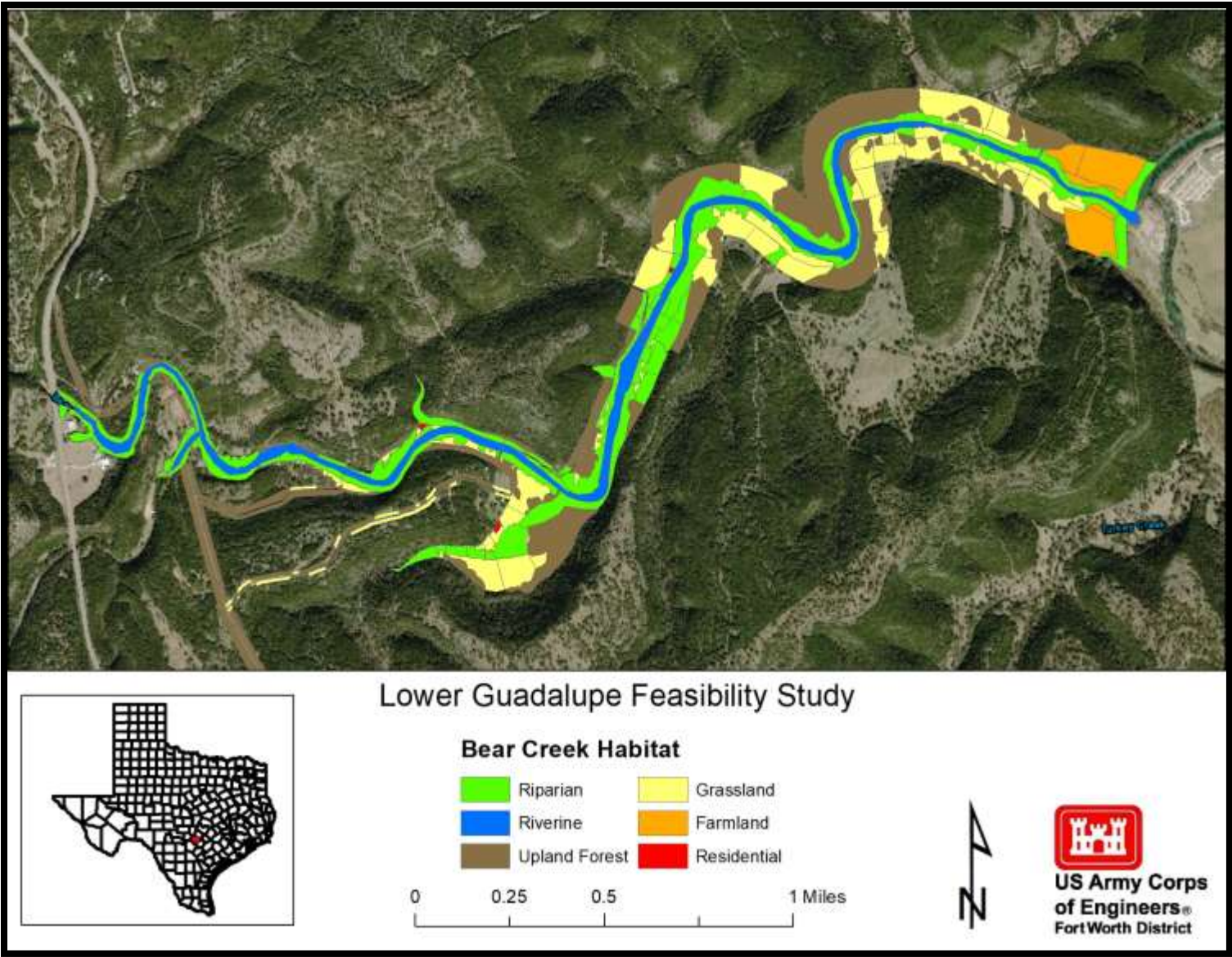


Figure 4. Evaluated Cover Types within the Bear Creek Study Area

2.3 Model Selection

The Service and Texas Parks and Wildlife Department (TPWD) participated in several resource agency meetings in 2017 to discuss potential measures, impacts, and plan site visits.

On August 25th and 31st and September 21st 2017, the models and evaluations species were chosen for the LGRFS. The model selection process was conducted over several webinar meetings with USFWS and TPWD staff. Resource Agencies were coordinated with to select USACE Eco-PCX certified species HSI models that would best represent the Lower Guadalupe River study habitats to evaluate existing conditions and habitat response to proposed restorative measures. The models were chosen based on geographical and cover type appropriateness. Other factors include economic or ecologic value to the surrounding habitat and/or community.

During the week of September 25, 2017, USACE, Service, and TPWD staff met and conducted habitat surveys at various potential measure sites within they study area. Site visits were limited to areas with public access. Some assumptions on habitat extents and quality were made and supplemented with online resources. During the week of site visits, the interagency team also conducted habitat metric projections into the future for both the future without-and future with project conditions. These efforts were used to calculate habitat mitigation requirements for the unavoidable loss of aquatic and riparian habitat. All models selected are certified by USACE headquarters for use and were also evaluated and endorsed by the USACE Ecosystem Restoration Planning Center of Expertise (ECO-PCX) based on regional and cover type applicability.

2.3.1 Terrestrial

Final evaluation species HEP models include the Fox Squirrel (*Sciurus nigris*), Barred Owl (*Strix varia*), Eastern Meadowlark (*Sturnella magna*), and Downy Woodpecker (*Picoides pubescens*) (Table 3).

Table 3. Lower Guadalupe Feasibility Study Evaluation Species

Evaluation Species	Cover Type
Barred Owl	Upland Forest
Downy Woodpecker	Upland and Riparian Forest
Fox Squirrel	Riparian Forest
Eastern Meadowlark	Grassland

2.3.1.1 Barred Owl

Metrics for the barred owl HEP model are listed below:

- Number of tree greater than 51 cm/0.4 ha
- Mean DBH of overstory trees
- Percent canopy cover of overstory trees

Table 4. Barred Owl Life Requisite Suitability Indices and the Related HSI Formula

<u>Species</u>	<u>Life Requisite Suitability Indices (LRSI)</u>	<u>HSI Formula</u>
Barred Owl	Reproduction	Equal to the reproduction suitability index HSI = SIR = (SIV1 x SIV2) ^{1/2} x SIV3
<u>Life Requisite Suitability Index Formulas & Variables</u>		
	SIV1	The relationship between the number of trees ≥51 cm dbh/0.4 ha and reproductive habitat quality for barred owls.
	SIV2	The relationship between mean dbh of overstory trees and reproductive habitat quality for barred owls
	SIV3	The relationship between percent canopy cover of over-story trees and reproductive habitat quality for barred owls.

Source: Allen 1987

2.3.1.2 Downy Woodpecker

Metrics for the downy woodpecker HEP model are listed as follows:

- Basal area
- Number of snags greater than six inches dbh/acre

Table 5. Downy Woodpecker Life Requisite Suitability Indices and the Related HSI Formula

<u>Species</u>	<u>Life Requisite Suitability Indices (LRSI)</u>	<u>HSI Formula</u>
Downy Woodpecker	Food and Reproduction	HSI is equal to the lowest life requisite value
<u>Life Requisite Suitability Index Formulas & Variables</u>		
	V1	Basal area
	V2	Number of snags > 6 inches dbh/1.0 acre

Source: Schroeder 1982A

2.3.1.3 Fox Squirrel

Metrics for the fox squirrel HEP model are listed as follows:

- Percent canopy of mast producers
- Distance to grain
- Average DBH of overstory trees
- Percent tree canopy closure
- Percent shrub crown cover

Table 6. Fox Squirrel Life Requisite Suitability Indices and the Related HSI Formula

<u>Species</u>	<u>Life Requisite Suitability Indices (LRSI)</u>	<u>HSI Formula</u>
Fox Squirrel	Food, Cover, and Reproduction	Minimum LRSI value between Forage and Reproduction
	<u>Life Requisite Suitability Index Formulas & Variables</u>	
	Winter Food	$(3V1 + V2)/3$
	Cover/Reproduction	$(V3 \times V4 \times V5)^{1/3}$
	V1	Percent canopy closure of trees that produce hard mast
	V2	Distance to available grain
	V3	Average dbh of overstory trees
	V4	Percent tree canopy closure
	V5	Percent shrub crown cover

Source: Allen 1982

2.3.1.4 Eastern Meadowlark

Metrics for the Eastern Meadowlark are listed as follows:

- Percent herbaceous canopy cover
- Proportion of herbaceous canopy cover that is grass
- Average height of herbaceous canopy
- Distance to perch site
- Percent shrub crown cover

Table 7. Eastern Meadowlark Life Suitability Indices and the Related HSI Formula

<u>Species</u>	<u>Life Requisite Suitability Indices (LRSI)</u>	<u>HSI Formula</u>
Eastern Meadowlark	Food and Reproduction	Minimum LRSI value between Forage and Reproduction
	<u>Life Requisite Suitability Index Formulas & Variables</u>	
	Food/Reproduction	$(V1 \times V2 \times V3 \times V4)^{1/2} \times V5$
	V1	Percent herbaceous canopy cover
	V2	Proportion of herbaceous canopy cover that is grass
	V3	Average height of herbaceous canopy (average spring conditions)
	V4	Distance to perch site (such as tall forb, shrub, tree, fence, or telephone wires)
	V5	Percent shrub crown cover

Source: Schroeder 1982B

2.3.2 Qualitative Habitat Evaluation Index

The viability of aquatic species, including benthic macroinvertebrate species, is dependent on the stream's physical and chemical factors (Cuffney et al. 2009). The quality of the fluvial system can be assessed based on the system's physical, chemical and biological components.

The Qualitative Habitat Evaluation Index (QHEI) in Flowing Waters was originally developed by the Ohio Environmental Protection Agency (EPA) as an index of macro-habitat quality of streams in Ohio and associated ecoregions (Ohio EPA 2006). The QHEI was designed to provide a measure of habitat that generally corresponds to the physical and chemical characteristics which influences the presence and abundance of stream fishes, and which are generally important to other aquatic life (e.g. invertebrates).

QHEI is a macro-scale approach that measures emergent properties of habitat (e.g. sinuosity, pool/riffle development) rather than the individual factors that shape these characteristics (e.g. velocity, flow depth, and median grain size). The QHEI is a measurement of the physical integrity of a stream where habitat quality is scored as the sum of a series of visually assessed, interrelated metrics, including: substrate, in-stream cover, channel morphology, riparian zone and bank erosion, pool and riffle quality, and gradient (Rankin 1989) (Table 10). Habitat quality scores range from 0 (very poor) to 100 (excellent) (Table 11), then indexed from 0 – 1. The QHEI is a quick, yet comprehensive tool that allows for rapid evaluation of streams at a reach scale.

Table 8. Metrics of the QHEI Model

Metric	Emphasis	Metric Component	Component Scoring Range	Best Possible Score
1: Substrate	Diversity of high quality substrate types.	a) Type b) Quality	0 to 21 -5 to 3	20
2: Instream Cover	Diversity of high quality instream cover.	a) Type b) Amount	0 to 10 1 to 11	20
3: Channel Morphology	Quality of the stream channel as it relates to the creation and stability of macrohabitat.	a) Sinuosity b) Development c) Channelization d) Stability	1 to 4 1 to 7 1 to 6 1 to 3	20
4: Riparian Zone and Bank Erosion	Quality of the riparian buffer zone and quality of the floodplain vegetation.	a) Width b) Quality c) Bank Erosion	0 to 4 0 to 3 1 to 3	10

5A: Pool Quality	Quality of the pool, glide, and/or riffle-run habitats.	a) Max Depth	0 to 6	12
5B: Riffle Quality		b) Current Velocity	-2 to 4	
		c) Morphology	0 to 2	
		a) Depth	0 to 4	8
		b) Substrate Stability	0 to 2	
		c) Sub. Embeddedness	1 to 2	
6: Gradient	Accounts for the varying influence of gradient with stream size.		2 to 10	10

Table 9. QHEI Habitat Rating

Habitat Rating	QHEI Score Range	Indexed Range
Excellent	≥75	≥0.75
Good	60 to 74	0.60 to 0.74
Fair	45 to 59	0.45 to 0.59
Poor	30 to 44	0.30 to 0.44
Very Poor	<30	<0.30

The QHEI currently relies on field data sheets and hand calculations to produce an index score. A blank copy of the datasheet is provided in Appendix A. Calculations were performed in a certified Excel® spreadsheet, provided by the ECO-PCX, which has previously undergone review. Subjectivity introduced into the scoring was reduced to the greatest extent practicable by ensuring that the same team performed data collection at each of the survey sites and that all data was reviewed by the resource agencies most familiar with the Lower Guadalupe system.

2.3.3 Data Collection

An interagency team was established to complete field work and review HEP results. Each of the HEP models include recommendations on how to collect data for each variable. However, due to the large study area and time constraints on field visits, some of the recommendations were not applicable for this study. In coordination with the interagency HEP team members, it was determined that the majority of the variables could be determined accurately by ocular estimation at each representative plot. Variables that could be collected efficiently in the field were measured using appropriate tools. The interagency team utilized professional judgment and knowledge of the area to determine variables that did not reflect current conditions.

2.4 Habitat Units and Annualization of Habitat Quality

The values assessed and projected during the field visits were used to identify the habitat impacts for the proposed flood risk management objective. The HSI scores were multiplied by the net change in acreages of the impacted areas to calculate the net change in Habitat Units (HUs). HUs represent a numerical combination of quality (i.e. Habitat Suitability Index) and quantity (acres) existing at any given point in time. Table 27 shows the habitat units remaining and the net change in habitat units for the proposed direct impact areas.

$$\text{Remaining Acres} \times \text{Habitat Quality (HSI)} = \text{Habitat Units (HUs)}$$

The net change in HUs is for a single point in time; however, the impacts of a detention dam would occur over the entire planning horizon (50 years). To account for the value of the loss over time, when HSI scores are not available for each year of analysis, the cumulative HUs are calculated using a formula that requires only the target year, in this case the FWOP value, and the area estimates (USFWS 1980). The following formula was used:

$$\int_0^T HU dt = (T_2 - T_1) \left[\left(\frac{A_1 H_1 + A_2 H_2}{3} \right) + \left(\frac{A_2 H_1 + A_1 H_2}{6} \right) \right]$$

Where:

$$\int_0^T HU dt = \text{Cumulative HUs}$$

T1= first target year of time interval

T2 = last target year of time interval

A1 = area of available habitat at beginning of time interval

A2= area of available habitat as the end of time interval

H1 = Habitat Suitability Index at the beginning of time interval

H2 = Habitat Suitability Index at the end of time interval

3 and 6 = constants derived from integration of HSI x Area for the interval between any two target years

This formula was developed to precisely calculate cumulative HUs when either HSI or area or both change over a time interval, which is common when dealing with the unevenness found in nature. Habitat Unit gains or losses are annualized by summing the cumulative HUs calculated using the above equation across all target years in the period of analysis and dividing the total (cumulative HUs) by the number of years in the planning horizon (i.e. 50 years). This calculation results in the Average Annual Habitat Units (AAHUs) (USFWS 1980).

The impact of a project can be quantified by subtracting the Future-With Project (FWP) scenarios benefits/impacts from FWOP benefits/impacts. The difference in AAHUs between the FWOP and the FWP represents the net impact attributable to the project in terms of habitat quantity and quality.

2.4.1 Target Years

Target Year (TY) 0 habitat conditions are represented by the existing, or baseline, habitat conditions. The field and desktop collected data were used to describe the habitat and quantify

habitat units. Target Year 0 conditions serve as a basis of comparison for both FWOP and FWP scenarios. Additional TYs were identified based on when implemented measures would be expected to elicit community responses represented by changes in the projected habitat variables.

Target Year 1 is used as a standard comparison year to identify and capture changes in habitat conditions that occur within one year after measures have been constructed. Amount of wetted area, reduction in invasive species, and water regimes are likely variables that may improve within this time period.

Target Year 5 was selected to allow enough time to review natural plant establishment. Aquatic vegetative abundance and diversity are key variables to assess community response at this target year.

Similarly, TY 25 was selected to capture the riparian habitat associated with the restored riverine and riparian habitats. Twenty-five years post-removal of Cummings Dam, the proposed mitigation effort, is adequate to capture a mature riparian habitat along the San Marcos River. Riparian plant abundance and diversity are also key response variables for this target year.

Target Year 50 is the planning life span of the project and is used as the last projected TY for the study. Mitigation measures should produce mature habitat by this target year and represent the habitat types within the study area and any mitigation areas.

3.0 FUTURE-WITHOUT THE PROJECT

Under the Future-Without the Project (FWOP) condition there would be no flood risk management on Bear Creek, however, it is anticipated that normal activities by the public and natural ecological processes would continue to occur in the study area. The following is a general description of the likely future conditions in the study area over the 50 year life of the project. The habitat types analyzed for the FWOP include: riparian forest, upland forest, grassland, and riverine habitat. Life requisite values and metric variables will be mentioned throughout this section. All projected values for the calculation of HSI, CHU, and AAHU can be found in Attachment C.

3.1 Riparian Forest

Riparian forests are typically bottomland hardwoods. The HEP defines the bottomland hardwood cover type as a wetland area dominated by deciduous trees, usually along streams, which is occasionally flooded. In optimum conditions, this cover type provides food, cover, nesting habitat, and space for riparian forest dependent species. Two evaluation species were used to represent riparian forest habitat: Fox Squirrel and Downy Woodpecker.

The limiting factor for the Fox Squirrel HEP is the average DBH of overstory trees. The other metric values were relatively high, but the average DBH brought down the overall upstream and downstream HSI scores for Fox Squirrel. The Downy Woodpecker HSI is equal to the lowest life requisite value, which in this case is the number of snags greater than 6 inches DBH per acre.

Table 10. Future-Without Project HSI and CHU Values for Upstream and Downstream Riparian Forest Habitat throughout the Target Years

Evaluation Species	Target Year										
	Acre s	0		1		5		25		50	
		HSI	CH U	HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU
Fox Squirrel Upstream	67.51	0.38	---	0.38	25.65	0.38	102.62	0.38	513.08	0.38	641.35
Downy Woodpecker Upstream	67.51	0.60	---	0.60	40.51	0.60	162.02	0.60	810.12	0.60	1012.65
Fox Squirrel Downstream	50.43	0.38	---	0.38	19.16	0.38	76.65	0.38	383.27	0.38	479.09
Downy Woodpecker Downstream	50.43	0.60	---	0.60	30.26	0.60	121.03	0.60	605.16	0.60	756.45

Table 11. Future-Without Project Total AAHUs for Riparian Habitat over 50 Years

Evaluation Species	AAHUs Over 50 Years	Average FWOP Riparian AAHUs	Total Riparian AAHUs
Fox Squirrel Upstream	25.65	33.08	57.79
Downy Woodpecker Upstream	40.51		
Fox Squirrel Downstream	19.16	24.71	
Downy Woodpecker Downstream	30.26		

3.2 Upland Forest

Deciduous forests are upland hardwood areas dominated by trees with a minimum tree canopy cover of 25%. Upland forests provide food, cover, nesting habitat, and space to upland forest dependent species. Two evaluation species were utilized to represent the upland forest guild: Northern Bobwhite, Downy Woodpecker, and Barred Owl.

Barred Owl and Downy Woodpecker displayed above average HSI scores for both upstream and downstream upland forest habitat. The Barred Owl HSI scores had significant increases at TY 25 due to an estimated increase of median DBH of overstory trees.

The Northern Bobwhite HSI scores are considerably below the average score of 0.5. The contributing factors to a low HSI score for Northern Bobwhite are listed below:

- Percent herbaceous canopy cover
- Average height of herbaceous canopy (summer)
- Percent area in equivalent optimum winter food
- Percent area in equivalent optimum cover

Table 12. Future-Without Project HSI and CHU Values for Upstream and Downstream Upland Forest Habitat throughout the Target Years

Evaluation Species		Target Year										
		Acres	0		1		5		25		50	
			HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU
Barred Owl Upstream	74.74	0.82	---	0.82	61.05	0.82	244.20	1.00	1357.89	1.00	1868.50	
Downy Woodpecker Upstream	74.74	0.80	---	0.80	59.79	0.80	239.17	0.80	1195.84	0.80	1494.80	
Northern Bobwhite Downstream	78.80	0.08	---	0.08	6.30	0.08	25.22	0.08	126.08	0.08	157.60	
Barred Owl Downstream	78.80	0.82	---	0.82	64.37	0.82	257.46	1.00	1431.66	1.00	1970.00	
Downy Woodpecker Downstream	78.80	0.80	---	0.80	63.04	0.80	252.16	0.80	1260.80	0.80	1576.00	

Table 13. Future-Without Project Total AAHUs for Upstream and Downstream Upland Habitat over 50 years

Evaluation Species	AAHUs Over 50 Years	Average FWOP Upland AAHUs	Total Upland AAHUs
Barred Owl Upstream	70.63	45.47	93.41
Downy Woodpecker Upstream	59.79		
Northern Bobwhite Downstream	6.30		
Barred Owl Downstream	74.47	47.94	
Downy Woodpecker Downstream	63.04		

3.3 Grassland

Grasslands are dominated by grasses (native or introduced) that are not regularly planted or mowed, and have a canopy cover of 25% or less. Grasslands provide open space, food, and cover for escape and nesting. The Eastern Meadowlark HEP was utilized as the evaluation species for grasslands.

The grasslands within the project area have been disturbed by human use. The grasslands identified are maintained by mowing and other mechanical means. The grassland vegetative species within the impact area are mostly non-native and have relatively low habitat use. Existing grassland value is assumed to be low due to the current conditions. Because of the highly variable nature of the grasslands in the direct impact zone of the Bear Creek detention dam, as well as regular disturbance, the HSI scores will not be utilized for mitigation efforts. Qualitative descriptions of grassland impacts will be included as appropriate.

The main factors affecting the low HSI scores for the Eastern Meadowlark are:

- Average height of herbaceous canopy (average spring conditions)
- Distance to perch site
- Percent shrub crown cover

Table 14. Future-Without Project HSI and CHU Values for Upstream and Downstream Grassland Habitat throughout the Target Years

Evaluation Species	Target Year										
	Acres	0		1		5		25		50	
		HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU
Eastern Meadowlark Upstream	26.92	0.22	---	0.22	5.99	0.22	23.96	0.22	119.79	0.22	149.73
Eastern Meadowlark Downstream	658.82	0.22	---	0.22	14.64	0.22	58.58	0.22	292.88	0.22	366.10

Table 15. Future-Without Project Total AAHUs for Upstream and Downstream Grassland Habitat Over 50 Years

Evaluation Species	AAHUs Over 50 Years	Total Grassland AAHUs
Eastern Meadowlark Upstream	5.99	20.63
Eastern Meadowlark Downstream	14.64	

3.4 Riverine

The Lower Guadalupe River Basin is well known for its clear rivers and rocky bottoms. The riverine habitat in Bear Creek is a prime example of natural conditions within Comal River-Guadalupe River watershed. It exhibits exceptional overall aquatic use values and is only expected to maintain its quality without future projects. As such, the HSI values for all TYs are exceptional.

Table 16. Future-Without Project HSI and CHU Values for Upstream and Downstream Riverine Habitat Over Throughout the Target Years

Habitat Type	Target Year										
	Acres	0		1		5		25		50	
		HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU
Riverine Upstream	29.90	0.88	---	0.88	26.31	0.88	105.25	0.88	526.24	0.88	657.80
Riverine	22.24	0.88	---	0.88	19.57	0.88	78.28	0.88	391.41	0.88	489.28

Downstream											
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Table 17. Future-Without Project Total AAHUs for Upstream and Downstream Riverine Habitat Over 50 Years

Evaluation Technique	AAHUs Over 50 Years	Total Riverine AAHUs
Riverine Upstream	26.31	45.88
Riverine Downstream	19.57	

4.0 FUTURE-WITH THE PROJECT

The no action alternative was selected, as such no impacts would occur as a result of this study. Had the Bear Creek Detention Dam alternative been selected for implementation, Future-With Project (FWP) projections show direct impacts on all of the mentioned habitat types in Chapter 3. Construction of the Bear Creek Detention Dam would have created permanent and lasting impacts to the study area. The impacts include construction access, staging areas, primary and secondary access, the Bear Creek Dam, bank protection, and a flow buffer. The design of the proposed structure will capture and slowly release water, and, with design input and advice from resource agencies, provide sediment passage, and at least seasonal fish passage.

All assessment values of the FWP, as measured against the FWOP condition, are identical unless stated otherwise. For the purpose of this report, the Bear Creek Detention Dam impacts assumed that the FWP impacts will be restricted to a direct loss in acreage for upstream Upland, Grassland, and Riverine habitats. Riparian habitat will have a direct loss in upstream acreage as well as impacts to some life requisite values for Fox Squirrel and Downy Woodpecker starting at Target Year 5.

The following sections will describe the likely future conditions in the study area over the 50 year life of the project.

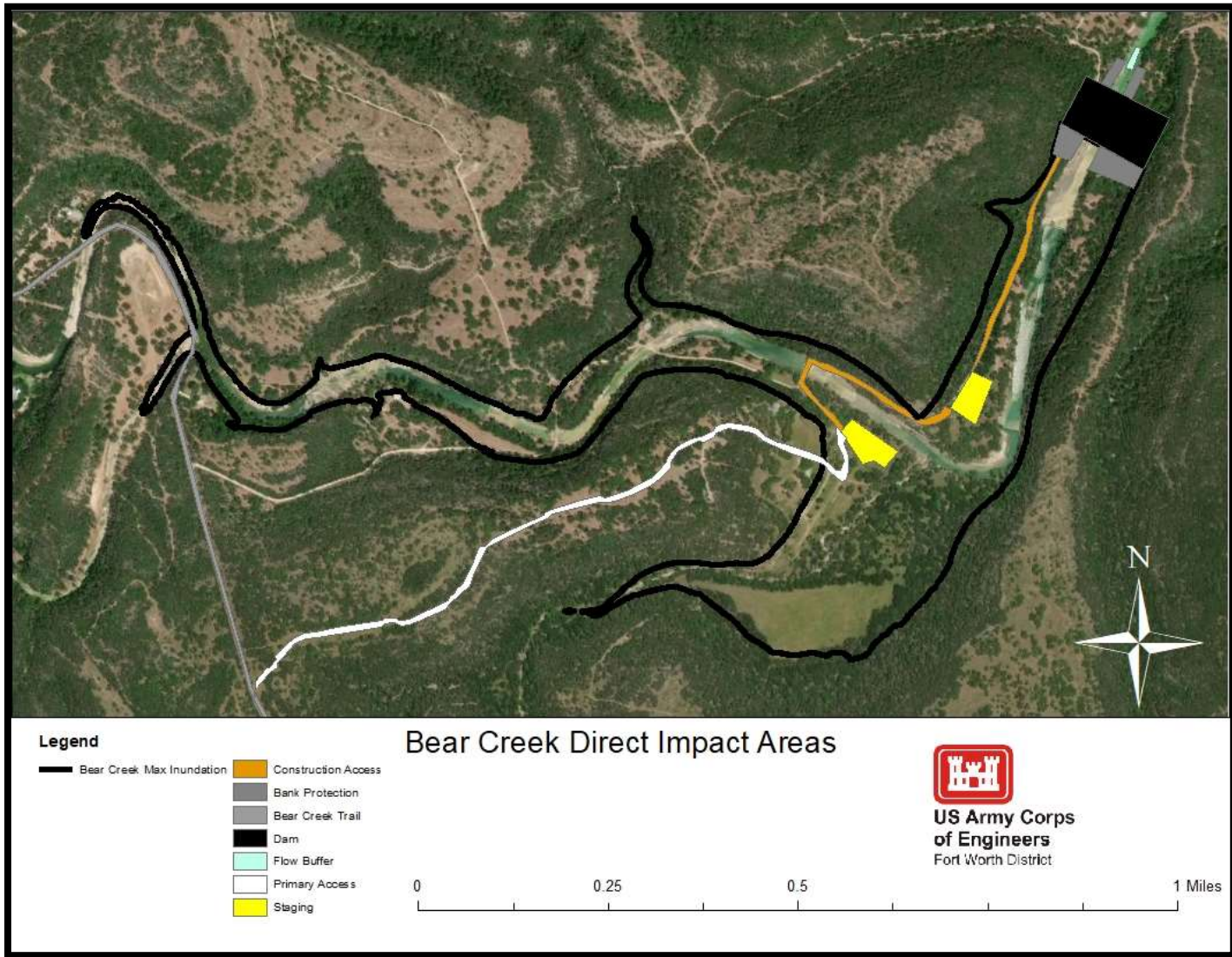


Figure 5. Areas Directly Impacted by the Proposed Bear Creek Detention Dam

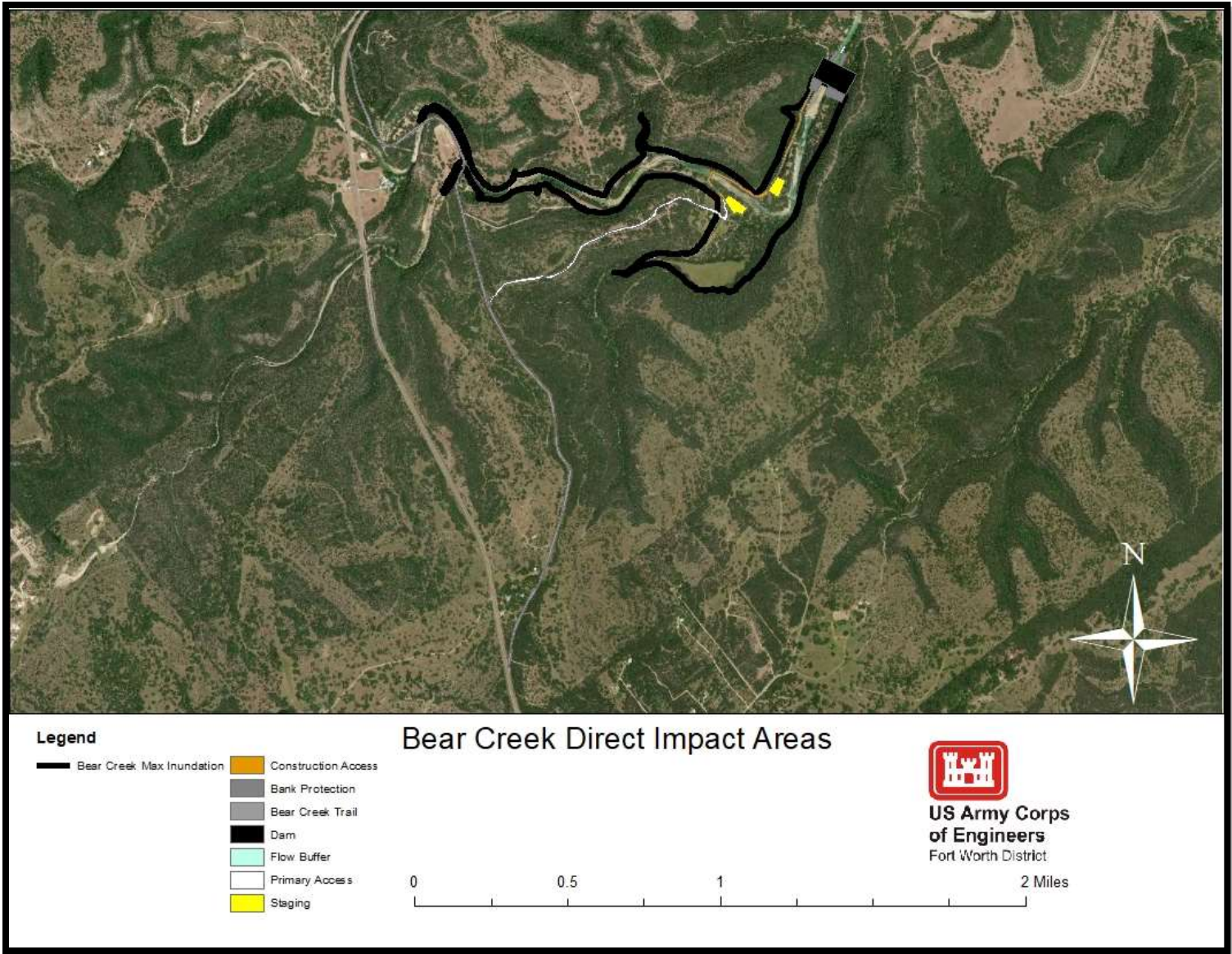


Figure 6. Entirety of Direct Impacts for the Bear Creek Project Area

4.1 Riparian

The overall acreage of upstream riparian habitat decreased by 7.29 acres, due to the permanent impacts of construction. It is assumed the quality of upstream habitat will remain the same throughout the TYs. However, life requisite values were adversely affected in downstream riparian habitat, as seen below in Table 19. The life requisite values and acreage diminished the HUs (see Attachment C), affecting the total CHUs for each year and so forth. The negative impacts to life requisite values will occur in TYs 5, 25; regarding mast canopy cover, canopy closure, and shrub cover for the Fox Squirrel and basal area for the Downy Woodpecker. A positive increase in the number of snags improved the overall HSI score of the Downy Woodpecker.

Table 18. Future-With Project HSI and CHU Values for Upstream and Downstream Riparian Forest Habitat throughout the Target Years

Evaluation Species	Target Year										
	Acres	0		1		5		25		50	
		HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU
Fox Squirrel Upstream	60.22	0.38	---	0.38	22.88	0.38	91.53	0.38	457.67	0.38	572.09
Downy Woodpecker Upstream	60.22	0.60	---	0.60	36.13	0.60	144.53	0.60	722.64	0.60	903.30
Fox Squirrel Downstream	50.43	0.38	---	0.38	19.16	0.35	73.63	0.32	337.88	0.32	403.44
Downy Woodpecker Downstream	50.43	0.60	---	0.60	30.26	0.50	110.95	0.50	504.30	0.50	630.38

Table 19. Future-With Project Total AAHUs for Upstream and Downstream Riparian Habitat Over 50 Years

Evaluation Species	AAHUs Over 50 Years	Average FWOP Riparian AAHUs	Total Riparian AAHUs
Fox Squirrel Upstream	22.88	29.51	50.61
Downy Woodpecker Upstream	36.13		
Fox Squirrel Downstream	16.68	21.10	

Downy Woodpecker Downstream	25.52		
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4.2 Upland

A total of 3.23 acres of upland habitat will be permanently impacted by the proposed action's construction. The HUs were diminished due to this loss in acreage, which decreases the overall upland forest AAHU (Table 22). Because the upland habitat is higher in elevation compared to the riparian habitat, it is assumed there will not be impacts to the life requisite variables downstream of the proposed Bear Creek Detention Dam.

Table 20. Future-With Project HSI and CHU Values for Upstream and Downstream Upland Forest Habitat Throughout the Target Years

Evaluation Species	Acres	Target Year									
		0		1		5		25		50	
		HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU
Barred Owl Upstream	71.51	0.82	---	0.82	58.41	0.82	233.64	1.00	1299.21	1.00	1787.75
Downy Woodpecker Upstream	71.51	0.80	---	0.80	57.21	0.80	228.83	0.80	1144.16	0.80	1430.20
Northern Bobwhite Downstream	78.80	0.08	---	0.08	6.30	0.08	25.22	0.08	126.08	0.08	157.60
Barred Owl Downstream	78.80	0.82	---	0.82	64.37	0.82	257.46	1.00	1431.66	1.00	1970.00
Downy Woodpecker Downstream	78.80	0.80	---	0.80	63.04	0.80	252.16	0.80	1260.80	0.80	1576.00

Table 21. Future-With Project Total AAHUs for Upstream and Downstream Upland Habitat Over 50 Years

Evaluation Species	AAHUs Over 50 Years	Average FWOP Upland AAHUs	Total Upland AAHUs
Barred Owl Upstream	67.58	43.50	91.44
Downy Woodpecker Upstream	57.21		

Northern Bobwhite Downstream	6.30	47.94	
Barred Owl Downstream	74.47		
Downy Woodpecker Downstream	63.04		

4.3 Grassland

Grassland impacts in the FWP are similar to the Upland habitat impacts. There will not be a decrease in the life requisite values, but the overall decrease of upstream grassland habitat from 26.92 to 23.01 acres will negatively impact the total AAHU score.

Table 22. Future-With Project HSI and CHU Values for Upstream and Downstream Grassland Habitat throughout the Target Years

Evaluation Species	Target Year										
	Acres	0		1		5		25		50	
		HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU
Eastern Meadowlark Upstream	23.01	0.22	---	0.22	5.12	0.22	20.48	0.22	102.39	0.22	127.99
Eastern Meadowlark Downstream	3.89	0.22	---	0.22	0.87	0.22	3.46	0.22	17.31	0.22	21.64

Table 23. Future-With Project Total AAHUs for Upstream and Downstream Grassland Habitat Over 50 Years

Evaluation Species	AAHUs Over 50 Years	Total Grassland AAHUs
Eastern Meadowlark Upstream	5.12	14.65
Eastern Meadowlark Downstream	5.98	

4.4 Riverine

The Bear Creek Detention Dam construction will result in a net loss of 1.3 acres of riverine habitat. Although the total AAHU compared to the FWOP will decrease due to the acreage loss, it is assumed upstream and downstream riverine habitat will remain high quality as regular flows would be allowed to pass through culverts at the base of the structure.

Table 24. Future-With Project HSI and CHU Values for Upstream and Downstream Riverine Habitat Throughout the Target Years

Habitat Type	Target Year										
	Acres	0		1		5		25		50	
		HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU	HSI	CHU
Riverine Upstream	28.60	0.88	---	0.88	25.17	0.88	100.67	0.88	503.36	0.88	629.20
Riverine Downstream	22.24	0.88	---	0.88	19.57	0.88	78.28	0.88	391.42	0.88	489.28

Table 25. Future-With Project Total AAHUs for Upstream and Downstream Riverine Habitat Over 50 Years

Evaluation Technique	AAHUs Over 50 Years	Total Riverine AAHUs
Riverine Upstream	25.17	44.74
Riverine Downstream	19.57	

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ATTACHMENT A: PHOTOS OF BEAR CREEK

Bear Creek x Little Bear Creek (Looking U/S Little Bear Creek)	Bear Creek x Little Bear Creek (Looking D/S Little Bear Creek)
	
Bear Creek x Bear Creek Trail	Bear Creek x Bear Creek Trail (Looking D/S)



Dropping into the Bear Creek Drainage



Bear Creek x FM 2722 (Looking D/S)



Bear Creek x FM 2722 (Looking U/S)



ATTACHMENT B: QUALITATIVE HABITAT EVALUATION INDEX FIELD DATA SHEET

OhioEPA		Qualitative Habitat Evaluation Index and Use Assessment Field Sheet				QHEI Score:	#DIV/0!
Substrate	Cover	Channel	Riparian	Pool/Current	Riffle/Run	Gradient	
#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
Max 20	Max 20	Max 20	Max 10	Max 12	Max 8	Max 10	
Stream & Location:				RM:	Date:		
				Scorers Full Name & Affiliation:			
River Code:	STORET #:		Lat./Long.:		Office Verific		Location
			(NAD 83 - decimal ')				
1] SUBSTRATE							
BEST TYPES		OTHER TYPES		ORIGIN		QUALITY	
POOL	RIFFLE	POOL	RIFFLE				
<input type="checkbox"/> BLDR / SLABS		<input type="checkbox"/> HARDPAN		<input type="checkbox"/> LIMESTONE		<input type="checkbox"/> HEAVY	
<input type="checkbox"/> BOULDER		<input type="checkbox"/> DETRITUS		<input type="checkbox"/> TILLS	SILT	<input type="checkbox"/> MODERATE	
<input type="checkbox"/> COBBLE		<input type="checkbox"/> MUCK		<input type="checkbox"/> WETLANDS		<input type="checkbox"/> NORMAL	
<input type="checkbox"/> GRAVEL		<input type="checkbox"/> SILT		<input type="checkbox"/> HARDPAN		<input type="checkbox"/> FREE	
<input type="checkbox"/> SAND		<input type="checkbox"/> ARTIFICIAL		<input type="checkbox"/> SANDSTONE			
<input type="checkbox"/> BEDROCK				<input type="checkbox"/> RIP/RAP		<input type="checkbox"/> EXTENSIVE	Substrate
NUMBER OF BEST TYPES:		<input type="checkbox"/> 4 or more		<input type="checkbox"/> LACUSTURINE	EMBED	<input type="checkbox"/> MODERATE	#DIV/0!
		<input type="checkbox"/> 3 or less		<input type="checkbox"/> SHALE		<input type="checkbox"/> NORMAL	Max 20
				<input type="checkbox"/> COAL FINES		<input type="checkbox"/> NONE	
2] INSTREAM COVER							
<input type="checkbox"/> UNDERCUT BANKS	<input type="checkbox"/> POOLS > 70cm	<input type="checkbox"/> OXBOWS, BACKWATERS					Cover
<input type="checkbox"/> OVERHANGING VEGETATION	<input type="checkbox"/> ROOTWADS	<input type="checkbox"/> AQUATIC MACROPHYTES					0
<input type="checkbox"/> SHALLOWS (IN SLOW WATER)	<input type="checkbox"/> BOULDERS	<input type="checkbox"/> LOGS OR WOODY DEBRIS					Max 20
<input type="checkbox"/> ROOTMATS							
3] CHANNEL MORPHOLOGY							
SINUOSITY	DEVELOPMENT		CHANNELIZATION		STABILITY		
<input type="checkbox"/> HIGH	<input type="checkbox"/> EXCELLENT	<input type="checkbox"/> NONE		<input type="checkbox"/> HIGH			Channel
<input type="checkbox"/> MODERATE	<input type="checkbox"/> GOOD	<input type="checkbox"/> RECOVERED		<input type="checkbox"/> MODERATE			#DIV/0!
<input type="checkbox"/> LOW	<input type="checkbox"/> FAIR	<input type="checkbox"/> RECOVERING		<input type="checkbox"/> LOW			Max 20
<input type="checkbox"/> NONE	<input type="checkbox"/> POOR	<input type="checkbox"/> RECENT OR NO RECOVERY					

4] BANK EROSION AND RIPARIAN ZONE

EROSION		RIPARIAN WIDTH		FLOOD PLAIN QUALITY			
<input type="checkbox"/> <input type="checkbox"/>	NONE / LITTLE	<input type="checkbox"/> <input type="checkbox"/>	WIDE >50m	<input type="checkbox"/> <input type="checkbox"/>	FOREST, SWAMP	<input type="checkbox"/> <input type="checkbox"/>	CONSERVATION TILLAGE
<input type="checkbox"/> <input type="checkbox"/>	MODERATE	<input type="checkbox"/> <input type="checkbox"/>	MODERATE 10-50m	<input type="checkbox"/> <input type="checkbox"/>	SHRUB OR OLD FIELD	<input type="checkbox"/> <input type="checkbox"/>	URBAN OR INDUSTRIAL
<input type="checkbox"/> <input type="checkbox"/>	HEAVY / SEVERE	<input type="checkbox"/> <input type="checkbox"/>	NARROW 5-10m	<input type="checkbox"/> <input type="checkbox"/>	RESIDENTIAL, PARK, NEW FIELD	<input type="checkbox"/> <input type="checkbox"/>	MINING/CONSTRUCTION
		<input type="checkbox"/> <input type="checkbox"/>	VERY NARROW <5m	<input type="checkbox"/> <input type="checkbox"/>	FENCED PASTURE		
		<input type="checkbox"/> <input type="checkbox"/>	NONE	<input type="checkbox"/> <input type="checkbox"/>	OPEN PASTURE, ROW CROP		
							Riparian
							#DIV/0!
							Max 10

5] POOL/SLIDE AND RIFFLE/RUN QUALITY

MAXIMUM DEPTH		CHANNEL WIDTH		CURRENT VELOCITY		Recreation Potential		
<input type="checkbox"/> <input type="checkbox"/>	> 1m	<input type="checkbox"/> <input type="checkbox"/>	POOL > RIFFLE	<input type="checkbox"/> <input type="checkbox"/>	TORRENTIAL	<input type="checkbox"/> <input type="checkbox"/>	SLOW	PRIMARY CONTACT
<input type="checkbox"/> <input type="checkbox"/>	0.7 =< 1m	<input type="checkbox"/> <input type="checkbox"/>	POOL = RIFFLE	<input type="checkbox"/> <input type="checkbox"/>	VERY FAST	<input type="checkbox"/> <input type="checkbox"/>	INTERSTITIAL	
<input type="checkbox"/> <input type="checkbox"/>	0.4 =< 0.7m	<input type="checkbox"/> <input type="checkbox"/>	POOL < RIFFLE	<input type="checkbox"/> <input type="checkbox"/>	FAST	<input type="checkbox"/> <input type="checkbox"/>	INTERMITTENT	Pool/Current
<input type="checkbox"/> <input type="checkbox"/>	0.2 =< 0.4m			<input type="checkbox"/> <input type="checkbox"/>	MODERATE	<input type="checkbox"/> <input type="checkbox"/>	EDDIES	#DIV/0!
<input type="checkbox"/> <input type="checkbox"/>	< 0.2m							Max 12

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:

RIFFLE DEPTH		RUN DEPTH		RIFFLE / RUN SUBSTRATE		RIFFLE / RUN EMBEDDEDNESS	
<input type="checkbox"/> <input type="checkbox"/>	BEST AREAS >10cm	<input type="checkbox"/> <input type="checkbox"/>	MAXIMUM >50cm	<input type="checkbox"/> <input type="checkbox"/>	STABLE	<input type="checkbox"/> <input type="checkbox"/>	NONE
<input type="checkbox"/> <input type="checkbox"/>	BEST AREAS 5-10cm	<input type="checkbox"/> <input type="checkbox"/>	MAXIMUM <50cm	<input type="checkbox"/> <input type="checkbox"/>	MOD. STABLE	<input type="checkbox"/> <input type="checkbox"/>	LOW
<input type="checkbox"/> <input type="checkbox"/>	BEST AREAS <5cm			<input type="checkbox"/> <input type="checkbox"/>	UNSTABLE	<input type="checkbox"/> <input type="checkbox"/>	MODERATE
						<input type="checkbox"/> <input type="checkbox"/>	EXTENSIVE
							Riffle/Run
							#DIV/0!
							Max 8

6] GRADIENT

DRAINAGE AREA (sq mi)	<input type="checkbox"/>	Stream Width (ft)	FALSE	% POOL:	<input type="checkbox"/>	% GLIDE:	<input type="checkbox"/>
GRADIENT (feet/mile)	<input type="checkbox"/>	Classification	FALSE	% RUN:	<input type="checkbox"/>	% RIFFLE:	<input type="checkbox"/>
							Gradient
							Max 10

QHEI Score:

#DIV/0!

ATTACHMENT C: FWOP DATA AND CALCULATIONS

Future-Without Project Conditions															
Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	V4	V5	HSI	HUs	CHUs	AAHUs	
Bear Detention (FWOP)	Upstream of detention (FWOP)	Riparian	0	67.51	FOSQ	40	400	20	75	20	0.38	25.65			
			1	67.51	FOSQ	40	400	20	75	20	0.38	25.65	25.65		
			5	67.51	FOSQ	40	400	20	75	20	0.38	25.65	102.62		
			25	67.51	FOSQ	40	400	20	75	20	0.38	25.65	513.08		
			50	67.51	FOSQ	40	400	20	75	20	0.38	25.65	641.35	25.65	
											Average FWOP Upstream Riparian AAHUs		33.08		

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	V4	V5	HSI	HUs	CHUs	AAHUs	
Bear Detention (FWOP)	Downstream of detention (FWOP)	Riparian	0	50.43	FOSQ	40	400	20	75	20	0.38	19.16			
			1	50.43	FOSQ	40	400	20	75	20	0.38	19.16	19.16		
			5	50.43	FOSQ	40	400	20	75	20	0.38	19.16	76.65		
			25	50.43	FOSQ	40	400	20	75	20	0.38	19.16	383.27		
			50	50.43	FOSQ	40	400	20	75	20	0.38	19.16	479.09	19.16	
											Average FWOP Downstream Riparian AAHUs		24.71		
											Total FWOP Riparian AAHUs		57.79		

Future-Without-Project Conditions																							
Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	V4	V5A	V5B	V6	V7	V8	V9	V10	V11	V12	V13	HSI	HUs	CHUs	AAHUs
Bear Detention (FWOP)	Upstream of detention (FWOP)	Upland	0	74.74	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	5.9792		
			1	74.74	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	5.9792	5.98	
			5	74.74	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	5.9792	23.92	
			25	74.74	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	5.9792	119.56	
			50	74.74	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	5.9792	149.40	5.98

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	HSI	HUs	CHUs	AAHUs
Bear Detention (FWOP)	Upstream of detention (FWOP)	Upland	0	74.74	BACW	4	15	75	0.82	61.05		
			1	74.74	BACW	4	15	75	0.82	61.05	61.05	
			5	74.74	BACW	4	15	75	0.82	61.05	244.20	
			25	74.74	BACW	4	20	75	1.00	74.74	1357.89	
			50	74.74	BACW	4	20	75	1.00	74.74	1868.50	70.63

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	HSI	HUs	CHUs	AAHUs
Bear Detention (FWOP)	Upstream of detention (FWOP)	Upland	0	74.74	DCWD	20	4		0.80	59.79		
			1	74.74	DCWD	20	4		0.80	59.79	59.79	
			5	74.74	DCWD	20	4		0.80	59.79	239.17	
			25	74.74	DCWD	20	4		0.80	59.79	1195.84	
			50	74.74	DCWD	20	4		0.80	59.79	1434.80	59.79

Average FWOP Upstream Upland AAHUs 45.47

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	V4	V5A	V5B	V6	V7	V8	V9	V10	V11	V12	V13	HSI	HUs	CHUs	AAHUs
Bear Detention (FWOP)	Downstream of detention (FWOP)	Upland	0	78.8	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	6.304		
			1	78.8	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	6.304	6.30	
			5	78.8	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	6.304	25.22	
			25	78.8	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	6.304	126.08	
			50	78.8	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	6.304	157.60	6.30

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	HSI	HUs	CHUs	AAHUs
Bear Detention (FWOP)	Downstream of detention (FWOP)	Upland	0	78.8	BACW	4	15	75	0.82	64.37		
			1	78.8	BACW	4	15	75	0.82	64.37	64.37	
			5	78.8	BACW	4	15	75	0.82	64.37	257.46	
			25	78.8	BACW	4	20	75	1.00	78.80	1431.66	
			50	78.8	BACW	4	20	75	1.00	78.80	1970.00	74.47

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	HSI	HUs	CHUs	AAHUs
Bear Detention (FWOP)	Downstream of detention (FWOP)	Upland	0	78.8	DCWD	20	4		0.80	63.04		
			1	78.8	DCWD	20	4		0.80	63.04	63.04	
			5	78.8	DCWD	20	4		0.80	63.04	252.16	
			25	78.8	DCWD	20	4		0.80	63.04	1260.80	
			50	78.8	DCWD	20	4		0.80	63.04	1576.00	63.04

Average FWOP Downstream Upland AAHUs 47.94

Total FWOP Upland AAHUs 93.41

Future-Without Project Conditions

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	V4	V5	HSI	HUs	CHUs	AAHUs
Bear Detention (FWOP)	Upstream of detention (FWOP)	Grassland	0	26.92	EAME	100	100	5	60	0	0.22	5.99		
			1	26.92	EAME	100	100	5	60	0	0.22	5.99	5.99	
			5	26.92	EAME	100	100	5	60	0	0.22	5.99	23.96	
			25	26.92	EAME	100	100	5	60	0	0.22	5.99	119.79	
			50	26.92	EAME	100	100	5	60	0	0.22	5.99	149.73	5.99

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	V4	V5	HSI	HUs	CHUs	AAHUs
Bear Detention (FWOP)	Downstream of detention (FWOP)	Grassland	0	65.82	EAME	100	100	5	60	0	0.22	14.64		
			1	65.82	EAME	100	100	5	60	0	0.22	14.64	14.64	
			5	65.82	EAME	100	100	5	60	0	0.22	14.64	58.58	
			25	65.82	EAME	100	100	5	60	0	0.22	14.64	292.88	
			50	65.82	EAME	100	100	5	60	0	0.22	14.64	366.10	14.64

Total FWOP Grassland AAHUs 20.63

Future-Without Project Conditions

Measure	Location	Cover Type	Target Year	Acres	Model	HSI	HUs	CHUs	AAHUs
Bear Detention (FWOP)	Upstream of detention (FWOP)	Riverine	0	29.90	QHEI	0.88	26.31		
			1	29.90	QHEI	0.88	26.31	26.31	
			5	29.90	QHEI	0.88	26.31	105.25	
			25	29.90	QHEI	0.88	26.31	526.24	
			50	29.90	QHEI	0.88	26.31	657.80	26.31

Measure	Location	Cover Type	Target Year	Acres	Model	HSI	HUs	CHUs	AAHUs
Bear Detention (FWOP)	Downstream of detention (FWOP)	Riverine	0	22.24	QHEI	0.88	19.57		
			1	22.24	QHEI	0.88	19.57	19.57	
			5	22.24	QHEI	0.88	19.57	78.28	
			25	22.24	QHEI	0.88	19.57	391.42	
			50	22.24	QHEI	0.88	19.57	489.28	19.57

Total FWOP Riverine AAHUs 45.88

ATTACHMENT D: FWP DATA AND CALCULATIONS

Future-With Project Conditions														
Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	V4	V5	HSI	HUs	CHUs	AAHUs
Bear Detention (FWP)	Upstream of detention (FWP)	Riparian	0	60.22	FOSQ	40	400	20	75	20	0.38	22.88		
			1	60.22	FOSQ	40	400	20	75	20	0.38	22.88	22.88	
			5	60.22	FOSQ	40	400	20	75	20	0.38	22.88	91.53	
			25	60.22	FOSQ	40	400	20	75	20	0.38	22.88	457.67	
			50	60.22	FOSQ	40	400	20	75	20	0.38	22.88	572.09	22.88
Bear Detention (FWP)	Upstream of detention (FWP)	Riparian	0	60.22	DOWO	20	3	0.60	36.13					
			1	60.22	DOWO	20	3	0.60	36.13	36.13				
			5	60.22	DOWO	20	3	0.60	36.13	144.53				
			25	60.22	DOWO	20	3	0.60	36.13	722.64				
			50	60.22	DOWO	20	3	0.60	36.13	903.30	36.13			
Average FWP Upstream Riparian AAHUs												29.51		
Bear Detention (FWP)	Downstream of detention (FWP)	Riparian	0	50.43	FOSQ	40	400	20	75	20	0.38	19.16		
			1	50.43	FOSQ	40	400	20	75	20	0.38	19.16	19.16	
			5	50.43	FOSQ	20	400	20	50	50	0.35	17.65	73.63	
			25	50.43	FOSQ	10	400	20	15	50	0.32	16.14	337.88	
			50	50.43	FOSQ	10	400	20	15	50	0.32	16.14	403.44	16.68
Bear Detention (FWP)	Downstream of detention (FWP)	Riparian	0	50.43	DOWO	20	3	0.60	30.26					
			1	50.43	DOWO	20	3	0.60	30.26	30.26				
			5	50.43	DOWO	5	8	0.50	25.22	110.95				
			25	50.43	DOWO	5	8	0.50	25.22	504.30				
			50	50.43	DOWO	5	8	0.50	25.22	630.38	25.52			
Average FWOP Downstream Riparian AAHUs												21.10		
Total FWP Riparian AAHUs												50.61		
Change in Riparian AAHUs												7.18	Loss	

Future-With Project Conditions

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	V4	V5A	V5B	V6	V7	V8	V9	V10	V11	V12	V13	HSI	HUs	CHUs	AAHUs
Bear Detention (FWP)	Upstream of detention	Upland	0	709	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	5,7208		
			1	709	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	5,7208	5.72	
			5	709	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	5,7208	22.88	
			25	709	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	5,7208	114.42	
			50	709	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	5,7208	143.02	5.72

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	HSI	HUs	CHUs	AAHUs
Bear Detention (FWP)	Upstream of detention	Upland	0	709	BADW	4	15	75	0.82	58.41		
			1	709	BADW	4	15	75	0.82	58.41	58.41	
			5	709	BADW	4	15	75	0.82	58.41	233.64	
			25	709	BADW	4	20	75	1.00	71.51	1299.21	
			50	709	BADW	4	20	75	1.00	71.51	1787.75	67.58

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	HSI	HUs	CHUs	AAHUs
Bear Detention (FWP)	Upstream of detention	Upland	0	709	DDWD	20	4	4	0.80	57.21		
			1	709	DDWD	20	4	4	0.80	57.21	57.21	
			5	709	DDWD	20	4	4	0.80	57.21	228.83	
			25	709	DDWD	20	4	4	0.80	57.21	1144.16	
			50	709	DDWD	20	4	4	0.80	57.21	1430.20	57.21

Average FWOP Downstream Upland AAHUs 43.50

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	V4	V5A	V5B	V6	V7	V8	V9	V10	V11	V12	V13	HSI	HUs	CHUs	AAHUs
Bear Detention (FWP)	Downstream of detention	Upland	0	78.8	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	6,304		
			1	78.8	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	6,304	6.30	
			5	78.8	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	6,304	25.22	
			25	78.8	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	6,304	126.08	
			50	78.8	NOBO	75	50	B	B	38	200	75	15	15	70	C	25	10	5	0.08	6,304	157.60	6.30

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	HSI	HUs	CHUs	AAHUs
Bear Detention (FWP)	Downstream of detention	Upland	0	78.8	BADW	4	15	75	0.82	64.37		
			1	78.8	BADW	4	15	75	0.82	64.37	64.37	
			5	78.8	BADW	4	15	75	0.82	64.37	257.46	
			25	78.8	BADW	4	20	75	1.00	78.80	1431.66	
			50	78.8	BADW	4	20	75	1.00	78.80	1970.00	74.47

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	HSI	HUs	CHUs	AAHUs
Bear Detention (FWP)	Downstream of detention	Upland	0	78.8	DDWD	20	4	4	0.80	63.04		
			1	78.8	DDWD	20	4	4	0.80	63.04	63.04	
			5	78.8	DDWD	20	4	4	0.80	63.04	252.16	
			25	78.8	DDWD	20	4	4	0.80	63.04	1260.80	
			50	78.8	DDWD	20	4	4	0.80	63.04	1576.00	63.04

Average FWOP Downstream Upland AAHUs 47.94

Total FWOP Upland AAHUs 91.44

Change in Upland AAHUs: 1.96 Loss

Future-With Project Conditions

Measure	Location	Cover Type	target Year	Acres	Model	V1	V2	V3	V4	V5	HSI	HUs	CHUs	AAHUs
Bear Detention (FWP)	Upstream of detention (FWP)	Grassland	0	23.01	EAME	100	100	5	60	0	0.22	5.12		
			1	23.01	EAME	100	100	5	60	0	0.22	5.12	5.12	
			5	23.01	EAME	100	100	5	60	0	0.22	5.12	20.48	
			25	23.01	EAME	100	100	5	60	0	0.22	5.12	102.39	
			50	23.01	EAME	100	100	5	60	0	0.22	5.12	127.99	5.12

Measure	Location	Cover Type	target Year	Acres	Model	V1	V2	V3	V4	V5	HSI	HUs	CHUs	AAHUs
Bear Detention (FWP)	Downstream of detention (FWP)	Grassland	0	3.89	EAME	100	100	5	60	0	0.22	0.87		
			1	3.89	EAME	100	100	5	60	0	0.22	0.87	0.87	
			5	3.89	EAME	100	100	5	60	0	0.22	0.87	3.46	
			25	3.89	EAME	100	100	5	60	0	0.22	0.87	17.31	
			50	3.89	EAME	100	100	5	60	0	0.22	0.87	21.64	0.87

Total FWP Grassland AAHUs 5.98

Change in Grassland AAHUs 14.65 Loss

ATTACHMENT E: MITIGATION DATA AND CALCULATIONS

Riparian Mitigation and Modeling Requirements

Riparian AAHU Mitigation Need 7.18

Future-Without Project Conditions: Agriculture/Mowed field

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	V4	V5	HSI	HUs	CHUs	AAHUs
Bear Detention (FWOP)	Upstream of detention (FWOP)	Riparian	0	25	FOSQ	0	400	0	0	0	0.00	0.00		
			1	25	FOSQ	0	400	0	0	0	0.00	0.00	0.00	
			5	25	FOSQ	0	400	0	0	0	0.00	0.00	0.00	
			25	25	FOSQ	0	400	0	0	0	0.00	0.00	0.00	
			50	25	FOSQ	0	400	0	0	0	0.00	0.00	0.00	0.00

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	HSI	HUs	CHUs	AAHUs
Bear Detention (FWOP)	Upstream of detention (FWOP)	Riparian	0	25	DOWD	0	0	0.00	0.00		
			1	25	DOWD	0	0	0.00	0.00	0.00	
			5	25	DOWD	0	0	0.00	0.00	0.00	
			25	25	DOWD	0	0	0.00	0.00	0.00	
			50	25	DOWD	0	0	0.00	0.00	0.00	0.00

Average FWOP Riparian AAHUs 0.00

Future-With Project Conditions: Planting Bare Root Riparian Forest

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	V3	V4	V5	HSI	HUs	CHUs	AAHUs
Bear Detention (FWP)	Downstream of detention (FWP)	Riparian	0	25	FOSQ	0	400	0	0	0	0.00	0.00		
			1	25	FOSQ	0	400	0	5	5	0.00	0.00	0.00	
			5	25	FOSQ	0	400	3	10	30	0.00	0.00	0.00	
			25	25	FOSQ	60	400	20	50	15	0.40	10.00	100.00	
			50	25	FOSQ	60	400	25	75	15	0.65	16.25	328.13	8.56

Measure	Location	Cover Type	Target Year	Acres	Model	V1	V2	HSI	HUs	CHUs	AAHUs
Bear Detention (FWP)	Downstream of detention (FWP)	Riparian	0	25	DOWD	0	0	0.00	0.00		
			1	25	DOWD	0	0	0.00	0.00	0.00	
			5	25	DOWD	5	0	0.00	0.00	0.00	
			25	25	DOWD	10	1	0.20	5.00	50.00	
			50	25	DOWD	15	3	0.60	15.00	250.00	6.00

Average FWP Riparian AAHUs 7.28

Change in Riparian AAHUs 7.28 Gain

Riverine Mitigation Modeling and Requirements

Riverine AAHU Mitigation Need

1.14

Future-Without Project Conditions: Guadalupe River or Comal River in Comal County

Measure	Location	Cover Type	Target Year	Acres	Model	HSI	HUs	CHUs	AAHUs
Cummings Dam	Upstream	Riverine	0	31	QHEI	0.88	27.28		
Removal	of dam		1	31	QHEI	0.88	27.28	27.28	
(FWOP)	(FWOP)		5	31	QHEI	0.88	27.28	109.12	
			25	31	QHEI	0.88	27.28	545.60	
			50	31	QHEI	0.88	27.28	682.00	27.28
Total FWOP Riverine AAHUs									27.28

Future-With Project Conditions: Increase Run Riffle Pool Quality, Add Riparian Width (50m) on both banks

Measure	Location	Cover Type	Target Year	Acres	Model	HSI	HUs	CHUs	AAHUs
Cummings Dam	Downstream	Riverine	0	31	QHEI	0.88	27.28		
Removal	of dam		1	31	QHEI	0.91	28.21	27.75	
(FWP)	(FWP)		5	31	QHEI	0.91	28.21	112.84	
			25	31	QHEI	0.92	28.52	567.30	
			50	31	QHEI	0.92	28.52	713.00	28.42
Total FWP Riverine AAHUs									28.42

Change in Riverine AAHUs

1.14

Gain

Riverine Mitigation Modeling and Requirements

Riverine AAHU Mitigation Need

1.14

Future-Without Project Conditions: Cummings Dam in place

Measure	Location	Cover Type	Target Year	Acres	Model	HSI	HUs	CHUs	AAHUs
Cummings Dam	Upstream	Riverine	0	34.14	QHEI	0.56	19.12		
Removal	of dam		1	34.14	QHEI	0.56	19.12	19.12	
(FWOP)	(FWOP)		5	34.14	QHEI	0.56	19.12	76.47	
			25	34.14	QHEI	0.56	19.12	382.37	
			50	34.14	QHEI	0.56	19.12	477.96	19.12

Measure	Location	Cover Type	Target Year	Acres	Model	HSI	HUs	CHUs	AAHUs
Cummings Dam	Downstream	Riverine	0	1	QHEI	0.88	0.88		
Removal	of dam		1	1	QHEI	0.88	0.88	0.88	
(FWOP)	(FWOP)		5	1	QHEI	0.88	0.88	3.52	
			25	1	QHEI	0.88	0.88	17.60	
			50	1	QHEI	0.88	0.88	22.00	0.88

Total FWOP Riverine AAHUs 20.00

Future-With Project Conditions: Cummings Dam removed

Measure	Location	Cover Type	Target Year	Acres	Model	HSI	HUs	CHUs	AAHUs
Cummings Dam	Upstream	Riverine	0	34.14	QHEI	0.56	19.12		
Removal	of dam		1	34.14	QHEI	0.63	21.51	20.31	
(FWP)	(FWP)		5	34.14	QHEI	0.68	23.22	89.45	
			25	34.14	QHEI	0.85	29.02	522.34	
			50	34.14	QHEI	0.88	30.04	738.28	27.41

Measure	Location	Cover Type	Target Year	Acres	Model	HSI	HUs	CHUs	AAHUs
Cummings Dam	Downstream	Riverine	0	1	QHEI	0.88	0.88		
Removal	of dam		1	1	QHEI	0.88	0.88	0.88	
(FWP)	(FWP)		5	1	QHEI	0.88	0.88	3.52	
			25	1	QHEI	0.88	0.88	17.60	
			50	1	QHEI	0.88	0.88	22.00	0.88

Total FWP Riverine AAHUs 28.29

Change in Riverine AAHUs 8.29 Gain

ATTACHMENT F: Natural Resources

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Project information

NAME

Lower Guadalupe Feasibility Study (1 of 3) Bear Detention Dam

LOCATION

Comal County, Texas



DESCRIPTION

The Lower Guadalupe Feasibility Study was authorized by the Guadalupe and San Antonio Rivers and Tributaries, Texas, resolution adopted by the Committee on Transportation and Infrastructure, U.S. House of Representatives, House Resolution docket 2547 dated 11 March 1998. The purpose of the study is to investigate flooding with effort to reduce risk from future floods. The study area is comprised of the portions of the Guadalupe, San Marcos, and Blanco River Basins in Texas. Various flood risk management measures were developed and evaluated including dry detention dams in Hays, Blanco, and Comal Counties as well as bypass channels along the eastern flank of San Marcos. Dry and wet flood proofing structures, in addition to raising structures, alternatives

were also evaluated throughout the study area. As a result of alternative screening and analysis, the Bear Creek Detention Dam (BCDD) on Bear Creek in Comal County is being recommended for implementation. To mitigate the unavoidable adverse impacts to Federally threatened and endangered species associated with the construction and operation of the BCDD the implementation sponsor, Comal County, would acquire and manage up to 412 acres of existing golden-cheeked warbler (*Setophaga chrysoparia*, [GCWA]) habitat in perpetuity for the benefit of GCWA and other natural resources. In addition, up to 25 acres of riparian habitat will be planted and managed along the Guadalupe River below New Braunfels to offset impacts to riparian corridors, and the removal of Cummings Dam, downstream of San Marcos on the San Marcos River to offset aquatic impacts from the construction of the BCDD. This IPAC project (1 of 3) shows the footprint of the BCDD.

Local office

Austin Ecological Services Field Office

☎ (512) 490-0057

📠 (512) 490-0974

10711 Burnet Road, Suite 200

Austin, TX 78758-4460

<http://www.fws.gov/southwest/es/AustinTexas/>

<http://www.fws.gov/southwest/es/EndangeredSpecies/lists/>

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information.
2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME

STATUS

Golden-cheeked Warbler (=wood) <i>Dendroica chrysoparia</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/33	Endangered
Least Tern <i>Sterna antillarum</i> This species only needs to be considered if the following condition applies: <ul style="list-style-type: none"> • Wind Energy Projects No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8505	Endangered
Piping Plover <i>Charadrius melodus</i> This species only needs to be considered if the following condition applies: <ul style="list-style-type: none"> • Wind Energy Projects There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot <i>Calidris canutus rufa</i> This species only needs to be considered if the following condition applies: <ul style="list-style-type: none"> • Wind Energy Projects No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane <i>Grus americana</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/758	Endangered

Amphibians

NAME	STATUS
San Marcos Salamander <i>Eurycea nana</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6374	Threatened
Texas Blind Salamander <i>Typhlomolge rathbuni</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5130	Endangered

Fishes

NAME	STATUS
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Fountain Darter *Etheostoma fonticola*

Endangered

There is **final** critical habitat for this species. Your location is outside the critical habitat.

<https://ecos.fws.gov/ecp/species/5858>

Clams

NAME

STATUS

Golden Orb *Quadrula aurea*

Candidate

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/9042>

Texas Fatmucket *Lampsilis bracteata*

Candidate

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/9041>

Texas Fawnsfoot *Truncilla macrodon*

Candidate

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/8965>

Texas Pimpleback *Quadrula petrina*

Candidate

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/8966>

Insects

NAME

STATUS

Comal Springs Dryopid Beetle *Stygoparnus comalensis*

Endangered

There is **final** critical habitat for this species. Your location is outside the critical habitat.

<https://ecos.fws.gov/ecp/species/7175>

Comal Springs Riffle Beetle *Heterelmis comalensis*

Endangered

There is **final** critical habitat for this species. Your location is outside the critical habitat.

<https://ecos.fws.gov/ecp/species/3403>

Crustaceans

NAME

STATUS

Peck's Cave Amphipod *Stygobromus* (=Stygonectes) *pecki*

Endangered

There is **final** critical habitat for this species. Your location is outside the critical habitat.

<https://ecos.fws.gov/ecp/species/8575>

Flowering Plants

NAME	STATUS
Bracted Twistflower <i>Streptanthus bracteatus</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2856	Candidate
Texas Wild-rice <i>Zizania texana</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/805	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds <http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list

will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME

BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Black Throated Sparrow *Amphispiza bilineata*

Breeds Mar 15 to Sep 5

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For

- example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
- To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
 - The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

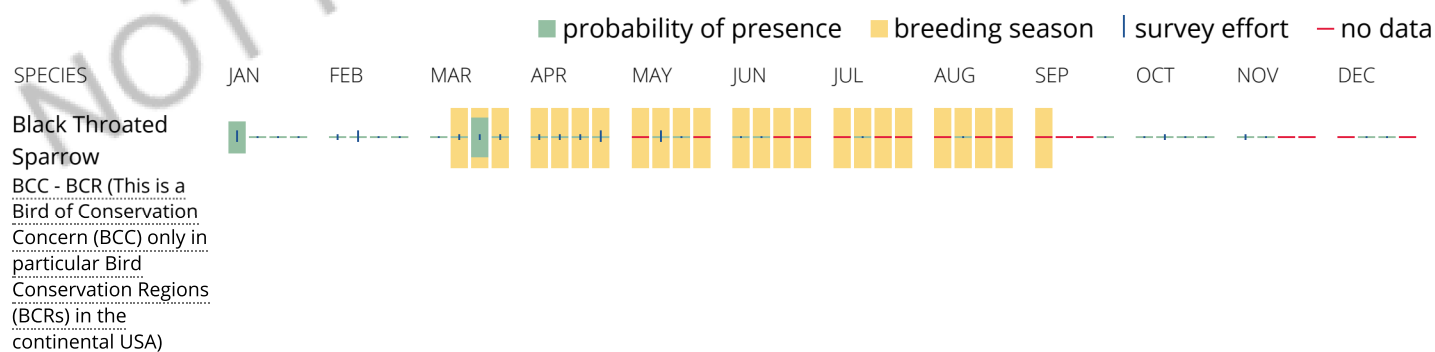
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (—)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) and/or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [AKN Phenology Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER FORESTED/SHRUB WETLAND

[PFO2C](#)

[PSS1Ah](#)

FRESHWATER POND

[PUBHh](#)

[PUSCh](#)

RIVERINE

[R2UBH](#)

[R4SBC](#)

[R4SBA](#)

[R5UBH](#)

[R2RSC](#)

[R2RSA](#)

A full description for each wetland code can be found at the [National Wetlands Inventory website](#)

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Project information

NAME

Lower Guadalupe Feasibility Study (2 of 3) Cummings Dam removal for aquatic mitigation

LOCATION

Hays County, Texas



DESCRIPTION

The Lower Guadalupe Feasibility Study was authorized by the Guadalupe and San Antonio Rivers and Tributaries, Texas, resolution adopted by the Committee on Transportation and Infrastructure, U.S. House of Representatives, House Resolution docket 2547 dated 11 March 1998. The purpose of the study is to investigate flooding with effort to reduce risk from future floods. The study area is comprised of the portions of the Guadalupe, San Marcos, and Blanco River Basins in Texas. Various flood risk management measures were developed and evaluated including dry detention dams in Hays, Blanco, and Comal Counties as well as bypass channels along the eastern flank of San Marcos. Dry and wet flood proofing structures, in addition to raising structures, alternatives

were also evaluated throughout the study area. As a result of alternative screening and analysis, the Bear Creek Detention Dam (BCDD) on Bear Creek in Comal County is being recommended for implementation. To mitigate the unavoidable adverse impacts to Federally threatened and endangered species associated with the construction and operation of the BCDD the implementation sponsor, Comal County, would acquire and manage up to 412 acres of existing golden-cheeked warbler (*Setophaga chrysoparia*, [GCWA]) habitat in perpetuity for the benefit of GCWA and other natural resources. In addition, up to 25 acres of riparian habitat will be planted and managed along the Guadalupe River below New Braunfels to offset impacts to riparian corridors, and the removal of Cummings Dam, downstream of San Marcos on the San Marcos River to offset aquatic impacts from the construction of the BCDD. This IPAC project (2 of 3) shows the footprint of the aquatic mitigation efforts, the removal of Cummings Dam.

Local office

Austin Ecological Services Field Office

☎ (512) 490-0057

📠 (512) 490-0974

10711 Burnet Road, Suite 200

Austin, TX 78758-4460

<http://www.fws.gov/southwest/es/AustinTexas/>

<http://www.fws.gov/southwest/es/EndangeredSpecies/lists/>

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information.
2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME

STATUS

Golden-cheeked Warbler (=wood) <i>Dendroica chrysoparia</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/33	Endangered
Least Tern <i>Sterna antillarum</i> This species only needs to be considered if the following condition applies: <ul style="list-style-type: none"> • Wind Energy Projects No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8505	Endangered
Piping Plover <i>Charadrius melodus</i> This species only needs to be considered if the following condition applies: <ul style="list-style-type: none"> • Wind Energy Projects There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot <i>Calidris canutus rufa</i> This species only needs to be considered if the following condition applies: <ul style="list-style-type: none"> • Wind Energy Projects No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane <i>Grus americana</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/758	Endangered

Amphibians

NAME	STATUS
Austin Blind Salamander <i>Eurycea waterlooensis</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5737	Endangered
Barton Springs Salamander <i>Eurycea sosorum</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1113	Endangered

San Marcos Salamander *Eurycea nana* Threatened
 There is **final** critical habitat for this species. Your location is outside the critical habitat.
<https://ecos.fws.gov/ecp/species/6374>

Texas Blind Salamander *Typhlomolge rathbuni* Endangered
 No critical habitat has been designated for this species.
<https://ecos.fws.gov/ecp/species/5130>

Fishes

NAME	STATUS
Fountain Darter <i>Etheostoma fonticola</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5858	Endangered
San Marcos Gambusia <i>Gambusia georgei</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/7519	Endangered

Clams

NAME	STATUS
Golden Orb <i>Quadrula aurea</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9042	Candidate
Texas Fatmucket <i>Lampsilis bracteata</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9041	Candidate
Texas Fawnsfoot <i>Truncilla macrodon</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8965	Candidate
Texas Pimpleback <i>Quadrula petrina</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8966	Candidate

Insects

NAME	STATUS
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Comal Springs Dryopid Beetle *Stygoparnus comalensis* Endangered
 There is **final** critical habitat for this species. Your location is outside the critical habitat.
<https://ecos.fws.gov/ecp/species/7175>

Comal Springs Riffle Beetle *Heterelmis comalensis* Endangered
 There is **final** critical habitat for this species. Your location is outside the critical habitat.
<https://ecos.fws.gov/ecp/species/3403>

Crustaceans

NAME	STATUS
Peck's Cave Amphipod <i>Stygobromus (=Stygonectes) pecki</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8575	Endangered

Flowering Plants

NAME	STATUS
Bracted Twistflower <i>Streptanthus bracteatus</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2856	Candidate
Texas Wild-rice <i>Zizania texana</i> There is final critical habitat for this species. Your location overlaps the critical habitat. https://ecos.fws.gov/ecp/species/805	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

NAME	TYPE
Texas Wild-rice <i>Zizania texana</i> https://ecos.fws.gov/ecp/species/805#crithab	Final

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds <http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME

BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE

BIRD DOES NOT LIKELY BREED IN
YOUR PROJECT AREA.)

Bald Eagle *Haliaeetus leucocephalus*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

<https://ecos.fws.gov/ecp/species/1626>

Breeds Sep 1 to Jul 31

Harris's Sparrow *Zonotrichia querula*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds elsewhere

Lesser Yellowlegs *Tringa flavipes*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9679>

Breeds elsewhere

Long-billed Curlew *Numenius americanus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/5511>

Breeds elsewhere

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week

of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.

- The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

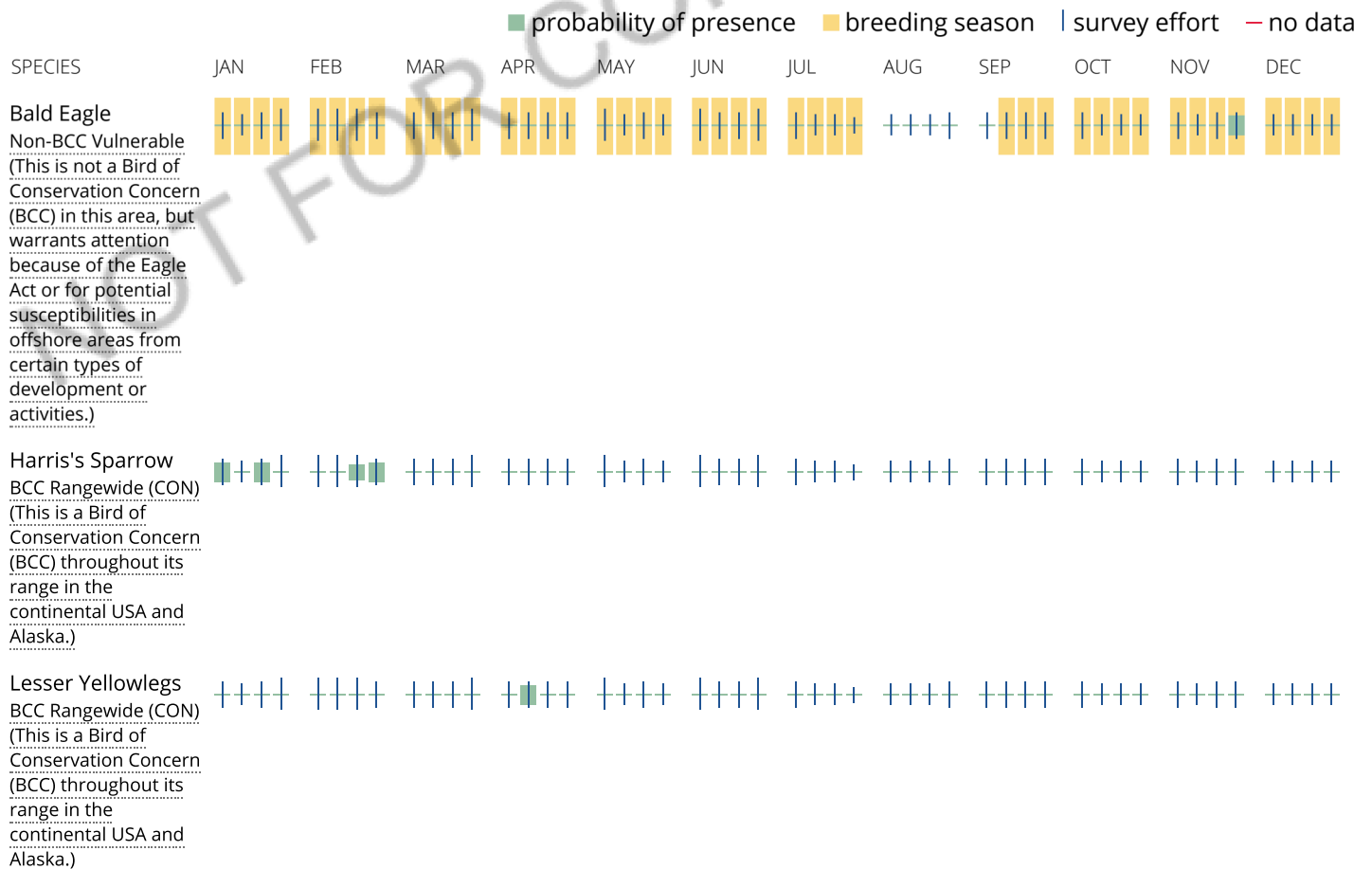
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (—)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Long-billed Curlew
BCC Rangewide (CON)
(This is a Bird of
Conservation Concern
(BCC) throughout its
range in the
continental USA and
Alaska.)



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) and/or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

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Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [AKN Phenology Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

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Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

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1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
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Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER POND

[PUBF](#)

LAKE

[L](#)

RIVERINE

[R2UBH](#)

[R4SBC](#)

A full description for each wetland code can be found at the [National Wetlands Inventory website](#)

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

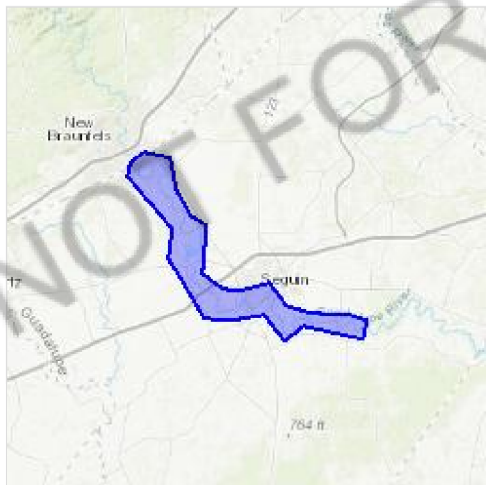
Project information

NAME

Lower Guadalupe Feasibility Study (3 of 3) Riparian Mitigation

LOCATION

Comal and Guadalupe counties, Texas



DESCRIPTION

The Lower Guadalupe Feasibility Study was authorized by the Guadalupe and San Antonio Rivers and Tributaries, Texas, resolution adopted by the Committee on Transportation and Infrastructure, U.S. House of Representatives, House Resolution docket 2547 dated 11 March 1998. The purpose of the study is to investigate flooding with effort to reduce risk from future floods. The study area is comprised of the portions of the Guadalupe, San Marcos, and Blanco River Basins in Texas. Various flood risk management measures were developed and evaluated including dry detention dams in Hays, Blanco, and Comal Counties as well as bypass channels along the eastern flank of San Marcos. Dry and wet flood proofing structures, in addition to raising structures, alternatives

were also evaluated throughout the study area. As a result of alternative screening and analysis, the Bear Creek Detention Dam (BCDD) on Bear Creek in Comal County is being recommended for implementation. To mitigate the unavoidable adverse impacts to Federally threatened and endangered species associated with the construction and operation of the BCDD the implementation sponsor, Comal County, would acquire and manage up to 412 acres of existing golden-cheeked warbler (*Setophaga chrysoparia*, [GCWA]) habitat in perpetuity for the benefit of GCWA and other natural resources. In addition, up to 25 acres of riparian habitat will be planted and managed along the Guadalupe River below New Braunfels to offset impacts to riparian corridors, and the removal of Cummings Dam, downstream of San Marcos on the San Marcos River to offset aquatic impacts from the construction of the BCDD. This IPAC project (3 of 3) shows the footprint of where approx. 25 acres of riparian mitigation would be placed within.

Local office

Austin Ecological Services Field Office

☎ (512) 490-0057

📠 (512) 490-0974

10711 Burnet Road, Suite 200

Austin, TX 78758-4460

<http://www.fws.gov/southwest/es/AustinTexas/>

<http://www.fws.gov/southwest/es/EndangeredSpecies/lists/>

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information.
2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME

STATUS

<p>Golden-cheeked Warbler (=wood) <i>Dendroica chrysoparia</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/33</p>	Endangered
<p>Least Tern <i>Sterna antillarum</i> This species only needs to be considered if the following condition applies: <ul style="list-style-type: none"> • Wind Energy Projects No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8505</p>	Endangered
<p>Piping Plover <i>Charadrius melodus</i> This species only needs to be considered if the following condition applies: <ul style="list-style-type: none"> • Wind Energy Projects There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6039</p>	Threatened
<p>Red Knot <i>Calidris canutus rufa</i> This species only needs to be considered if the following condition applies: <ul style="list-style-type: none"> • Wind Energy Projects No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1864</p>	Threatened
<p>Whooping Crane <i>Grus americana</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/758</p>	Endangered

Amphibians

NAME	STATUS
<p>San Marcos Salamander <i>Eurycea nana</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6374</p>	Threatened
<p>Texas Blind Salamander <i>Typhlomolge rathbuni</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5130</p>	Endangered

Fishes

NAME	STATUS
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Fountain Darter *Etheostoma fonticola*

Endangered

There is **final** critical habitat for this species. Your location is outside the critical habitat.

<https://ecos.fws.gov/ecp/species/5858>

Clams

NAME	STATUS
Golden Orb <i>Quadrula aurea</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9042	Candidate
Texas Fatmucket <i>Lampsilis bracteata</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9041	Candidate
Texas Fawnsfoot <i>Truncilla macrodon</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8965	Candidate
Texas Pimpleback <i>Quadrula petrina</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8966	Candidate

Insects

NAME	STATUS
Comal Springs Dryopid Beetle <i>Stygoparnus comalensis</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/7175	Endangered
Comal Springs Riffle Beetle <i>Heterelmis comalensis</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3403	Endangered

Crustaceans

NAME	STATUS
Peck's Cave Amphipod <i>Stygobromus</i> (=Stygonectes) <i>pecki</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8575	Endangered

Flowering Plants

NAME	STATUS
Bracted Twistflower <i>Streptanthus bracteatus</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2856	Candidate
Texas Wild-rice <i>Zizania texana</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/805	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds <http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list

will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME

BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Bald Eagle *Haliaeetus leucocephalus*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

<https://ecos.fws.gov/ecp/species/1626>

Breeds Sep 1 to Jul 31

Harris's Sparrow *Zonotrichia querula*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds elsewhere

Lesser Yellowlegs *Tringa flavipes*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9679>

Breeds elsewhere

Red-headed Woodpecker *Melanerpes erythrocephalus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 10 to Sep 10

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

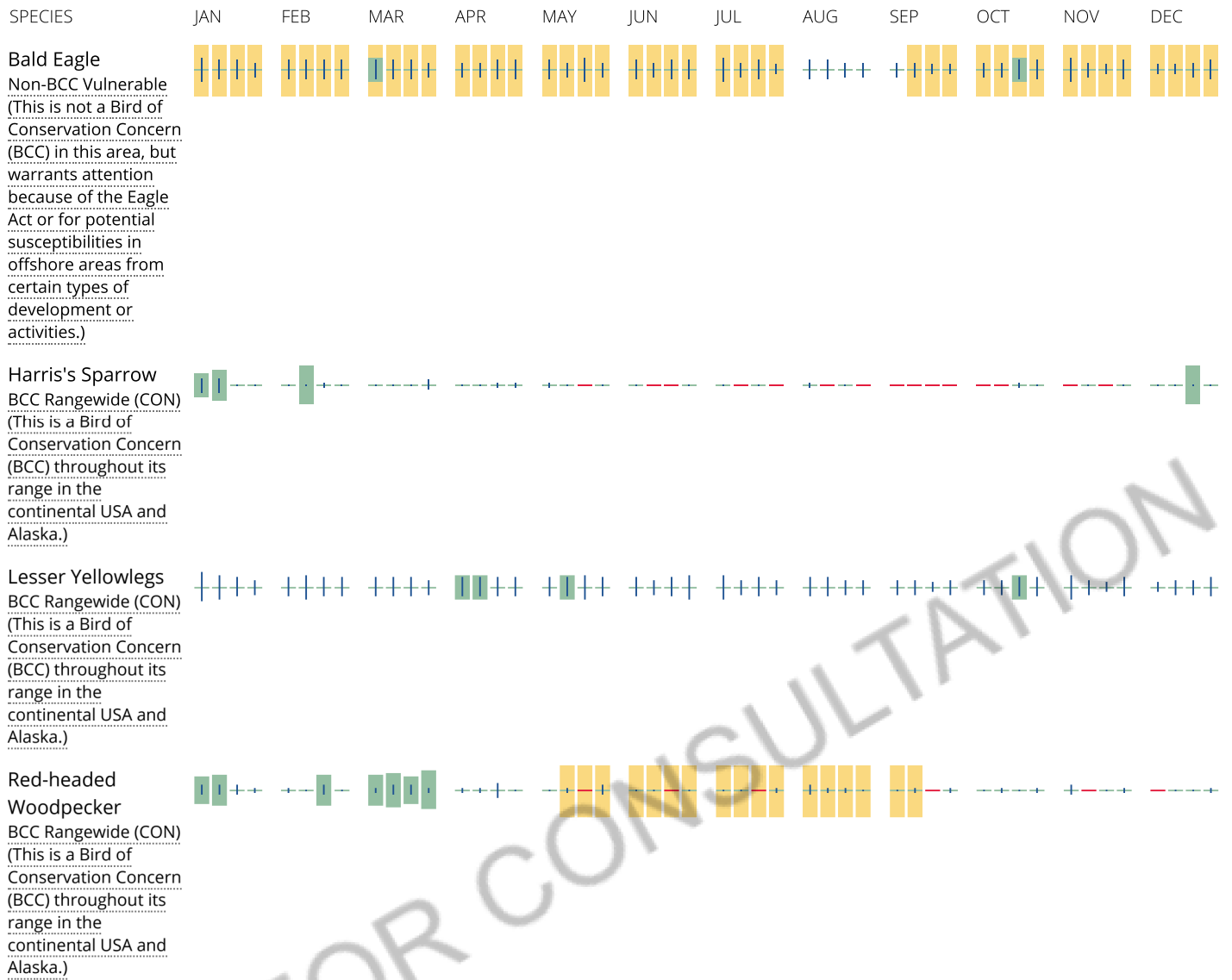
No Data (—)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort — no data



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) and/or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [AKN Phenology Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

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Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

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Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER FORESTED/SHRUB WETLAND

[PFO1Ah](#)

[PFO1A](#)

[PFO1Fh](#)

[PFO1Ch](#)

[PFO2Ch](#)

[PSS1C](#)

[PFO2C](#)

[PFO2F](#)

[PFO2Ah](#)

FRESHWATER POND

[PUBHh](#)

[PUBF](#)

[PUSAh](#)

[PUSCh](#)

[PUBFh](#)

[PUBHx](#)

[PAB3Hh](#)

[PUSAx](#)

[PUSKx](#)

[PUBFx](#)

[PUBH](#)

[PUSCx](#)

[PUSA](#)

[PAB3Fh](#)

[PUSC](#)

LAKE

[L1UBHh](#)

[L2AB3Hh](#)

[L1UBHx](#)

[L2AB3Fh](#)

[L2UBHh](#)

[L2UBFx](#)

[L2UBF](#)

[L2UBFh](#)

RIVERINE

[R2UBH](#)

[R4SBC](#)

[R4SBA](#)

[R5UBH](#)

[R4SBaX](#)

A full description for each wetland code can be found at the [National Wetlands Inventory website](#)

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

TEXAS BLACKLAND PRAIRIES SPECIES OF GREATEST CONSERVATION NEED						
Scientific Name	Common Name	Status		Abundance Ranking		General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place
		Federal	State	Global	State	
MAMMALS						
<i>Blarina hylophaga plumblea</i>	Elliot's short-tailed shrew			G5T1Q	S1	Savanna/Open Woodland
<i>Geomys attwateri</i>	Attwater's pocket gopher			G4	S4	Shrubland
<i>Lutra canadensis</i>	River otter			G5	S4	Riparian
<i>Mustela frenata</i>	Long-tailed weasel			G5	S5	Forest, Woodland, Desert Scrub, Shrubland, Savanna/Open Woodland
<i>Myotis austroriparius</i>	Southeastern myotis			G3G4	S3	Caves/Karst, Forest, Riparian
<i>Myotis velifer</i>	Cave myotis			G5	S4	Caves/Karst,
<i>Puma concolor</i>	Mountain lion			G5	S2	Forest, Woodland, Desert Scrub, Shrubland, Savanna/Open Woodland, Riparian
<i>Spilogale putorius</i>	Eastern spotted skunk			G4T	S4	Savanna/Open Woodland, Grassland
<i>Sylvilagus aquaticus</i>	Swamp rabbit			G5	S5	Riparian, Freshwater Wetland
<i>Tadarida brasiliensis</i>	Brazilian free-tailed bat			G5	S5	Cave/Karst, Artificial Refugia
<i>Taxidea taxus</i>	American badger			G5	S5	Grassland, Desert scrub, Woodland, Savanna/Open Woodland, Forest
<i>Ursus americanus</i>	Black bear	SAT	T	G5	S3	Forest, Woodland, Savanna/Open Woodland, Desert Scrub, Shrubland
BIRDS						
<i>Anas acuta</i>	Northern Pintail			G5	S3B,S5N	Lacustrine, freshwater wetland, saltwater wetland, coastal, marine
<i>Colinus virginianus</i>	Northern Bobwhite			G5	S4B	Grassland, Shrubland, Savanna/Open Woodland
<i>Tympanuchus cupido</i>	Greater Prairie-Chicken (Interior)			G4	S1B	Grassland
<i>Meleagris gallopavo</i>	Wild Turkey			G5	S5B	Shrubland, Savanna/Open Woodland, Forest, Riparian, Agricultural
<i>Ixobrychus exilis</i>	Least Bittern			G5	S4B	Lacustrine, Freshwater Wetland, Saltwater Wetland, Estuary
<i>Egretta thula</i>	Snowy Egret			G5	S5B	Riparian, Riverine, Lacustrine, Freshwater Wetland, Saltwater Wetland, Estuary, Coastal, Cultural Aquatic
<i>Egretta caerulea</i>	Little Blue Heron			G5	S5B	Riparian, Riverine, Lacustrine, Freshwater Wetland, Saltwater Wetland, Estuary, Coastal, Cultural Aquatic
<i>Butorides virescens</i>	Green Heron			G5	S5B	Riparian, Riverine, Lacustrine, Freshwater Wetland, Cultural Aquatic
<i>Mycteria americana</i>	Wood Stork		T	G4	SHB,S2N	Riverine, Freshwater wetland
<i>Ictinia mississippiensis</i>	Mississippi Kite			G5	S4B	Woodland, Forest, Riparian, Developed:Urban/Suburban/Rural
<i>Haliaeetus leucocephalus</i>	Bald Eagle			G5	S3B,S3N	Riparian, Lacustrine, Freshwater Wetland, Saltwater Wetland
<i>Circus cyaneus</i>	Northern Harrier			G5	S2B,S3N	Grassland, Shrubland
<i>Buteo lineatus</i>	Red-shouldered Hawk			G5	S4B	Woodland, Forest, Riparian, Freshwater Wetland
<i>Pluvialis dominica</i>	American Golden-Plover			G5	S3	Grassland, Freshwater Wetland, Agricultural
<i>Charadrius montanus</i>	Mountain Plover	PT		G3	S2	Agricultural, Grassland
<i>Scolopax minor</i>	American Woodcock			G5	S2B,S3N	Woodland, Forest, Riparian
<i>Sternula antillarum</i>	Least Tern	LE*	E*	G4	S3B	Riverine, Lacustrine, Freshwater Wetland, Saltwater Wetland, Estuary, Coastal, Marine, Developed: Industrial
<i>Asio flammeus</i>	Short-eared Owl			G5	S4N	Grassland, Shrubland, Agricultural
<i>Caprimulgus carolinensis</i>	Chuck-will's-widow			G5	S3S4B	Woodland, Forest, Riparian
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker			G5	S3B	Savanna/Open Woodland, Woodland, Forest, Riparian, Developed: Urban/Suburban/Rural
<i>Dryocopus pileatus</i>	Pileated Woodpecker			G5	S4B	Savanna/Open Woodland, Woodland, Forest, Riparian, Developed: Urban/Suburban/Rural
<i>Tyrannus forficatus</i>	Scissor-tailed Flycatcher			G5	S3B	Desert Scrub, Grassland, Shrubland, Agricultural, Developed
<i>Lanius ludovicianus</i>	Loggerhead Shrike			G4	S4B	Desert Scrub, Grassland, Shrubland, Savanna/Open Woodland, Agricultural, Developed
<i>Vireo bellii</i>	Bell's Vireo			G5	S3B	Desert scrub, Shrubland, Riparian
<i>Poecile carolinensis</i>	Carolina Chickadee			G5	S5B	Woodland, Forest, Riparian, Developed: Urban/Suburban/Rural

Texas Blackland Prairies Ecoregion Species of Greatest Conservation Need

Scientific Name	Common Name	Status		Abundance Ranking		General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place
		Federal	State	Global	State	
<i>Thryomanes bewickii (bewickii)</i>	Bewick's Wren			G5	S5B	Shrubland, Savanna/Open Woodland, Woodland, Developed: Urban/Suburban/Rural
<i>Cistothorus platensis</i>	Sedge Wren			G5	S4	Grassland, Freshwater Wetland
<i>Hylocichla mustelina</i>	Wood Thrush			G5	S4B	Woodland, Forest, Riparian
<i>Anthus spragueii</i>	Sprague's Pipit	C		G4	S3N	Barren/Sparse Vegetation, Grassland, Shrubland, Agricultural
<i>Dendroica dominica</i>	Yellow-throated Warbler			G5	S4B	Woodland, Forest, Riparian
<i>Protonotaria citrea</i>	Prothonotary Warbler			G5	S3B	Woodland, Forest, Riparian, Lacustrine, Freshwater Wetland
<i>Limnothlypis swainsonii</i>	Swainson's Warbler			G4	S3B	Woodland, Forest, Riparian
<i>Seiurus motacilla</i>	Louisiana Waterthrush			G5	S3B	Woodland, Forest, Riparian
<i>Oporornis formosus</i>	Kentucky Warbler			G5	S3B	Woodland, Forest
<i>Spizella pusilla</i>	Field Sparrow			G5	S5B	Grassland, Shrubland, Savanna/Open Woodland
<i>Ammodramus savannarum</i>	Grasshopper Sparrow			G5	S3B	Grassland, Agricultural
<i>Chondestes grammacus</i>	Lark Sparrow			G5	S4B	Grassland, Shrubland, Savanna/Open Woodland
<i>Ammodramus henslowii</i>	Henslow's Sparrow			G4	S2S3N,SXB	Grassland, Savanna/Open Woodland
<i>Ammodramus leconteii</i>	Le Conte's Sparrow					Grassland
<i>Zonotrichia querula</i>	Harris's Sparrow			G5	S4	Shrubland, Agricultural
<i>Calcarius mccownii</i>	McCown's Longspur			G4	S4	Grassland, Agricultural
<i>Calcarius pictus</i>	Smith's Longspur					Grassland, Agricultural
<i>Piranga rubra</i>	Summer Tanager			G5	S5B	Savanna/Open Woodland, Woodland, Forest, Riparian, Developed: Urban/Suburban/Rural
<i>Passerina ciris</i>	Painted Bunting			G5	S4B	Shrubland, Agricultural
<i>Spiza americana</i>	Dickcissel			G5	S4B	Grassland, Agricultural
<i>Sturnella magna</i>	Eastern Meadowlark			G5	S5B	Grassland, Shrubland, Savanna/Open Woodland
<i>Euphagus carolinus</i>	Rusty Blackbird			G4	S3	Woodland, Forest, Riparian, Lacustrine, Freshwater Wetland
<i>Icterus spurius</i>	Orchard Oriole			G5	S4B	Shrubland, Savanna/Open Woodland, Woodland, Riparian
REPTILES AND AMPHIBIANS						
<i>Anaxyrus (Bufo) woodhousii</i>	Woodhouse's toad			G5	SU	woodland, forest, freshwater wetland
<i>Apalone mutica</i>	smooth softshell turtle					riparian, riverine, lacustrine, freshwater wetland
<i>Apalone spinifera</i>	spiny softshell turtle					riparian, riverine, lacustrine, freshwater wetland
<i>Cheylydra serpentina</i>	Common snapping turtle					riparian, riverine
<i>Crotalus atrox</i>	Western diamondback rattlesnake				S4	barren/sparse vegetation, desert scrub, grassland, shrubland, savanna, woodland, caves/karst
<i>Crotalus horridus</i>	Timber (Canebrake) Rattlesnake		T	G4	S4	woodland, forest, riparian
<i>Graptemys caglei</i>	Cagle's map turtle		T	G3	S1	riparian, riverine
<i>Graptemys versa</i>	Texas map turtle			G4	SU	riparian, riverine
<i>Heterodon nasicus</i>	Western hognosed snake					desert scrub, grassland, shrubland
<i>Macrochelys temminckii</i>	alligator snapping turtle		T	G3G4	S3	riparian, riverine, cultural aquatic
<i>Ophisaurus attenuatus</i>	western slender glass lizard					grassland, savanna
<i>Phrynosoma cornutum</i>	Texas horned lizard		T	G4G5	S4	desert scrub, grassland, savanna
<i>Pseudacris streckeri</i>	Strecker's Chorus Frog			G5	S3	grassland, savanna, woodland, riparian, cultural aquatic, freshwater wetland
<i>Sistrurus catenatus</i>	massasauga					grassland, barren/sparse vegetation, shrubland, coastal,
<i>Terrapene carolina</i>	Eastern box turtle			G5	S3	grasslands, savanna, woodland
<i>Terrapene ornata</i>	Ornate box turtle			G5	S3	grassland, barren/sparse vegetation, desert scrub, savanna, woodland
<i>Thamnophis sirtalis annectans</i>	Texas Garter Snake (Eastern/Texas/New Mexico)			G5	S2	riparian, around lacustrine and cultural aquatic sites
<i>Trachemys scripta</i>	Red-eared slider					riparian, riverine, lacustrine, freshwater wetland, cultural aquatic
FRESHWATER FISHES						
<i>Anguilla rostrata</i>	American eel			G4	S5	streams and reservoirs in drainages connected to marine environments
<i>Atractosteus spatula</i>	alligator gar					channel snag, pool-s snag complex, pool-edge, and pool-vegetation habitat

Scientific Name	Common Name	Status		Abundance Ranking		General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place
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<i>Cycleptus elongatus</i>	Blue sucker		T	G3G4	S3	large, deep rivers, and deeper zones of lakes
<i>Etheostoma fonticola</i>	Fountain darter	LE	E	G1	S1	usually in dense beds of <i>Vallisneria</i> , <i>Elodia</i> , <i>Ludwigia</i> and other aquatic plants; substrate normally mucky
<i>Macryhbopsis storeriana</i>	Silver chub					over silt or mud, turbid water with very soft sand/silt substrate
<i>Micropterus treculii</i>	Guadalupe bass			G3	S3	small lentic environments; commonly taken in flowing water
<i>Notropis atrocaudalis</i>	Blackspot shiner					backwater and swiftest currents
<i>Notropis bairdi</i>	Red River shiner					streambeds with widely fluctuating flows subject to high summer temperatures, high rates of evaporation, and
<i>Notropis buccula</i>	Small eye shiner	C		G2Q	S2	condition tolerances (turbidity, salinity, oxygen).
<i>Notropis chalybaeus</i>	Ironcolor shiner					Plain streams and rivers of low to moderate gradient; often at the upstream ends of pools, with a moderate to
<i>Notropis oxyrhynchus</i>	Sharpnose shiner	C		G3	S3	Moderate current velocities and depths, sand bottom
<i>Notropis potteri</i>	Chub shiner		T	G4	S3	turbid, flowing water with silt or sand substrate; tolerant of high salinities
<i>Notropis shumardi</i>	Silverband shiner					channel with moderate to swift current velocities and moderate to deep depths; associated with turbid water
<i>Percina apristis</i>	Guadalupe darter					collections from the clearest waters tributary to the Guadalupe, namely spring heads and the main river west
<i>Polyodon spathula</i>	Paddlefish		T	G4	S3	rivers, sluggish pools, backwaters, bayous, and oxbows with abundant zooplankton; large reservoirs if
<i>Satan eurystomus</i>	Widemouth blindcat		T	G1	S1	Karst: Subterranean waters
<i>Trogloglanis pattersoni</i>	Toothless blindcat		T	G1	S1	Karst: Subterranean waters
INVERTEBRATES						
<i>Bombus pensylvanicus</i>	American bumblebee			GU	SU*	Grassland, Savanna/Open Woodland
<i>Chimarra holzenthali</i>	Holzenthali's Philopotamid caddisfly			G1G2	S1	Riparian, Riverine
<i>Cotinis boylei</i>	A scarab beetle			G2*	S2*	Grassland, Shrubland, Woodland
<i>Nicrophorus americanus</i>	American Burying Beetle	LE		G1	S1	Grassland, Savanna/Open Woodland
<i>Potamilus amphichaenus</i>	Texas heelsplitter		T	G1G2	S1	Riverine
<i>Procambarus regalis</i>	Regal burrowing crayfish			G2G3	S2?*	Freshwater Wetland, Grassland
<i>Procambarus steigmani</i>	Parkhill prairie crayfish			G1G2	S1S2*	Freshwater Wetland, Grassland
<i>Pseudocentropiloides morihari</i>	A mayfly			G2G3	S2?*	Riverine, Riparian
<i>Sphinx eremitoides</i>	Sage sphinx			G1G2	S1?*	Grassland
<i>Susperatus tonkawa</i>	A mayfly			G1	S1*	Riparian, Riverine
PLANTS						
<i>Agalinis densiflora</i>	Osage Plains false foxglove			G3	S2	Savanna/Open Woodland - Outcrops
<i>Astragalus reflexus</i>	Texas milk vetch			G3	S3	Savanna/Open Woodland
<i>Calopogon oklahomensis</i>	Oklahoma grass pink			G3	S1S2	Savanna/Open Woodland; Grassland; Freshwater Wetland
<i>Carex edwardsiana</i>	canyon sedge			G3G4S3S4	S3S4	Woodland (slopes above Riparian)
<i>Carex shinnensis</i>	Shinner's sedge			G3?	S2	Grassland
<i>Crataegus dallasiana</i>	Dallas hawthorn			G3Q	S3	Riparian (creeks in the Blackland Prairie)
<i>Cuscuta exaltata</i>	tree dodder			G3	S3	Woodland
<i>Dalea hallii</i>	Hall's prairie-clover			G3	S3	Savanna/Open Woodland; Grassland
<i>Echinacea atrorubens</i>	Topeka purple-coneflower			G3	S3	Savanna/Open Woodland
<i>Hexalectris nitida</i>	Glass Mountains coral-root			G3	S3	Woodland
<i>Hexalectris warnockii</i>	Warnock's coral-root			G2G3	S2	Woodland
<i>Hymenoxys pygmaea</i>	Pygmy prairie dawn			G1	S1	Barren/Sparse Vegetation with Grassland matrix (saline prairie)
<i>Liatris glandulosa</i>	glandular gay-feather			G3	S3	Savanna/Open Woodland
<i>Paronychia setacea</i>	bristle nailwort			G3	S3	Savanna/Open Woodland
<i>Phlox oklahomensis</i>	Oklahoma phlox			G3	SH	Savanna/Open Woodland
<i>Physaria engelmannii</i>	Engelmann's bladderpod			G3	S3	Savanna/Open Woodland
<i>Polygonella parksii</i>	Parks' jointweed			G2	S2	Savanna/Open Woodland (sandhills); Grassland
<i>Prunus texana</i>	Texas peachbush			G3G4	S3S4	Savanna/Open Woodland; Grassland

Texas Blackland Prairies Ecoregion Species of Greatest Conservation Need

Scientific Name	Common Name	Status		Abundance Ranking		General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place
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<i>Thalictrum texanum</i>	Texas meadow-rue			G2	S2	Savanna/Open Woodland; Riparian (bottomland forest)
<i>Zizania texana</i>	Texas wild rice	LE	E	G1	S1	Riverine (spring-fed, clear, thermally constant, moderate current, sand to gravel substrate)

EDWARDS PLATEAU SPECIES OF GREATEST CONSERVATION NEED						
Scientific Name	Common Name	Status		Abundance Ranking		General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place
		Federal	State	Global	State	
MAMMALS						
<i>Antrozous pallidus</i>	Pallid bat			G5	S5	Caves/Karst, Desert scrub, Grassland, Shrubland
<i>Conepatus leuconotus</i>	Hog-nosed skunk			G5	S4	Shrubland, Savanna/Open Woodland, Barren/Sparse Vegetation,
<i>Corynorhinus townsendii</i>	Townsend's big-eared bat			G4T4	S3? S4?	Caves/Karst, Desert scrub, Grassland, Shrubland
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog			G5T3	S3	Grassland
<i>Eptesicus fuscus</i>	Big brown bat			G5	S5	Forest, Barren/Sparse Vegetation, Caves/Karst, Artificial Refugia
<i>Geomys texensis bakeri</i>	Frio pocket gopher			G2QT2	S2	Riparian
<i>Geomys texensis texensis</i>	Llano pocket gopher			G3T2	S2	Riparian
<i>Lutra canadensis</i>	River otter			G5	S4	Riparian
<i>Mormoops megalophylla</i>	Ghost-faced bat			G4	S2	Desert Scrub, Riparian, Caves/Karst
<i>Mustela frenata</i>	Long-tailed weasel			G5	S5	Forest, Woodland, Desert Scrub, Shrubland, Savanna/Open Woodland
<i>Mustela nigripes</i>	Black-footed ferret	LE		G1	SH	Grassland
<i>Myotis velifer</i>	Cave myotis			G5	S4	Caves/Karst,
<i>Nasua narica</i>	White-nosed coati		T	G5	S2?	Forest, Desert Scrub, Riparian
<i>Parastrellus hesperus</i>	Canyon Bat (western pipistrelle)			G5	S5	Riparian, Barren Sparse Vegetation
<i>Perimyotis subflavus</i>	Tricolored Bat (eastern pipistrelle)			G5	S5	Caves/Karst, Artificial Refugia, Woodland
<i>Puma concolor</i>	Mountain lion			G5	S2	Forest, Woodland, Desert Scrub, Shrubland, Savanna/Open Woodland, Riparian
<i>Spilogale gracilis</i>	Western spotted skunk			G5	S5	Agricultural, Grassland, Forest, Woodland, Desert Scrub
<i>Spilogale putorius</i>	Eastern spotted skunk			G4T	S4	Savanna/Open Woodland, Grassland
<i>Sylvilagus aquaticus</i>	Swamp rabbit			G5	S5	Riparian, Freshwater Wetland
<i>Tadarida brasiliensis</i>	Brazilian free-tailed bat			G5	S5	Cave/Karst, Artificial Refugia
<i>Taxidea taxus</i>	American badger			G5	S5	Grassland, Desert scrub, Woodland, Savanna/Open Woodland, Forest
<i>Ursus americanus</i>	Black bear	SAT	T	G5	S3	Forest, Woodland, Savanna/Open Woodland, Desert Scrub, Shrubland
<i>Vulpes velox</i>	Swift fox			G3	S3?	Grassland
BIRDS						
<i>Colinus virginianus</i>	Northern Bobwhite			G5	S4B	Grassland, Shrubland, Savanna/Open Woodland
<i>Cyrtonyx montezumae</i>	Montezuma Quail			G4G5	S3B	Grassland, Shrubland
<i>Meleagris gallopavo</i>	Wild Turkey			G5	S5B	Shrubland, Savanna/Open Woodland, Forest, Riparian, Agricultural
<i>Circus cyaneus</i>	Northern Harrier			G5	S2B,S3N	Grassland, Shrubland
<i>Buteogallus anthracinus</i>	Common Black-Hawk		T	G4G5	S2B	Woodland, Riparian
<i>Parabuteo unicinctus</i>	Harris's Hawk			G5	S3B	Desert Scrub, Grassland, Shrubland
<i>Buteo lineatus</i>	Red-shouldered Hawk			G5	S4B	Woodland, Forest, Riparian, Freshwater Wetland
<i>Buteo albonotatus</i>	Zone-tailed Hawk		T	G4	S3B	Barren/Sparse Vegetation, Riparian
<i>Aquila chrysaetos</i>	Golden Eagle			G5	S3B	Desert Scrub, Grassland, Shrubland
<i>Caprimulgus carolinensis</i>	Chuck-will's-widow			G5	S3S4B	Woodland, Forest, Riparian
<i>Tyrannus forficatus</i>	Scissor-tailed Flycatcher			G5	S3B	Desert Scrub, Grassland, Shrubland, Agricultural, Developed
<i>Lanius ludovicianus</i>	Loggerhead Shrike			G4	S4B	Desert Scrub, Grassland, Shrubland, Savanna/Open Woodland, Agricultural, Developed
<i>Vireo bellii</i>	Bell's Vireo			G5	S3B	Desert scrub, Shrubland, Riparian
<i>Vireo atricapilla</i>	Black-capped Vireo	LE	E	G3	S2B	Shrubland
<i>Poecile carolinensis</i>	Carolina Chickadee			G5	S5B	Woodland, Forest, Riparian, Developed: Urban/Suburban/Rural
<i>Anthus spragueii</i>	Sprague's Pipit	C		G4	S3N	Barren/Sparse Vegetation, Grassland, Shrubland, Agricultural

Edwards Plateau Species of Greatest Conservation Need

Scientific Name	Common Name	Status		Abundance Ranking		General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place
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<i>Parula pitiayumi</i>	Tropical Parula		T	G5	S3B	Savanna/Open Woodland, Woodland, Forest, Riparian
<i>Dendroica chrysoparia</i> *	Golden-cheeked Warbler	LE	E	G2	S2B	Woodland
<i>Dendroica dominica</i>	Yellow-throated Warbler			G5	S4B	Woodland, Forest, Riparian
<i>Seiurus motacilla</i>	Louisiana Waterthrush			G5	S3B	Woodland, Forest, Riparian
<i>Aimophila cassinii</i>	Cassin's Sparrow			G5	S4B	Grassland, Shrubland
<i>Aimophila ruficeps</i>	Rufous-crowned Sparrow			G5	S4B	Grassland
<i>Spizella pusilla</i>	Field Sparrow			G5	S5B	Grassland, Shrubland, Savanna/Open Woodland
<i>Ammodramus savannarum</i>	Grasshopper Sparrow			G5	S3B	Grassland, Agricultural
<i>Chondestes grammacus</i>	Lark Sparrow			G5	S4B	Grassland, Shrubland, Savanna/Open Woodland
<i>Ammodramus leconteii</i>	Le Conte's Sparrow					Grassland
<i>Zonotrichia querula</i>	Harris's Sparrow			G5	S4	Shrubland, Agricultural
<i>Piranga rubra</i>	Summer Tanager			G5	S5B	Savanna/Open Woodland, Woodland, Forest, Riparian, Developed: Urban/Suburban/Rural
<i>Passerina ciris</i>	Painted Bunting			G5	S4B	Shrubland, Agricultural
<i>Spiza americana</i>	Dickcissel			G5	S4B	Grassland, Agricultural
<i>Sturnella magna</i>	Eastern Meadowlark			G5	S5B	Grassland, Shrubland, Savanna/Open Woodland
<i>Icterus spurius</i>	Orchard Oriole			G5	S4B	Shrubland, Savanna/Open Woodland, Woodland, Riparian
REPTILES AND AMPHIBIANS						
<i>Anaxyrus (Bufo) woodhousii</i>	Woodhouse's toad			G5	SU	woodland, forest, freshwater wetland
<i>Apalone mutica</i>	smooth softshell turtle					riparian, riverine, lacustrine, freshwater wetland
<i>Apalone spinifera</i>	spiny softshell turtle					riparian, riverine, lacustrine, freshwater wetland
<i>Cheylydra serpentina</i>	Common snapping turtle					riparian, riverine
<i>Crotalus atrox</i>	Western diamondback rattlesnake				S4	barren/sparse vegetation, desert scrub, grassland, shrubland, savanna, woodland, caves/karst
<i>Drymarchon melanurus erebennus</i>	Texas Indigo Snake		T	G4	S3	shrubland, savanna
<i>Eurycea latitans</i>	Cascade Caverns salamander		T	G3	S1	caves and karst, freshwater wetland (springs)
<i>Eurycea nana</i>	San Marcos salamander	LT	T	G1	S1	freshwater wetland (springs)
<i>Eurycea naufragia</i>	Georgetown Salamander	C		G1	S1	caves and karst, freshwater wetland (springs)
<i>Eurycea neotenes</i>	Texas salamander			G1	S2	caves and karst, freshwater wetland (springs)
<i>Eurycea pterophila</i>	Blanco River springs salamander			G2	S2	caves and karst, freshwater wetland (springs)
<i>Eurycea rathbuni</i>	Texas blind salamander	LE	E	G1	S1	aquifer, caves, and karst, freshwater wetland (springs)
<i>Eurycea robusta</i>	Blanco blind salamander		T	G1Q	S1	aquifer
<i>Eurycea sosorum</i>	Barton Springs salamander	LE	E	G1	S1	caves and karst, freshwater wetland (springs)
<i>Eurycea tonkawae</i>	Jollyville Plateau Salamander	C		G1	S2S3	caves and karst, freshwater wetland (springs)
<i>Eurycea tridentifera</i>	Comal blind salamander		T	G1	S1	Aquifer, Caves and Karst
<i>Eurycea waterlooensis</i>	Austin blind salamander	C		G1	S1	Aquifer but often found in Freshwater Wetland (springs) and Caves, Karst could apply as well
<i>Gopherus berlandieri</i>	Texas tortoise		T	G4	S2*	savanna, shrubland
<i>Graptemys caglei</i>	Cagle's map turtle		T	G3	S1	riparian, riverine
<i>Graptemys versa</i>	Texas map turtle			G4	SU	riparian, riverine
<i>Heterodon nasicus</i>	Western hognosed snake					desert scrub, grassland, shrubland
<i>Holbrookia lacerata lacerata</i>	Plateau earless lizard				S2	desert scrub, grassland, shrubland, savanna
<i>Nerodia paucimaculata</i>	Concho water snake	LT-PDL		G2	S2	riparian, riverine, cultural aquatic
<i>Ophisaurus attenuatus</i>	western slender glass lizard					grassland, savanna
<i>Phrynosoma cornutum</i>	Texas horned lizard		T	G4G5	S4	desert scrub, grassland, savanna
<i>Pseudacris streckeri</i>	Strecker's Chorus Frog			G5	S3	grassland, savanna, woodland, riparian, cultural aquatic, freshwater wetland
<i>Sistrurus catenatus</i>	massasauga					grassland, barren/sparse vegetation, shrubland, coastal,
<i>Terrapene carolina</i>	Eastern box turtle			G5	S3	grasslands, savanna, woodland

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<i>Terrapene ornata</i>	Ornate box turtle			G5	S3	grassland, barren/sparse vegetation, desert scrub, savanna, woodland
<i>Thamnophis sirtalis annectans</i>	Texas Garter Snake (Eastern/Texas/New Mexico)			G5	S2	riparian, around lacustrine and cultural aquatic sites
<i>Trachemys scripta</i>	Red-eared slider					riparian, riverine, lacustrine, freshwater wetland, cultural aquatic
FRESHWATER FISHES						
<i>Anguilla rostrata</i>	American eel			G4	S5	streams and reservoirs in drainages connected to marine environments
<i>Cyprinella lepida</i>	Plateau shiner			G1G2	S1S2	clear, cool, spring-fed headwater creeks, gravel and limestone substrates
<i>Cyprinella proserpina</i>	Proserpine shiner		T	G3	S2	pool habitats; adapted to flood-prone environments
<i>Cyprinella sp.</i>	Nueces river shiner			G1G2Q	S1S2	clear, cool, spring-fed headwater creeks
<i>Cyprinodon eximius ssp</i>	Devils River pupfish					tributary to larger rivers; rarely in headsprings; shallow, isolated pool habitat in the Devils River; sandy to
<i>Dionda argentosa</i>	Manantial roundnose minnow			G2	S2	Headwaters and runs of spring-influenced waters
<i>Dionda diaboli</i>	Devils River minnow	LT	T	G1	S1	over gravel-cobble substrate, usually associated with aquatic macrophytes
<i>Dionda nigrotaeniata</i>	Guadalupe roundnose minnow			G4	S4	spring-influenced headwaters
<i>Dionda serena</i>	Nueces roundnose minnow			G2	S2	spring-influenced headwaters
<i>Etheostoma grahami</i>	Rio Grande darter		T	G2G3	S2	Gravel and rubble riffles in spring-fed tributaries, creeks, and streams
<i>Gambusia heterochir</i>	Clear Creek gambusia	LE	E	G1	S1	springs
<i>Ictalurus lupus</i>	Headwater catfish			G3	S2	clear streams and rivers with moderate gradients, deep spring runs
<i>Micropterus treculii</i>	Guadalupe bass			G3	S3	small lentic environments; commonly taken in flowing water
<i>Percina apristis</i>	Guadalupe darter					collections from the clearest waters tributary to the Guadalupe, namely spring heads and the main river west
INVERTEBRATES						
<i>Allotexiweckelia hirsuta</i>	A cave obligate amphipod			G2G3	S2?*	Caves/Karst
<i>Almuerzothyas n. sp.</i>	An aquatic mite			G1*	S1*	Caves/Karst
<i>Amblycorypha uhleri</i>	A katydid			G2G3*	S2?*	Savanna/Open Woodland
<i>Apocheiridium reddelli</i>	A cave obligate pseudoscorpion			G1G2	S1*	Caves/Karst
<i>Arethaea ambulator</i>	A katydid			G2G3*	S2?*	Savanna/Open Woodland
<i>Arrenurus n. sp</i>	An aquatic mite			G1*	S1*	Caves/Karst
<i>Artesia subterranea</i>	A cave obligate amphipod			G1G2	S1?*	Caves/Karst
<i>Austrotinodes texensis</i>	Texas Austrotinodes caddisfly			G2	S2	Riparian, Riverine
<i>Baetodes alleni</i>	A mayfly			G1G2	S1?*	Riparian, Riverine
<i>Balconorbis uvaldensis</i>	Balcones ghostsnail			G1G2	S1*	Caves/Karst
<i>Batrisodes cryptotexanus</i>	A cave obligate beetle			G2*	S2*	Caves/Karst
<i>Batrisodes dentifrons</i>	A cave obligate beetle			G1G2*	S1*	Caves/Karst
<i>Batrisodes fanti</i>	A cave obligate beetle			G1G2*	S1*	Caves/Karst
<i>Batrisodes feminiclypeus</i>	A cave obligate beetle			G1G2*	S1*	Caves/Karst
<i>Batrisodes gravesi</i>	A cave obligate beetle			G2*	S2*	Caves/Karst
<i>Batrisodes grubbsi</i>	A cave obligate beetle			G1G2	S1*	Caves/Karst
<i>Batrisodes incisipes</i>	A cave obligate beetle			G1G2*	S1*	Caves/Karst
<i>Batrisodes pekinsi</i>	A cave obligate beetle			G1G2*	S1*	Caves/Karst
<i>Batrisodes reyesi</i>	A cave obligate beetle			G2G3	S2*	Caves/Karst
<i>Batrisodes shadeae</i>	A cave obligate beetle			G1G2*	S1*	Caves/Karst
<i>Batrisodes texanus</i>	A cave obligate beetle	LE		G1G2	S1	Caves/Karst
<i>Batrisodes venyivi</i>	A cave obligate beetle	LE		G1G2	S1	Caves/Karst
<i>Batrisodes wartoni</i>	A cave obligate beetle			G1G2*	S1	Caves/Karst
<i>Bombus pensylvanicus</i>	American bumblebee			GU	SU*	Grassland, Savanna/Open Woodland
<i>Bombus sonorus</i>	Sonoran bumblebee			GU	SU*	Grassland, Savanna/Open Woodland
<i>Bombus variabilis</i>	Variable cuckoo bumblebee			GU	SU*	Grassland, Savanna/Open Woodland

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<i>Brackenridgia reddelli</i>	A cave obligate isopod			G2G3	S2?*	Caves/Karst
<i>Caenis arwini</i>	A mayfly			G1G3	S2?*	Riparian, Riverine
<i>Calathaemon holthuisi</i>	A cave obligate shrimp			G1G2	S1?*	Caves/Karst
<i>Chitrella ellioti</i>	A cave obligate pseudoscorpion			G1G2	S1*	Caves/Karst
<i>Cicurina bandera</i>	A cave obligate spider			G2G3	S2*	Caves/Karst
<i>Cicurina bandida</i>	Bandit Cave spider			G1G2	S1	Caves/Karst
<i>Cicurina baronia</i>	Robber Baron Cave meshweaver	LE		G1G2	S1	Caves/Karst
<i>Cicurina barri</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina browni</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina caliga</i>	A cave obligate spider			G1G2*	S1*	Caves/Karst
<i>Cicurina caverna</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina coryelli</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina ellioti</i>	A cave obligate spider			G2G3	S2*	Caves/Karst
<i>Cicurina ezelli</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina gruta</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina holsingeri</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina hoodensis</i>	A cave obligate spider			G1G2*	S1*	Caves/Karst
<i>Cicurina machete</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina madla</i>	Madla Cave meshweaver	LE		G1G2	S1	Caves/Karst
<i>Cicurina mckenziei</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina medina</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina menardia</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina mixmaster</i>	A cave obligate spider			G1G2*	S1*	Caves/Karst
<i>Cicurina obscura</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina orellia</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina pablo</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina pastura</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina patei</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina porteri</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina puentecilla</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina rainesi</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina reclusa</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina reddelli</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina russelli</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina sansaba</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina selecta</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina serena</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina sheari</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina sprousei</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina stowersi</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina suttoni</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina travisae</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina troglobia</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina ubicki</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina uvalde</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina venefica</i>	A cave obligate spider			G1G2	S1*	Caves/Karst

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<i>Cicurina venii</i>	Braken Bat Cave Meshweaver	LE		G1G2	S1	Caves/Karst
<i>Cicurina vespera</i>	Government Canyon Bat Cave Meshweaver	LE		G1G2	S1	Caves/Karst
<i>Cicurina vibora</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cicurina wartoni</i>	Warton cave Meshweaver	C		G1	S1	Caves/Karst
<i>Cicurina watersi</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Cisthene conjuncta</i>	A lichen moth			G1Q	S1Q*	Forest, Savanna/Open Woodland
<i>Colletes bumeliae</i>	A cellophane bee			G1*	S1*	Grassland, Savanna/Open Woodland
<i>Comaldessus stygius</i>	Comal Springs diving beetle			G1	S1	Aquifer, Riparian
<i>Daedalochila hippocrepis</i>	Horseshoe liptooth			G1	S1	Woodland
<i>Dichopetala catinata</i>	A katydid			G1?*	S1?*	Grassland, Shrubland
<i>Dichopetala seeversi</i>	A katydid			G1*	S1*	Grassland, Shrubland
<i>Dinocheirus cavicolus</i>	A cave obligate pseudoscorpion			G2G3	S2*	Caves/Karst
<i>Eidmennella nastuta</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Eidmennella reclusa</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Elaphoidella n. sp.</i>	A cave obligate copepod			G1*	S1*	Caves/Karst
<i>Haideoporus texanus</i>	Edwards Aquifer diving beetle			G1G2	S1	Aquifer, Freshwater Wetland
<i>Heterelmis comalensis</i>	Comal Springs riffle beetle	LE		G1	S1	Aquifer, Freshwater Wetland
<i>Heterelmis sp.</i>	Fern Bank Springs riffle beetle			G1*	S1*	Aquifer, Freshwater Wetland
<i>Heterelmis sp.</i>	Fessenden Springs riffle beetle			G1*	S1*	Aquifer, Freshwater Wetland
<i>Heterelmis sp.</i>	Devils River Springs riffle beetle			G1*	S1*	Aquifer, Freshwater Wetland
<i>Holcopasites jerryrozeni</i>	A cuckoo bee			G1*	S1*	Grassland, Shrubland
<i>Holospira goldfussi</i>	New Braunfels Holospira			G2G3	S2?*	Woodland
<i>Holsingerius samacos</i>	A cave obligate amphipod			G1G2	S1?*	Caves/Karst
<i>Hyalella texana</i>	Clear Creek amphipod			G1	S1	Aquifer, Freshwater Wetland
<i>Hydroptila melia</i>	A caddisfly			G2G3	S2?*	Riparian, Riverine
<i>Ingolfiella n. sp.</i>	A cave obligate amphipod			G1G2*	S1*	Caves/Karst
<i>Lampsilis bracteata</i>	Texas fatmucket		T	G1	S1*	Riverine
<i>Leucohya texana</i>	A cave obligate pseudoscorpion			G1G2	S1*	Caves/Karst
<i>Lirceolus bisetus</i>	A cave obligate isopod			G1G2	S1*	Caves/Karst
<i>Lirceolus hardeni</i>	A cave obligate isopod			G2G3	S2?*	Caves/Karst
<i>Lirceolus pilus</i>	A cave obligate isopod			G2G3	S2?	Caves/Karst
<i>Lirceolus smithii</i>	Texas troglobitic water slater			G1G2	S1	Caves/Karst
<i>Lymantes nadineae</i>	A cave obligate beetle			G1*	S1*	Caves/Karst
<i>Macrotera parkeri</i>	A mining bee			G1G2*	S1S2*	Grassland, Shrubland
<i>Macrotera robertsi</i>	A mining bee			G1*	S1*	Grassland, Shrubland
<i>Marstonia comalensis</i>	Comal siltsnail			G1	S1	Aquifer, Freshwater Wetland
<i>Mexistenasellus coahuila</i>	A cave obligate isopod			G2G3	S2?*	Caves/Karst
<i>Mexiweckelia hardeni</i>	A cave obligate amphipod			G2G3	S2?*	Caves/Karst
<i>Microceramus texanus</i>	Texas urocoptid			G2	S2*	Woodland
<i>Millerelix gracilis</i>	Edwards Plateau liptooth			G2G3	S2?*	Woodland
<i>Myrmecoderus laevipennis</i>	A narrow-waisted bark beetle			G1*	S1*	Forest, Woodland
<i>Nectopsyche texana</i>	A caddisfly			G1G3	S2?*	Riparian, Riverine
<i>Tayshaneta anopica</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Tayshaneta bullis</i>	A cave obligate spider			G1G2*	S1*	Caves/Karst
<i>Tayshaneta concinna</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Tayshaneta devia</i>	A cave obligate spider			G1G2	S1*	Caves/Karst

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<i>Tayshaneta microps</i>	Government Canyon Bat Cave spider	LE		G1G2	S1	Caves/Karst
<i>Tayshaneta myopica</i>	Tooth Cave spider	LE		G1G2	S1	Caves/Karst
<i>Tayshaneta valverde</i>	A cave obligate spider			G1G2	S1*	Caves/Karst
<i>Neotrichia juani</i>	A caddisfly			G1	S1*	Riparian, Riverine
<i>Nitocrellopsis texana</i>	A cave obligate copepod			G1*	S1*	Caves/Karst
<i>Oncopodura fenestra</i>	A cave obligate springtail			G2G3	S2?*	Caves/Karst
<i>Oxyelophila callista</i>	A snout moth			G1?*	S1?*	Woodland
<i>Oxyethira ulmeri</i>	A caddisfly			G2G3	S2?*	Riparian, Riverine
<i>Palaemonetes antrorum</i>	A cave obligate shrimp			G2G3	S2?*	Caves/Karst
<i>Palaemonetes texanus</i>	Texas river shrimp			G1G2*	S1?*	Riverine
<i>Parabogidiella americana</i>	A cave obligate amphipod			G2G3	S2?*	Caves/Karst
<i>Paraholsingerius smaragdinus</i>	A cave obligate amphipod			G2G3	S2?*	Caves/Karst
<i>Paralimnetis texana</i>	Pointytop finger clam shrimp			G1	S1*	Riparian, Riverine
<i>Paramexiweckelia ruffoi</i>	A cave obligate amphipod			G1G2	S1?*	Caves/Karst
<i>Patera leatherwoodi</i>	Pedernales oval			G1	S1*	Woodland
<i>Perdita dolanensis</i>	A mining bee			G1*	S1*	Grassland, Shrubland
<i>Petrophila daemonalis</i>	A snout moth			G1?*	S1?*	Grassland, Shrubland
<i>Phreatodrobia conica</i>	Hueco cavesnail			G1	S1*	Caves/Karst
<i>Phreatodrobia imitata</i>	Mimic cavesnail			G1	S1	Caves/Karst
<i>Phreatodrobia micra</i>	Flattened cavesnail			G2G3	S2S3	Caves/Karst
<i>Phreatodrobia nugax</i>	Nymph trumpet			G1G2	S1*	Caves/Karst
<i>Phreatodrobia plana</i>	Disc cavesnail			G2	S2*	Caves/Karst
<i>Phreatodrobia punctata</i>	High-hat cavesnail			G2	S2*	Caves/Karst
<i>Phreatodrobia rotunda</i>	Beaked cavesnail			G1G2	S1*	Caves/Karst
<i>Plauditus texanus</i>	A mayfly			G2G3	S1?*	Riparian, Riverine
<i>Pogonomyrmex comanche</i>	Comanche harvester ant			G2G3*	S2*	Barren/Sparse Vegetation
<i>Procloeon distinctum</i>	A mayfly			G1G3	S2?*	Riverine, Riparian
<i>Protandrena maurula</i>	A mining bee			G1G2*	S1S2*	Grassland, Shrubland
<i>Protophila arca</i>	A caddisfly			G1	S1	Riverine, Riparian
<i>Pygarctia lorula</i>	A tiger moth			G2G3	S2?*	Savanna/Open Woodland
<i>Quadrula aurea</i>	Golden orb		T	G1	S2*	Riverine
<i>Quadrula houstonensis</i>	Smooth pimpleback		T	G2	S1S2*	Riverine
<i>Quadrula mitchelli</i>	False Spike		T	GH	SH	Riverine
<i>Quadrula petrina</i>	Texas pimpleback		T	G2	S1*	Riverine
<i>Rhadine austinica</i>	A cave obligate beetle			G1G2	S1*	Caves/Karst
<i>Rhadine bullis</i>	A cave obligate beetle			G2*	S2	Caves/Karst
<i>Rhadine exilis</i>	A cave obligate beetle	LE		G1	S1	Caves/Karst
<i>Rhadine infernalis</i>	A cave obligate beetle	LE		G2G3	S1	Caves/Karst
<i>Rhadine insolata</i>	A cave obligate beetle			G1G2	S1*	Caves/Karst
<i>Rhadine noctivaga</i>	A cave obligate beetle			G1G2	S1*	Caves/Karst
<i>Rhadine persephone</i>	Tooth Cave ground beetle	LE		G1G2	S1	Caves/Karst
<i>Rhadine reyesi</i>	A cave obligate beetle			G1G2*	S1S2*	Caves/Karst
<i>Rhadine russelli</i>	A cave obligate beetle			G1G2	S1*	Caves/Karst
<i>Rhadine specia</i>	A cave obligate beetle			G2*	S2*	Caves/Karst
<i>Rhadine subterranea</i>	A cave obligate beetle			G2*	S2*	Caves/Karst
<i>Seborgia relicta</i>	A cave obligate amphipod			G2G3	S2?*	Caves/Karst

Edwards Plateau Species of Greatest Conservation Need

Scientific Name	Common Name	Status		Abundance Ranking		General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place
		Federal	State	Global	State	
<i>Speocirolana hardeni</i>	A cave obligate isopod			G2G3	S2?*	Caves/Karst
<i>Speodesmus echinourus</i>	A cave obligate millipede			G2G3	S2?*	Caves/Karst
<i>Speodesmus falcatus</i>	A cave obligate millipede			G2 *	S2*	Caves/Karst
<i>Speodesmus ivyi</i>	A cave obligate millipede			G2 *	S2*	Caves/Karst
<i>Speodesmus reddelli</i>	A cave obligate millipede			G2 *	S2*	Caves/Karst
<i>Sphinx eremitoides</i>	Sage sphinx			G1G2	S1?*	Grassland
<i>Streptocephalus linderi</i>	Spinyfinger fairy shrimp			G2	S2*	Riverine, Riparian
<i>Stygobromus balconis</i>	A cave obligate amphipod			G2G3	S1	Caves/Karst
<i>Stygobromus dejectus</i>	Cascade Cave amphipod			G1G2	S1	Caves/Karst
<i>Stygobromus flagellatus</i>	Ezell's Cave amphipod			G2G3	S1	Caves/Karst
<i>Stygobromus hadenoecus</i>	Devil's Sinkhole amphipod			G1G2	S1	Caves/Karst
<i>Stygobromus limbus</i>	Border Cave amphipod			G1G2	S1*	Caves/Karst
<i>Stygobromus longipes</i>	Long-legged Cave amphipod			G2G3	S1	Caves/Karst
<i>Stygobromus n. sp.</i>	Neel's Cave amphipod			G1G2*	S1*	Caves/Karst
<i>Stygobromus n. sp.</i>	Devils River Cave amphipod			G1G2*	S1*	Caves/Karst
<i>Stygobromus n. sp.</i>	Fessenden Cave amphipod			G1G2*	S1*	Caves/Karst
<i>Stygobromus n. sp.</i>	Lost Maples Cave amphipod			G1G2*	S1*	Caves/Karst
<i>Stygobromus n. sp.</i>	San Gabriel Cave amphipod			G1G2*	S1*	Caves/Karst
<i>Stygobromus pecki</i>	Peck's Cave amphipod	LE	E	G1G2	S1	Caves/Karst
<i>Stygobromus reddelli</i>	Reddell stygobromid			G1G2	S1	Caves/Karst
<i>Stygobromus russelli</i>	A cave obligate amphipod			G1G2*	S1*	Caves/Karst
<i>Stygoparnus comalensis</i>	Comal Springs dryopid beetle	LE		G1G2	S1	Caves/Karst
<i>Stygopyrgus bartonensis</i>	Barton cavesnail			G1	S1	Caves/Karst
<i>Tartarocreagris altimana</i>	A cave obligate pseudoscorpion			G1G2*	S1*	Caves/Karst
<i>Tartarocreagris amblyopa</i>	A cave obligate pseudoscorpion			G1G2*	S1*	Caves/Karst
<i>Tartarocreagris attenuata</i>	A cave obligate pseudoscorpion			G1G2*	S1*	Caves/Karst
<i>Tartarocreagris domina</i>	A cave obligate pseudoscorpion			G1G2*	S1*	Caves/Karst
<i>Tartarocreagris grubbsi</i>	A cave obligate pseudoscorpion			G1G2*	S1*	Caves/Karst
<i>Tartarocreagris hoodensis</i>	A cave obligate pseudoscorpion			G1G2*	S1*	Caves/Karst
<i>Tartarocreagris infernalis</i>	A cave obligate pseudoscorpion			G2G3	S2?*	Caves/Karst
<i>Tartarocreagris intermedia</i>	A cave obligate pseudoscorpion			G1G2	S1*	Caves/Karst
<i>Tartarocreagris proserpina</i>	A cave obligate pseudoscorpion			G1G2*	S1*	Caves/Karst
<i>Tartarocreagris reddelli</i>	A cave obligate pseudoscorpion			G1G2*	S1*	Caves/Karst
<i>Tartarocreagris reyesi</i>	A cave obligate pseudoscorpion			G1G2*	S1*	Caves/Karst
<i>Tartarocreagris texana</i>	Tooth Cave Pseudoscorpion	LE		G1G2	S1	Caves/Karst
<i>Tethysbaena texana</i>	A cave obligate crustacean			G2G3	S2?*	Caves/Karst
<i>Texamaurops reddelli</i>	Kretschmarr Cave Mold Beetle	LE		G2G3	S1	Caves/Karst
<i>Texanobathynella bowmani</i>	A bathynellid			G2G3	S2?*	Caves/Karst
<i>Texapyrgus longleyi</i>	Striated Hydrobe			G1	S1	Freshwater Wetland
<i>Texella brevidenta</i>	A cave obligate harvestman			G1G2	S1*	Caves/Karst
<i>Texella brevistyla</i>	A cave obligate harvestman			G1G2	S1*	Caves/Karst
<i>Texella cokendolpheri</i>	Cokendolpher Cave Harvestman	LE		G1G2	S1	Caves/Karst
<i>Texella diplospina</i>	A cave obligate harvestman			G1G2	S1*	Caves/Karst
<i>Texella grubbsi</i>	A cave obligate harvestman			G1G2	S1*	Caves/Karst
<i>Texella hardeni</i>	A cave obligate harvestman			G1G2	S1*	Caves/Karst
<i>Texella mulaiki</i>	A cave obligate harvestman			G2G3	S2*	Caves/Karst

Edwards Plateau Species of Greatest Conservation Need

Scientific Name	Common Name	Status		Abundance Ranking		General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place
		Federal	State	Global	State	
<i>Texella reddelli</i>	Reddell harvestman	LE		G2G3	S2*	Caves/Karst
<i>Texella renkesae</i>	A cave obligate harvestman			G1G2	S1*	Caves/Karst
<i>Texella reyesi</i>	Bone Cave harvestman	LE		G2G3	S2*	Caves/Karst
<i>Texella spinoperca</i>	A cave obligate harvestman			G1G2*	S1*	Caves/Karst
<i>Texiweckelia texensis</i>	A cave obligate amphipod			G2G3	S2?*	Caves/Karst
<i>Truncilla macrodon</i>	Texas fawnsfoot		T	G2Q	S1*	Riverine
<i>Tyrannochthonius muchmoreorum</i>	A cave obligate pseudoscorpion					Caves/Karst
<i>Tyrannochthonius troglodytes</i>	A cave obligate pseudoscorpion			G1G2	S1*	Caves/Karst
<i>Xiphocentron messapus</i>	A caddisfly			G1G3	S2?*	Riparian, Riverine
PLANTS						
<i>Agalinis densiflora</i>	Osage Plains false foxglove			G3	S2	Savanna/Open Woodland - Outcrops
<i>Amorpha roemeriana</i>	Texas amorpha			G3	S3	Woodland
<i>Argythamnia aphoroides</i>	Hill Country wild-mercury			G2G3	S2S3	Savanna/Open Woodland
<i>Astragalus mollissimus var. coryi</i>	Cory's woolly locoweed			G5T3	S3	Grassland (limestone substrates)
<i>Astragalus reflexus</i>	Texas milk vetch			G3	S3	Savanna/Open Woodland
<i>Astragalus wrightii</i>	Wright's milkvetch			G3	S3	Grassland; Savanna/Open Woodland
<i>Bauhinia lunarioides</i>	Anacacho orchid			G3	S1	Shrubland
<i>Berberis swaseyi</i>	Texas barberry			G3	S3	Savanna/Open Woodland
<i>Brazoria enquistii</i>	Enquist's sandmint			G2	S2	Riparian (sandy banks and streamsides) with Savanna/Open Woodland matrix
<i>Brickellia dentata</i>	gravelbar brickellbush			G3G4	S3S4	Riparian
<i>Brickellia eupatorioides var. gracillima</i>	narrowleaf brickellbush			G5T3	S3	Riparian
<i>Campanula reverchonii</i>	Basin bellflower			G2	S2	Barren/Sparse Vegetation (granite gravels and outcrops)
<i>Cardamine macrocarpa var. texana</i>	Texas largeseed bittercress			G3T2	S2	Woodland (oak-juniper)
<i>Carex edwardsiana</i>	canyon sedge			G3G4S3S4	S3S4	Woodland (slopes above Riparian)
<i>Chaetopappa effusa</i>	spreading leastdaisy			G3G4	S3S4	Woodland
<i>Clematis texensis</i>	scarlet leather-flower			G3G4	S3S4	Woodland
<i>Colubrina stricta</i>	Comal snakewood			G2	S1	Shrubland
<i>Crataegus turnerorum</i>	Turners' hawthorn			G3Q	S3	Savanna/Open Woodland
<i>Croton alabamensis var. texensis</i>	Texabama croton			G3T2	S2	Woodland
<i>Cuscuta exaltata</i>	tree dodder			G3	S3	Woodland
<i>Dalea hallii</i>	Hall's prairie-clover			G3	S3	Savanna/Open Woodland; Grassland
<i>Dalea sabinalis</i>	Sabinal prairie-clover			GH	SH	Grassland; Savanna/Open Woodland
<i>Desmanthus reticulatus</i>	net-leaf bundleflower			G3	S3	Savanna/Open Woodland
<i>Desmodium lindheimeri</i>	Lindheimer's tickseed			G3G4	S1	Woodland
<i>Donrichardsia macroneuron</i>	Don Richard's spring moss			G1	S1	Freshwater Wetland (springs)
<i>Echinocereus coccineus var. paucispinus</i>	Texas claret-cup cactus			G5T3	S3	Shrublands; Desert Scrub; Grasslands; Woodlands
<i>Ephedra coryi</i>	Cory's ephedra			G3	S3	Barren/Sparse Vegetation (inland sand dunes); Grasslands
<i>Eriocaulon koernickianum</i>	small-headed pipewort			G2	S1	Freshwater Wetland (bogs)
<i>Eriogonum nealleyi</i>	Irion County wild-buckwheat			G2	S2	Savanna/Open Woodland; Grassland
<i>Eriogonum tenellum var. ramosissimum</i>	Basin wild-buckwheat			G5T3	S3	Barren/Sparse Vegetation (granite gravels and outcrops)
<i>Euphorbia peploidion</i>	low spurge			G3	S3	Savanna/Open Woodland
<i>Festuca versuta</i>	Texas fescue			G3	S3	Woodland
<i>Galactia watsoniana</i>	Watson's milk-pea			G1	S1	Woodland (canyons)
<i>Gilia ludens</i>	South Texas gilia			G3	S3	Shrubland
<i>Glossopetalon texense</i>	Texas greasebush			G1	S1	Savanna/Open Woodland; Barren/Sparse Vegetation (limestone cliffs, ledges, or outcrops)

Edwards Plateau Species of Greatest Conservation Need

Scientific Name	Common Name	Status		Abundance Ranking		General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place
		Federal	State	Global	State	
<i>Hesperaloe parviflora</i>	red yucca			G3	S3	Savanna/Open Woodland
<i>Hexalectris nitida</i>	Glass Mountains coral-root			G3	S3	Woodland
<i>Hexalectris warnockii</i>	Warnock's coral-root			G2G3	S2	Woodland
<i>Houstonia parviflora</i>	Greenman's bluet			G3	S3	Savanna/Open Woodland
<i>Isoetes lithophila</i>	rock quillwort			G2	S2	Freshwater Wetland (vernal pools)
<i>Isoetes piedmontana</i>	Piedmont quillwort			G3	S1	Freshwater Wetland (vernal pools)
<i>Lythrum ovalifolium</i>	Plateau loosestrife			G3G4	S3S4	Riparian; Freshwater Wetlands (seeps)
<i>Matelea edwardsensis</i>	Plateau milkvine			G3	S3	Woodland (canyons)
<i>Matelea sagittifolia</i>	arrowleaf milkvine			G3	S3	Shrubland; Woodland
<i>Monarda punctata</i> var. <i>stanfieldii</i>	Stanfield's beebalm			G5T3	S3	Savanna/Open Woodland
<i>Muhlenbergia villiflora</i> var. <i>villosa</i>	villous muhly			G5T3	S2	Barren/Sparse Vegetation (gypseous soils); Shrubland
<i>Nesaea longipes</i>	longstalk heimia			G2G3	S2	Freshwater Wetland (springs, cienegas)
<i>Oenothera cordata</i>	heartleaf evening-primrose			G3	S3	Savanna/Open Woodland
<i>Onosmodium helleri</i>	Heller's marbledseed			G3	S3	Woodland
<i>Packera texensis</i>	Llano butterweed			G2	S2	Savanna/Open Woodland (on granite gravels)
<i>Pediomelum cyphocalyx</i>	turnip-root scurfpea			G3G4	S3S4	Grassland
<i>Penstemon guadalupensis</i>	Guadalupe beardtongue			G3	S3	Savanna/Open Woodland
<i>Penstemon triflorus</i> subsp. <i>integrifolius</i>	Heller's beardtongue			G3T3	S2	Savanna/Open Woodland; Barren/Sparse Vegetation (limestone cliffs, ledges, or outcrops)
<i>Penstemon triflorus</i> subsp. <i>triflorus</i>	threeflower penstemon			G3T3	S3	Savanna/Open Woodland; Barren/Sparse Vegetation (limestone cliffs, ledges, or outcrops)
<i>Phaseolus texensis</i>	canyon bean			G2	S2	Woodland (canyons)
<i>Philadelphus ernestii</i>	canyon mock-orange			G3	S3	Woodland (canyons on limestone outcrops or boulders)
<i>Phoradendron hawksworthii</i>	Hawksworth's mistletoe			G3	S3	Woodland
<i>Physaria engelmannii</i>	Engelmann's bladderpod			G3	S3	Savanna/Open Woodland
<i>Physostegia correllii</i>	Correll's false dragon-head			G2	S2	Riparian; Riverine; Freshwater Wetland
<i>Polygala palmeri</i>	Palmer's milkwort			G3	S2	Shrubland
<i>Pomaria brachycarpa</i>	broadpod rushpea			G2	S2	Savanna/Open Woodland
<i>Prenanthes carrii</i>	canyon rattlesnake-root			G2	S2	Woodland (canyons)
<i>Prunus minutiflora</i>	Texas almond			G3G4	S3S4	Savanna/Open Woodland
<i>Prunus texana</i>	Texas peachbush			G3G4	S3S4	Savanna/Open Woodland; Grassland
<i>Salvia pentstemonoides</i>	big red sage			G1	S1	Barren/Sparse Vegetation (limestone outcrops, boulders, and cliffs); Woodland (canyons)
<i>Sclerocactus breviphamatus</i> subsp. <i>tobuschii</i>	Tobusch fishhook cactus	LE	E	G4T3	S3	Savanna/Open Woodland
<i>Selenia jonesii</i>	Jones' selenia			G3	S3	Grassland
<i>Seymeria texana</i>	Texas seymeria			G3	S3	Woodland
<i>Shinnersia rivularis</i>	springrun whitehead			G2G3	S1	Riverine (riffles)
<i>Spigelia texana</i>	Florida pinkroot			G3	S3	Woodland (canyons); Freshwater Wetland (Bottomland Forest)
<i>Streptanthus bracteatus</i>	bracted twistflower			G1G2	S1S2	Woodland; Savanna/Open Woodland
<i>Streptanthus platycarpus</i>	broadpod twistflower			G3	S3	Savanna/Open Woodland
<i>Styrax platanifolius</i> subsp. <i>platanifolius</i>	sycamore-leaf snowbell			G3T3	S3	Woodland
<i>Styrax platanifolius</i> subsp. <i>stellatus</i>	hairy sycamore-leaf snowbell			G3T3	S3	Woodland
<i>Styrax platanifolius</i> subsp. <i>texanus</i>	Texas snowbells	LE	E	G3T1	S1	Barren/Sparse Vegetation (limestone cliffs and ledges); Riparian; with Woodland or Shrubland matrix
<i>Tradescantia pedicellata</i>	granite spiderwort			G2Q	S2	Savanna/Open Woodland
<i>Tragia nigricans</i>	darkstem noseburn			G3	S3	Woodland
<i>Tridens buckleyanus</i>	Buckley tridens			G3G4	S3S4	Woodland
<i>Valerianella stenocarpa</i>	bigflower cornsalad			G3	S3	Savanna/Open Woodland
<i>Valerianella texana</i>	Edwards Plateau cornsalad			G2	S2	Savanna/Open Woodland (igneous or metamorphic gravels)
<i>Zizania texana</i>	Texas wild rice	LE	E	G1	S1	Riverine (spring-fed, clear, thermally constant, moderate current, sand to gravel substrate)



United States Department of the Interior



FISH AND WILDLIFE SERVICE

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<http://www.fws.gov/southwest/es/AustinTexas/>

<http://www.fws.gov/southwest/es/EndangeredSpecies/lists/>

In Reply Refer To:

July 16, 2019

Consultation Code: 02ETAU00-2019-SLI-1442

Event Code: 02ETAU00-2019-E-02912

Project Name: Lower Guadalupe Feasibility Study (1 of 3) Bear Detention Dam

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that *may* occur within the county of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please note that new information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Also note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of federally listed as threatened

or endangered species and to determine whether projects may affect these species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

While a Federal agency may designate a non-Federal representative to conduct informal consultation or prepare a biological assessment, the Federal Agency must notify the Service in writing of any such designation. The Federal agency shall also independently review and evaluate the scope and content of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by a federally funded, permitted or authorized activity, the agency is required to consult with the Service pursuant to 50 CFR 402. The following definitions are provided to assist you in reaching a determination:

- *No effect* - the proposed action will not affect federally listed species or critical habitat. A “no effect” determination does not require section 7 consultation and no coordination or contact with the Service is necessary. However, if the project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.
 - *May affect, but is not likely to adversely affect* - the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effect. The Federal agency or the designated non-Federal representative should consult with the Service to seek written concurrence that adverse effects are not likely. Be sure to include all of the information and documentation used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.
 - *Is likely to adversely affect* - adverse effects to listed species may occur as a direct or indirect result of the proposed action. For this determination, the effect of the action is neither discountable nor insignificant. If the overall effect of the proposed action is beneficial to the listed species but the action is also likely to cause some adverse effects to individuals of that species, then the proposed action “is likely to adversely affect” the listed species. The analysis should consider all interrelated and interdependent actions. An “is likely to adversely affect” determination requires the Federal action agency to initiate formal section 7 consultation with our office.
-

Regardless of the determination, the Service recommends that the Federal agency maintain a complete record of the evaluation, including steps leading to the determination of effect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related information. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at: <http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>.

Migratory Birds

For projects that may affect migratory birds, the Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of these species. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Migratory birds may nest in trees, brushy areas, or other areas of suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals, nests, or eggs. If project activities must be conducted during this time, we recommend surveying for nests prior to conducting work. If a nest is found, and if possible, the Service recommends a buffer of vegetation remain around the nest until the young have fledged or the nest is abandoned.

For additional information concerning the MBTA and recommendations to reduce impacts to migratory birds please contact the U.S. Fish and Wildlife Service Migratory Birds Office, 500 Gold Ave. SW, Albuquerque, NM 87102. A list of migratory birds may be viewed at <https://www.fws.gov/birds/management/managed-species/migratory-bird-treaty-act-protected-species.php>. Guidance for minimizing impacts to migratory birds for projects including communications towers can be found at: <https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-documents/communication-towers.php>. Additionally, wind energy projects should follow the wind energy guidelines

<https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-documents/wind-energy.php>) for minimizing impacts to migratory birds and bats.

Finally, please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan <https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-documents/eagles.php>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
-

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Austin Ecological Services Field Office

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Project Summary

Consultation Code: 02ETAU00-2019-SLI-1442

Event Code: 02ETAU00-2019-E-02912

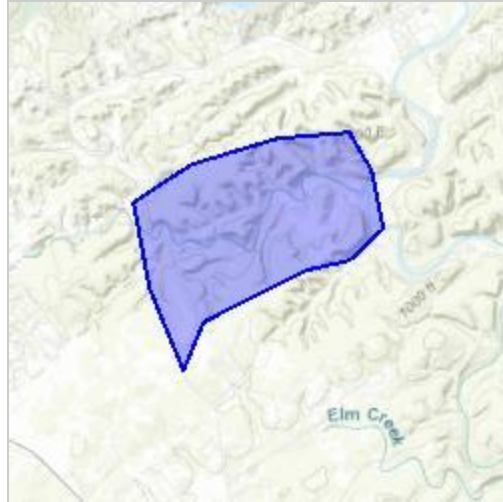
Project Name: Lower Guadalupe Feasibility Study (1 of 3) Bear Detention Dam

Project Type: DAM

Project Description: The Lower Guadalupe Feasibility Study was authorized by the Guadalupe and San Antonio Rivers and Tributaries, Texas, resolution adopted by the Committee on Transportation and Infrastructure, U.S. House of Representatives, House Resolution docket 2547 dated 11 March 1998. The purpose of the study is to investigate flooding with effort to reduce risk from future floods. The study area is comprised of the portions of the Guadalupe, San Marcos, and Blanco River Basins in Texas. Various flood risk management measures were developed and evaluated including dry detention dams in Hays, Blanco, and Comal Counties as well as bypass channels along the eastern flank of San Marcos. Dry and wet flood proofing structures, in addition to raising structures, alternatives were also evaluated throughout the study area. As a result of alternative screening and analysis, the Bear Creek Detention Dam (BCDD) on Bear Creek in Comal County is being recommended for implementation. To mitigate the unavoidable adverse impacts to Federally threatened and endangered species associated with the construction and operation of the BCDD the implementation sponsor, Comal County, would acquire and manage up to 412 acres of existing golden-cheeked warbler (*Setophaga chrysoparia*, [GCWA]) habitat in perpetuity for the benefit of GCWA and other natural resources. In addition, up to 25 acres of riparian habitat will be planted and managed along the Guadalupe River below New Braunfels to offset impacts to riparian corridors, and the removal of Cummings Dam, downstream of San Marcos on the San Marcos River to offset aquatic impacts from the construction of the BCDD. This IPAC project (1 of 3) shows the footprint of the BCDD.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/29.804340121618473N98.2057387095392W>



Counties: Comal, TX

Endangered Species Act Species

There is a total of 17 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 3 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.
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Birds

NAME	STATUS
<p>Golden-cheeked Warbler (=wood) <i>Dendroica chrysoparia</i></p> <p>No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/33</p>	Endangered
<p>Least Tern <i>Sterna antillarum</i></p> <p>Population: interior pop. No critical habitat has been designated for this species. This species only needs to be considered under the following conditions:</p> <ul style="list-style-type: none"> ▪ Wind Energy Projects <p>Species profile: https://ecos.fws.gov/ecp/species/8505</p>	Endangered
<p>Piping Plover <i>Charadrius melodus</i></p> <p>Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is final critical habitat for this species. Your location is outside the critical habitat. This species only needs to be considered under the following conditions:</p> <ul style="list-style-type: none"> ▪ Wind Energy Projects <p>Species profile: https://ecos.fws.gov/ecp/species/6039</p>	Threatened
<p>Red Knot <i>Calidris canutus rufa</i></p> <p>No critical habitat has been designated for this species. This species only needs to be considered under the following conditions:</p> <ul style="list-style-type: none"> ▪ Wind Energy Projects <p>Species profile: https://ecos.fws.gov/ecp/species/1864</p>	Threatened
<p>Whooping Crane <i>Grus americana</i></p> <p>Population: Wherever found, except where listed as an experimental population There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758</p>	Endangered

Amphibians

NAME	STATUS
<p>San Marcos Salamander <i>Eurycea nana</i></p> <p>There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6374</p>	Threatened
<p>Texas Blind Salamander <i>Typhlomolge rathbuni</i></p> <p>No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5130</p>	Endangered

Fishes

NAME	STATUS
Fountain Darter <i>Etheostoma fonticola</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5858	Endangered

Clams

NAME	STATUS
Golden Orb <i>Quadrula aurea</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9042	Candidate
Texas Fatmucket <i>Lampsilis bracteata</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9041	Candidate
Texas Fawnsfoot <i>Truncilla macrodon</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8965	Candidate
Texas Pimpleback <i>Quadrula petrina</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8966	Candidate

Insects

NAME	STATUS
Comal Springs Dryopid Beetle <i>Stygoparnus comalensis</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7175	Endangered
Comal Springs Riffle Beetle <i>Heterelmis comalensis</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3403	Endangered

Crustaceans

NAME	STATUS
Peck's Cave Amphipod <i>Stygobromus (=Stygonectes) pecki</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8575	Endangered

Flowering Plants

NAME	STATUS
Bracted Twistflower <i>Streptanthus bracteatus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2856	Candidate
Texas Wild-rice <i>Zizania texana</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/805	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.



United States Department of the Interior



FISH AND WILDLIFE SERVICE

Austin Ecological Services Field Office

10711 Burnet Road, Suite 200

Austin, TX 78758-4460

Phone: (512) 490-0057 Fax: (512) 490-0974

<http://www.fws.gov/southwest/es/AustinTexas/>

<http://www.fws.gov/southwest/es/EndangeredSpecies/lists/>

In Reply Refer To:

July 16, 2019

Consultation Code: 02ETAU00-2019-SLI-1444

Event Code: 02ETAU00-2019-E-02916

Project Name: Lower Guadalupe Feasibility Study (2 of 3) Cummings Dam removal for aquatic mitigation

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that *may* occur within the county of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

Please note that new information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Also note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of federally listed as threatened

or endangered species and to determine whether projects may affect these species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

While a Federal agency may designate a non-Federal representative to conduct informal consultation or prepare a biological assessment, the Federal Agency must notify the Service in writing of any such designation. The Federal agency shall also independently review and evaluate the scope and content of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by a federally funded, permitted or authorized activity, the agency is required to consult with the Service pursuant to 50 CFR 402. The following definitions are provided to assist you in reaching a determination:

- *No effect* - the proposed action will not affect federally listed species or critical habitat. A “no effect” determination does not require section 7 consultation and no coordination or contact with the Service is necessary. However, if the project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.
 - *May affect, but is not likely to adversely affect* - the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effect. The Federal agency or the designated non-Federal representative should consult with the Service to seek written concurrence that adverse effects are not likely. Be sure to include all of the information and documentation used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.
 - *Is likely to adversely affect* - adverse effects to listed species may occur as a direct or indirect result of the proposed action. For this determination, the effect of the action is neither discountable nor insignificant. If the overall effect of the proposed action is beneficial to the listed species but the action is also likely to cause some adverse effects to individuals of that species, then the proposed action “is likely to adversely affect” the listed species. The analysis should consider all interrelated and interdependent actions. An “is likely to adversely affect” determination requires the Federal action agency to initiate formal section 7 consultation with our office.
-

Regardless of the determination, the Service recommends that the Federal agency maintain a complete record of the evaluation, including steps leading to the determination of effect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related information. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at: <http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>.

Migratory Birds

For projects that may affect migratory birds, the Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of these species. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Migratory birds may nest in trees, brushy areas, or other areas of suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals, nests, or eggs. If project activities must be conducted during this time, we recommend surveying for nests prior to conducting work. If a nest is found, and if possible, the Service recommends a buffer of vegetation remain around the nest until the young have fledged or the nest is abandoned.

For additional information concerning the MBTA and recommendations to reduce impacts to migratory birds please contact the U.S. Fish and Wildlife Service Migratory Birds Office, 500 Gold Ave. SW, Albuquerque, NM 87102. A list of migratory birds may be viewed at <https://www.fws.gov/birds/management/managed-species/migratory-bird-treaty-act-protected-species.php>. Guidance for minimizing impacts to migratory birds for projects including communications towers can be found at: <https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-documents/communication-towers.php>. Additionally, wind energy projects should follow the wind energy guidelines

<https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-documents/wind-energy.php>) for minimizing impacts to migratory birds and bats.

Finally, please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan <https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-documents/eagles.php>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
-

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Austin Ecological Services Field Office

10711 Burnet Road, Suite 200

Austin, TX 78758-4460

(512) 490-0057

Project Summary

Consultation Code: 02ETAU00-2019-SLI-1444

Event Code: 02ETAU00-2019-E-02916

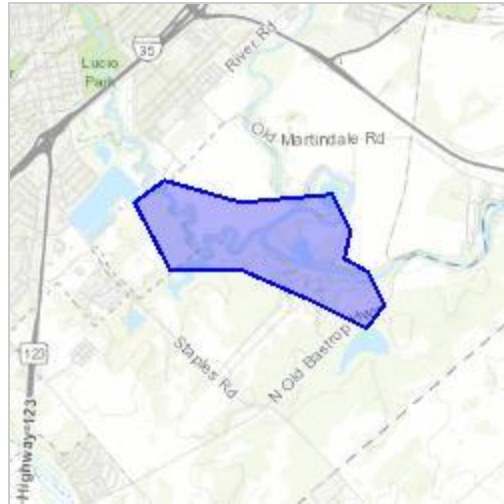
Project Name: Lower Guadalupe Feasibility Study (2 of 3) Cummings Dam removal for aquatic mitigation

Project Type: LAND - RESTORATION / ENHANCEMENT

Project Description: The Lower Guadalupe Feasibility Study was authorized by the Guadalupe and San Antonio Rivers and Tributaries, Texas, resolution adopted by the Committee on Transportation and Infrastructure, U.S. House of Representatives, House Resolution docket 2547 dated 11 March 1998. The purpose of the study is to investigate flooding with effort to reduce risk from future floods. The study area is comprised of the portions of the Guadalupe, San Marcos, and Blanco River Basins in Texas. Various flood risk management measures were developed and evaluated including dry detention dams in Hays, Blanco, and Comal Counties as well as bypass channels along the eastern flank of San Marcos. Dry and wet flood proofing structures, in addition to raising structures, alternatives were also evaluated throughout the study area. As a result of alternative screening and analysis, the Bear Creek Detention Dam (BCDD) on Bear Creek in Comal County is being recommended for implementation. To mitigate the unavoidable adverse impacts to Federally threatened and endangered species associated with the construction and operation of the BCDD the implementation sponsor, Comal County, would acquire and manage up to 412 acres of existing golden-cheeked warbler (*Setophaga chrysoparia*, [GCWA]) habitat in perpetuity for the benefit of GCWA and other natural resources. In additional, up to 25 acres of riparian habitat will be planted and managed along the Guadalupe River below New Braunfels to offset impacts to riparian corridors, and the removal of Cummings Dam, downstream of San Marcos on the San Marcos River to offset aquatic impacts from the construction of the BCDD. This IPAC project (2 of 3) shows the footprint of the aquatic mitigation efforts, the removal of Cummings Dam.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/29.857728571557416N97.91482087300642W>



Counties: Hays, TX

Endangered Species Act Species

There is a total of 20 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 3 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.
-

Birds

NAME	STATUS
<p>Golden-cheeked Warbler (=wood) <i>Dendroica chrysoparia</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/33</p>	Endangered
<p>Least Tern <i>Sterna antillarum</i> Population: interior pop. No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: <ul style="list-style-type: none"> ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/8505</p>	Endangered
<p>Piping Plover <i>Charadrius melodus</i> Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is final critical habitat for this species. Your location is outside the critical habitat. This species only needs to be considered under the following conditions: <ul style="list-style-type: none"> ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/6039</p>	Threatened
<p>Red Knot <i>Calidris canutus rufa</i> No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: <ul style="list-style-type: none"> ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/1864</p>	Threatened
<p>Whooping Crane <i>Grus americana</i> Population: Wherever found, except where listed as an experimental population There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758</p>	Endangered

Amphibians

NAME	STATUS
Austin Blind Salamander <i>Eurycea waterlooensis</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5737	Endangered
Barton Springs Salamander <i>Eurycea sosorum</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1113	Endangered
San Marcos Salamander <i>Eurycea nana</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6374	Threatened
Texas Blind Salamander <i>Typhlomolge rathbuni</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5130	Endangered

Fishes

NAME	STATUS
Fountain Darter <i>Etheostoma fonticola</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5858	Endangered
San Marcos Gambusia <i>Gambusia georgei</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7519	Endangered

Clams

NAME	STATUS
Golden Orb <i>Quadrula aurea</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9042	Candidate
Texas Fatmucket <i>Lampsilis bracteata</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9041	Candidate
Texas Fawnsfoot <i>Truncilla macrodon</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8965	Candidate
Texas Pimpleback <i>Quadrula petrina</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8966	Candidate

Insects

NAME	STATUS
Comal Springs Dryopid Beetle <i>Stygoparnus comalensis</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7175	Endangered
Comal Springs Riffle Beetle <i>Heterelmis comalensis</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3403	Endangered

Crustaceans

NAME	STATUS
Peck's Cave Amphipod <i>Stygobromus (=Stygonectes) pecki</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8575	Endangered

Flowering Plants

NAME	STATUS
Bracted Twistflower <i>Streptanthus bracteatus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2856	Candidate
Texas Wild-rice <i>Zizania texana</i> There is final critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/805	Endangered

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Texas Wild-rice <i>Zizania texana</i> https://ecos.fws.gov/ecp/species/805#crithab	Final



United States Department of the Interior



FISH AND WILDLIFE SERVICE

Austin Ecological Services Field Office

10711 Burnet Road, Suite 200

Austin, TX 78758-4460

Phone: (512) 490-0057 Fax: (512) 490-0974

<http://www.fws.gov/southwest/es/AustinTexas/>

<http://www.fws.gov/southwest/es/EndangeredSpecies/lists/>

In Reply Refer To:

July 16, 2019

Consultation Code: 02ETAU00-2019-SLI-1443

Event Code: 02ETAU00-2019-E-02914

Project Name: Lower Guadalupe Feasibility Study (3 of 3) Riparian Mitigation

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that *may* occur within the county of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

Please note that new information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Also note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of federally listed as threatened

or endangered species and to determine whether projects may affect these species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2) (c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

While a Federal agency may designate a non-Federal representative to conduct informal consultation or prepare a biological assessment, the Federal Agency must notify the Service in writing of any such designation. The Federal agency shall also independently review and evaluate the scope and content of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by a federally funded, permitted or authorized activity, the agency is required to consult with the Service pursuant to 50 CFR 402. The following definitions are provided to assist you in reaching a determination:

- *No effect* - the proposed action will not affect federally listed species or critical habitat. A “no effect” determination does not require section 7 consultation and no coordination or contact with the Service is necessary. However, if the project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.
 - *May affect, but is not likely to adversely affect* - the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effect. The Federal agency or the designated non-Federal representative should consult with the Service to seek written concurrence that adverse effects are not likely. Be sure to include all of the information and documentation used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.
 - *Is likely to adversely affect* - adverse effects to listed species may occur as a direct or indirect result of the proposed action. For this determination, the effect of the action is neither discountable nor insignificant. If the overall effect of the proposed action is beneficial to the listed species but the action is also likely to cause some adverse effects to individuals of that species, then the proposed action “is likely to adversely affect” the listed species. The analysis should consider all interrelated and interdependent actions. An “is likely to adversely affect” determination requires the Federal action agency to initiate formal section 7 consultation with our office.
-

Regardless of the determination, the Service recommends that the Federal agency maintain a complete record of the evaluation, including steps leading to the determination of effect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related information. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at: <http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>.

Migratory Birds

For projects that may affect migratory birds, the Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of these species. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Migratory birds may nest in trees, brushy areas, or other areas of suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals, nests, or eggs. If project activities must be conducted during this time, we recommend surveying for nests prior to conducting work. If a nest is found, and if possible, the Service recommends a buffer of vegetation remain around the nest until the young have fledged or the nest is abandoned.

For additional information concerning the MBTA and recommendations to reduce impacts to migratory birds please contact the U.S. Fish and Wildlife Service Migratory Birds Office, 500 Gold Ave. SW, Albuquerque, NM 87102. A list of migratory birds may be viewed at <https://www.fws.gov/birds/management/managed-species/migratory-bird-treaty-act-protected-species.php>. Guidance for minimizing impacts to migratory birds for projects including communications towers can be found at: <https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-documents/communication-towers.php>. Additionally, wind energy projects should follow the wind energy guidelines

<https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-documents/wind-energy.php>) for minimizing impacts to migratory birds and bats.

Finally, please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan <https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-documents/eagles.php>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
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Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

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Project Summary

Consultation Code: 02ETAU00-2019-SLI-1443

Event Code: 02ETAU00-2019-E-02914

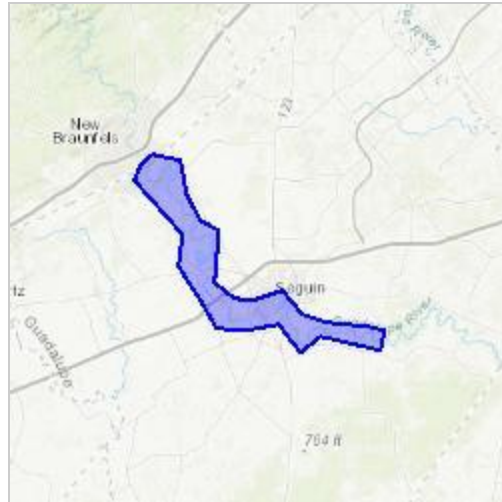
Project Name: Lower Guadalupe Feasibility Study (3 of 3) Riparian Mitigation

Project Type: VEGETATION MANAGEMENT

Project Description: The Lower Guadalupe Feasibility Study was authorized by the Guadalupe and San Antonio Rivers and Tributaries, Texas, resolution adopted by the Committee on Transportation and Infrastructure, U.S. House of Representatives, House Resolution docket 2547 dated 11 March 1998. The purpose of the study is to investigate flooding with effort to reduce risk from future floods. The study area is comprised of the portions of the Guadalupe, San Marcos, and Blanco River Basins in Texas. Various flood risk management measures were developed and evaluated including dry detention dams in Hays, Blanco, and Comal Counties as well as bypass channels along the eastern flank of San Marcos. Dry and wet flood proofing structures, in addition to raising structures, alternatives were also evaluated throughout the study area. As a result of alternative screening and analysis, the Bear Creek Detention Dam (BCDD) on Bear Creek in Comal County is being recommended for implementation. To mitigate the unavoidable adverse impacts to Federally threatened and endangered species associated with the construction and operation of the BCDD the implementation sponsor, Comal County, would acquire and manage up to 412 acres of existing golden-cheeked warbler (*Setophaga chrysoparia*, [GCWA]) habitat in perpetuity for the benefit of GCWA and other natural resources. In addition, up to 25 acres of riparian habitat will be planted and managed along the Guadalupe River below New Braunfels to offset impacts to riparian corridors, and the removal of Cummings Dam, downstream of San Marcos on the San Marcos River to offset aquatic impacts from the construction of the BCDD. This IPAC project (3 of 3) shows the footprint of where approx. 25 acres of riparian mitigation would be placed within.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/29.605663635099155N98.04157013598424W>



Counties: Comal, TX | Guadalupe, TX

Endangered Species Act Species

There is a total of 17 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 3 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.
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Birds

NAME	STATUS
<p>Golden-cheeked Warbler (=wood) <i>Dendroica chrysoparia</i></p> <p>No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/33</p>	Endangered
<p>Least Tern <i>Sterna antillarum</i></p> <p>Population: interior pop. No critical habitat has been designated for this species. This species only needs to be considered under the following conditions:</p> <ul style="list-style-type: none"> ▪ Wind Energy Projects <p>Species profile: https://ecos.fws.gov/ecp/species/8505</p>	Endangered
<p>Piping Plover <i>Charadrius melodus</i></p> <p>Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is final critical habitat for this species. Your location is outside the critical habitat. This species only needs to be considered under the following conditions:</p> <ul style="list-style-type: none"> ▪ Wind Energy Projects <p>Species profile: https://ecos.fws.gov/ecp/species/6039</p>	Threatened
<p>Red Knot <i>Calidris canutus rufa</i></p> <p>No critical habitat has been designated for this species. This species only needs to be considered under the following conditions:</p> <ul style="list-style-type: none"> ▪ Wind Energy Projects <p>Species profile: https://ecos.fws.gov/ecp/species/1864</p>	Threatened
<p>Whooping Crane <i>Grus americana</i></p> <p>Population: Wherever found, except where listed as an experimental population There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758</p>	Endangered

Amphibians

NAME	STATUS
<p>San Marcos Salamander <i>Eurycea nana</i></p> <p>There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6374</p>	Threatened
<p>Texas Blind Salamander <i>Typhlomolge rathbuni</i></p> <p>No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5130</p>	Endangered

Fishes

NAME	STATUS
Fountain Darter <i>Etheostoma fonticola</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5858	Endangered

Clams

NAME	STATUS
Golden Orb <i>Quadrula aurea</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9042	Candidate
Texas Fatmucket <i>Lampsilis bracteata</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9041	Candidate
Texas Fawnsfoot <i>Truncilla macrodon</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8965	Candidate
Texas Pimpleback <i>Quadrula petrina</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8966	Candidate

Insects

NAME	STATUS
Comal Springs Dryopid Beetle <i>Stygoparnus comalensis</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7175	Endangered
Comal Springs Riffle Beetle <i>Heterelmis comalensis</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3403	Endangered

Crustaceans

NAME	STATUS
Peck's Cave Amphipod <i>Stygobromus (=Stygonectes) pecki</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8575	Endangered

Flowering Plants

NAME	STATUS
Bracted Twistflower <i>Streptanthus bracteatus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2856	Candidate
Texas Wild-rice <i>Zizania texana</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/805	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.
