APPENDIX B

NATURAL RESOURCES OF THE SEP-HCP PLAN AREA

- GENERAL VEGETATION COMMUNITITES
- TERRAINS, SOILS AND GEOLOGY, GROUNDWATER AND AQUIFERS
- SURFACE WATER
- GENERAL WILDLIFE COMMUNITIES
- SPECIES OF CONSERVATION CONCERN
    - 0 AMPHIBIANS
    - 0 ARACHNIDS
    - 0 BIRDS
    - 0 CRUSTACEANS
    - 0 FISH
    - 0 INSECTS
    - 0 MAMMALS
    - 0 MOLLUSKS
    - 0 REPTILES
    - 0 PLANTS
- EXISTING CONSERVATION LANDS

GENERAL VEGETATION COMMUNITIES

RESOURCE ASSESSMENT FOR THE SOUTHERN EDWARDS PLATEAU HABITAT CONSERVATION PLAN

DRAFT MARCH 29, 2011

1.0 INTRODUCTION

This preliminary resource assessment describes the general character of the ecological regions and vegetation communities in the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP). The SEP-HCP Plan Area includes Bexar, Medina, Bandera, Kerr, Kendall, Blanco, and Comal counties. The purpose of this assessment is to document the basic background information for the Habitat Conservation Plan and associated Environmental Impact Statement.

2.0 ECOLOGICAL REGIONS

The U.S. Environmental Protection Agency (USEPA) produced a map of ecoregions of the conterminous United States to serve as a spatial framework for environmental resource management. These ecoregions denote areas within which ecosystems (and the type, quality, and quantity of environmental resources within them) are generally similar (Griffith et al. 2004). The SEP-HCP Plan Area crosses parts of four different ecoregions (at the Level 3 level), and covers parts of six different subregions (i.e., Level 4 ecoregions). Figure 1 shows the ecoregions within the Plan Area and Table 1 summarizes their representation within the Plan Area.

TABLE 1. LEVEL 4 ECOREGIONS WITHIN THE SEP-HCP PLAN AREA[1].

Level 4 Ecoregion	Acres within the Plan Area	% of Plan Area
Balcones Canyonlands	2,226,318	54%
Edwards Plateau Woodland	580,093	14%
Llano Uplift	7,373	0.2%
Northern Blackland Prairie	641,541	16%
Northern Nueces Alluvial Plains	598,310	14%
Southern Post Oak Savanna	74,334	2%

[1] Griffith et al. (2004)

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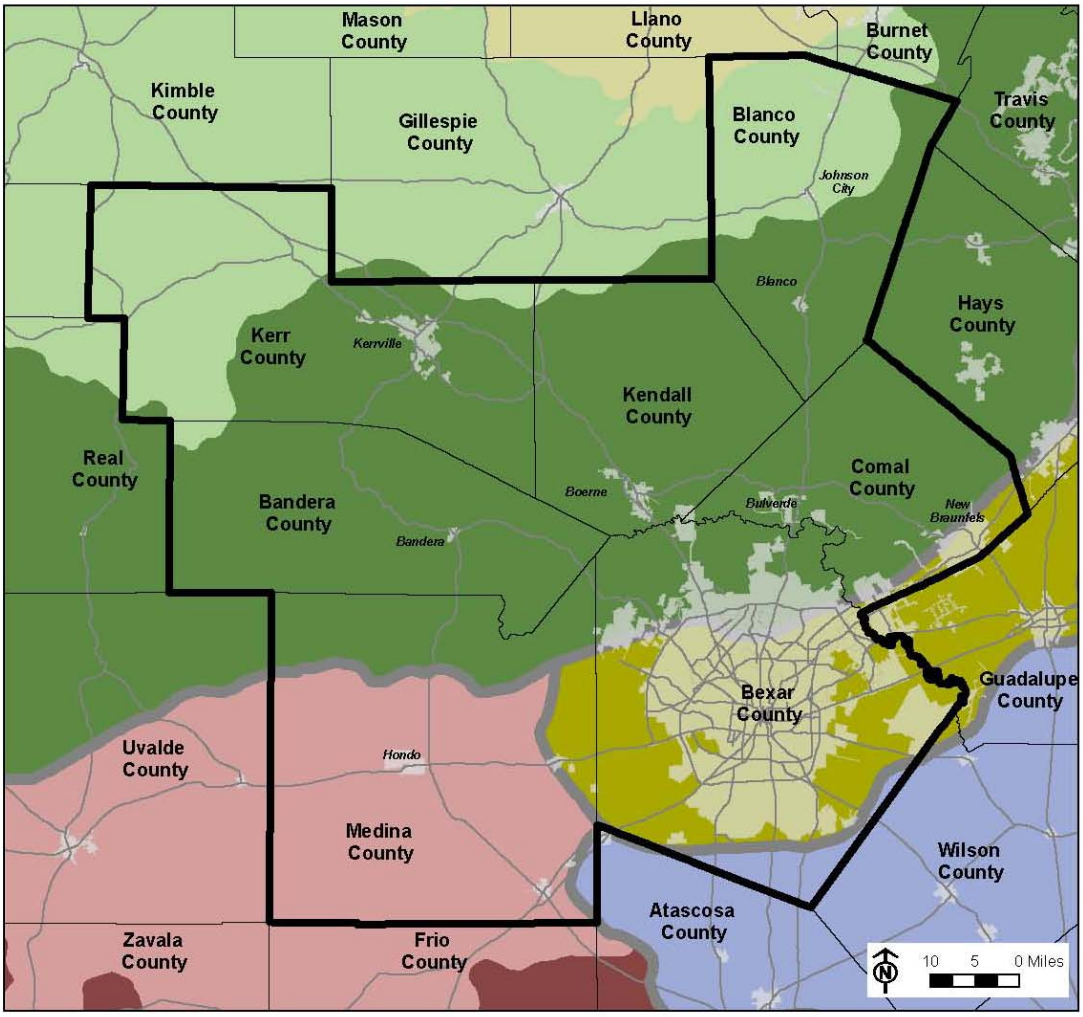
FIGURE 1. USEPA ECOREGION BOUNDARIES.



2.1 EDWARDS PLATEAU ECOREGION

2.1.1 BALCONES CANYONLANDS SUBREGION

The Balcones Canyonlands subregion forms the southeastern boundary of the Edwards Plateau, and is separated from the coastal plains to the east by the Balcones Fault Zone. This region has rugged topography with steep-sided canyons formed by the erosion and solution of the underlying limestone bedrock by the numerous springs, streams, and rivers that flow above and below the surface. The Balcones Canyonlands subregion supports a number of endemic plants, and woodlands that have a relatively high number of deciduous trees that are not commonly found elsewhere on the Edwards Plateau, such as escarpment black cherry (*Prunus serotina*), Texas madrone (*Arbutus xalapensis*),

Lacey oak (*Quercus laceyi*), bigtooth maple (*Acer grandidentatum*), and Carolina basswood (*Tilia americana* var. *caroliniana*). Riparian areas may also include relict populations of trees that are more common in the eastern Texas swamp communities, such as bald cypress (*Taxodium distichum*), American sycamore (*Platanus occidentalis*), and black willow (*Salix nigra*). Drier areas of the subregion are typically dominated by plateau live oak (*Quercus fusiformis*) woodlands and shrublands of Ashe juniper (*Juniperus ashei*), sumac (*Rhus* spp.), sotol (*Dasylirion* spp.), acacia (*Acacia* spp.), honey mesquite (*Prosopis glandulosa*), and cenizo (*Leucophyllum candidum*) (Griffith et al. 2004).

2.1.2 EDWARDS PLATEAU WOODLANDS SUBREGION

The central portion of the Edwards Plateau ecoregion is characterized by a savanna of grasslands with scattered plateau live oak, Spanish oak (*Quercus buckleyi*), Ashe juniper, and honey mesquite. With fire suppression and grazing, Ashe juniper and mesquite are thought to have increased over time, reducing the savanna character of the plateau. Common grasses in this savanna matrix include little bluestem (*Schizachyrium scoparium*), Texas wintergrass (*Nassella leucotricha*), yellow indiangrass (*Sorghastrum nutans*), white tridens (*Tridens albescens*), Texas cupgrass (*Eriochloa sericea*), sideoats grama (*Bouteloua curtipendula*), seep muhly (*Muhlenbergia reverchonii*), and common curlymesquite (*Hilaria belangeri*) (Griffith et al. 2004).

2.1.3 LLANO UPLIFT SUBREGION

The Llano Uplift portion of the Edwards Plateau is a basin that may be as much as 1,000 feet below the level of the surrounding limestone escarpment and is distinguished from other parts of the plateau by an exposed area of granite. Soils in this subregion tend to be acidic, unlike the alkaline soils of the Edwards Plateau Woodlands subregion. The granite outcrops of the Llano Uplift can contain unusual plant communities. However, typical woodland vegetation on the Llano Uplift is typically composed of plateau live oak, honey mesquite, post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), cedar elm (*Ulmus crassifolia*), and (occasionally) black hickory (*Carya texana*). Drier sites may include species more characteristics of west Texas, such as catclaw mimosa (*Acacia greggii*) and soaptree yucca (*Yucca elata*). The Llano Uplift also typically lacks Ashe juniper and Spanish oak, except within areas where limestone outcrops. Common grasses of this region include little bluestem, yellow indiangrass, silver bluestem (*Bothriochloa saccharoides*), and switchgrass (*Panicum virgatum*) (Griffith et al. 2004).

2.2 TEXAS BLACKLAND PRAIRIE ECOREGION

Within the SEP-HCP Plan Area, the Texas Blackland Prairie ecoregion is represented by the Northern Blackland Prairie subregion. The Northern Blackland Prairie has rolling to nearly level, deep and productive soils. Historically, this subregion was dominated by large expanses of grasses such as little bluestem, big bluestem, yellow indiangrass, and tall dropseed (*Sporobolus compositus*), with lowland sites represented by eastern gamagrass (*Tripsacum dactyloides*) and switchgrass. Common forbs present in these prairies included speces such as asters, prairie bluet, prairie clovers, and blackeyed susan. Occasional woodlands are found along riparian corridors, and include Shumard oak (*Quercus shumardii*), sugar hackberry (*Celtis laevigata*), elm (*Ulmus* spp.), ash (*Fraxinus* spp.), eastern cottonwood (*Populus deltoides*), and pecan (*Carya illinoinensis*). However, most of the native prairie habitat has been converted to cropland, non-native pasture, and developed land uses (Griffith et al. 2004).

2.3 SOUTH TEXAS PLAINS ECOREGION

The South Texas Plains ecoregion is represented by the Northern Nueces Alluvial Plains subregion within the Plan Area. The character of the Northern Nueces Alluvial Plains is influenced by streams draining from the Balcones Canyonlands subregion, and alluvial fans and alluvial plains deposits are common features on the landscape. Soils in this subregion are mostly very deep. Vegetation in the Northern Nueces Alluvial Plains is typically characterized as mesquite-live oak-bluewood parks within the northern part of the subregion and mesquite-granjeno parks in the southern part. These parks are interspersed with grasslands that may include scattered honey mesquite, plateau live oak, and other trees in areas with deep soils and short brush, commonly including guajillo (*Acacia berlandieri*), blackbrush (*Acacia rigidula*), elbowbush (*Forestiera pubescens*), and kidneywood (*Eysenhardtia texana*), in areas with shallower soils. Some floodplain forests may have hackberry, plateau live oak, pecan, cedar elm, black willow, and eastern cottonwood along the banks. Common grasses in this subregion include little bluestem, sideoats grama, lovegrass tridens (*Tridens eragrostoides*), multiflowered false rhodesgrass (*Trichloris pluriflora*), Arizona cottontop (*Digitaria californica*), plains bristlegrass (*Setaria vulpiseta*), and green sprangletop (*Leptochloa dubia*). Many areas in the Northern Nueces Alluvial Plains are used to grow crops, which are frequently irrigated (Griffith et al. 2004).

2.4 EAST CENTRAL TEXAS PLAINS ECOREGION

The southeastern corner of the SEP-HCP Plan Area is represented by the Southern Post Oak Savanna of the East Central Texas Plains ecoregion. This area is a mosaic of post oak savanna, improved pasture, and rangeland. Some areas in the southern portion of this subregion are being invaded by mesquite, while other areas have a thick understory of yaupon (*Ilex vomitoria*) and eastern red cedar (*Juniperus virginiana*) (Griffith et al. 2004).

3.0 TPWD VEGETATION MAP

Texas Parks and Wildlife Department (TPWD) mapped vegetation communities within Texas and noted commonly associated plants for each community (McMahan et al. 1984). While somewhat outdated (the map was based on aerial imagery and satellite data from the 1970's), "The Vegetation Types of Texas" still provides a useful summary of the general vegetation communities across the state.

The SEP-HCP Plan Area includes forests, woods, parks, brush, grasslands, crops, lakes, and urban lands. McMahan et al. (1984) identifies 13 vegetation types within the Plan Area, as shown on Figure 2 and summarized in Table 2. Table 3 lists the common plant associations identified by McMahan et al. (1984) for each of these vegetation types.

TABLE 2. VEGETATION TYPES WITHIN THE SEP-HCP PLAN AREA[1].

Vegetation Type	Acres within the Plan Area	% of Plan Area
Live Oak - Ashe Juniper Parks	1,256,474	30.4%
Live Oak - Ashe Juniper Woods	796,302	19.3%
Live Oak - Mesquite - Ashe Juniper Parks	791,526	19.2%
Crops	565,781	13.7%
Mesquite - Live Oak - Bluewood Parks	190,004	4.6%
Mesquite - Granjeno Woods	163,271	4.0%
Urban	159,376	3.9%
Post Oak Woods, Forest, and Grassland	76,918	1.9%

TABLE 2. VEGETATION TYPES WITHIN THE SEP-HCP PLAN AREA[1].

Vegetation Type	Acres within the Plan Area	% of Plan Area
Mesquite - Blackbrush Brush	41,105	1.0%
Live Oak - Mesquite Parks	34,646	0.8%
Post Oak Woods and Forest	23,969	0.6%
Lake	17,296	0.4%
Pecan - Elm Forest	11,300	0.3%

[1] McMahan et al. (1984)

FIGURE 2. VEGETATION TYPES OF TEXAS.

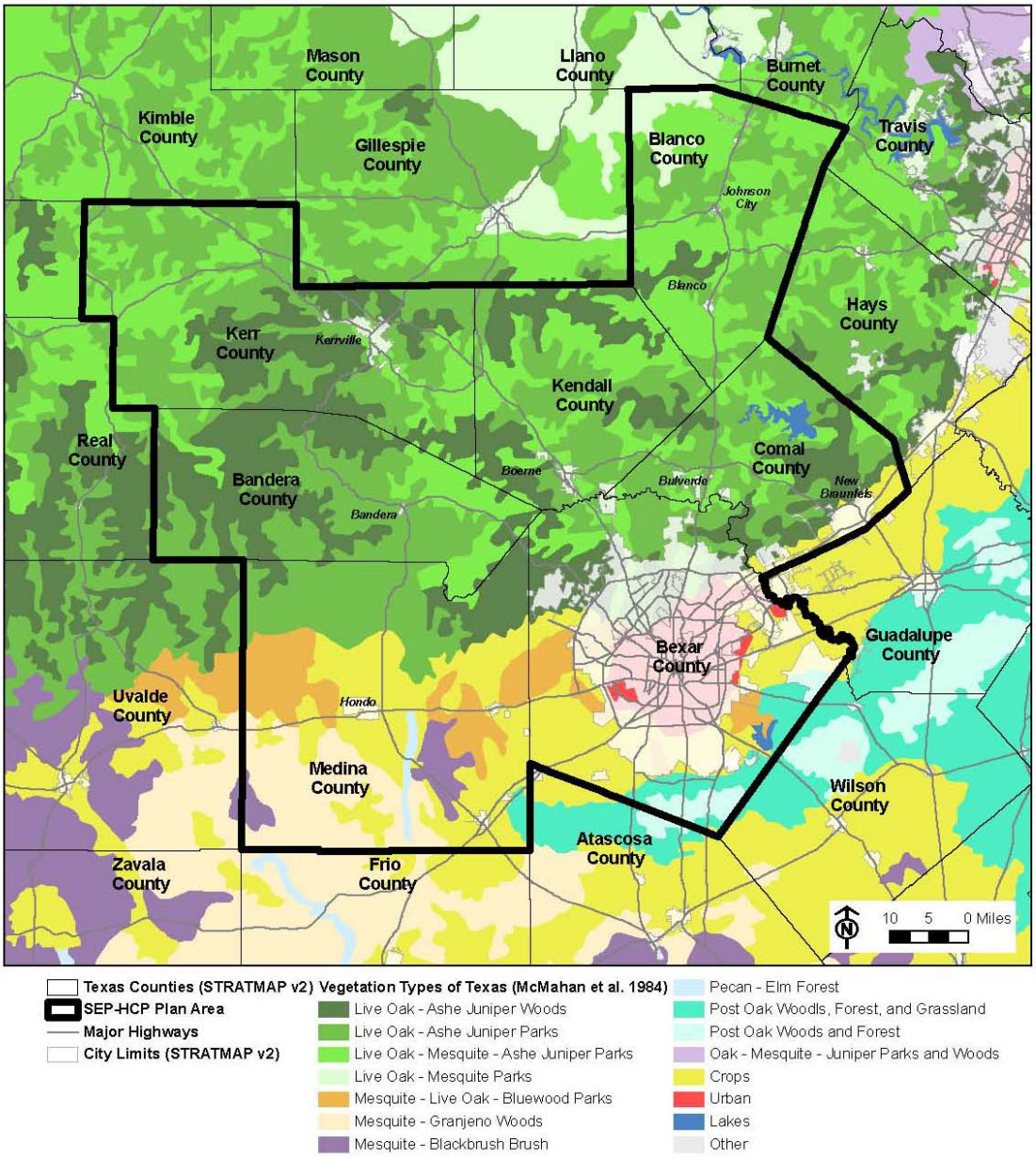


TABLE 3. PLANT SPECIES ASSOCIATIONS FOR VEGETATION TYPES OF TEXAS[1].

Common Name	Scientific Name	Live Oak - Ashe Juniper Parks	Live Oak - Ashe Juniper Woods	Live Oak - Mesquite - Ashe Juniper Parks	Mesquite - Live Oak - Bluestem Parks	Mesquite - Granjeno Woods	Post Oak Woods, Forest, and Grassland	Mesquite - Blackbrush Brush	Live Oak - Mesquite Parks	Post Oak Woods and Forest	Pecan - Elm Forest
agarito	*Berberis trifoliolata*	x		x	x				x		
allthorn	*Koeberlinia spinosa*							x			
American beautyberry	*Callicarpa americana*						x			x	
American elm	*Ulmus americana*										x
bald cypress	*Taxodium distichum*										x
beaked panicum	*Panicum anceps*						x			x	
Berlandier wolfberry	*Lycium berlandieri var. berlandieri*				x	x					
black hickory	*Carya texana*						x		x	x	
black willow	*Salix nigra*										x
blackbrush	*Acacia rigidula*				x						
blackjack oak	*Quercus marilandica*						x		x	x	
bluewood	*Condalia hookeri*					x		x			
buffalograss	*Buchloe dactyloides*								x		
Canada wildrye	*Elymus canadensis*										x
Carolina ash	*Fraxinus caroliniana*										x
catclaw	*Acacia greggii*					x					
cedar elm	*Ulmus crassifolia*	x	x	x			x		x	x	x
cedar sedge	*Carex planostachys*	x	x	x							
ceniza	*Leucophyllum frutescens*							x			
coral-berry	*Symphoricarpos orbiculatus*						x			x	
cottonwood	*Populus deltoides*										x
curly mesquite	*Hilaria belangeri*	x	x	x					x		
desert olive	*Forestiera angustifolia*					x		x			
desert yaupon	*Schaefferia cuneifolia*				x	x		x			
dewberry	*Rubus trivialis*						x			x	
dogweed	*Dyssodia pentachaeta var. pentachaeta*							x			
eastern redcedar	*Juniperus virginiana*						x			x	
elbowbush	*Forestiera pubescens*		x						x		

TABLE 3. PLANT SPECIES ASSOCIATIONS FOR VEGETATION TYPES OF TEXAS[1].

Common Name	Scientific Name	Live Oak - Ashe Juniper Parks	Live Oak - Ashe Juniper Woods	Live Oak - Mesquite - Ashe Juniper Parks	Mesquite - Live Oak - Bluestem Parks	Mesquite - Granjeno Woods	Post Oak Woods, Forest, and Grassland	Mesquite - Blackbrush Brush	Live Oak - Mesquite Parks	Post Oak Woods and Forest	Pecan - Elm Forest
escaprpment cherry	*Prunus serotina var. eximia*		x								
evergreen sumac	*Rhus virens*		x								
field ragweed	*Ambrosia confertiflora*					x					
firewheel	*Gaillardia spp.*								x		
flameleaf sumac	*Rhus lanceolata*	x		x							
frostweed	*Verbesina virginica*										x
goatbush	*Castela texana*							x			
granjeno	*Celtis pallida*				x			x			
greenbriar	*Smilax bona-nox*										x
guajillo	*Acacia berlandieri*							x			
guayacan	*Porlieria angustifolia*					x		x			
hackberry	*Celtis spp.*						x			x	x
hairy grama	*Bouteloua hirsuta*							x	x		
hairy tridens	*Tridens spp.*	x		x				x			
Hall's panicum	*Panicum hallii*	x		x	x	x					
hawthorn	*Crataegus spp.*						x			x	
huisache	*Acacia farnesiana*				x						
huisachillo	*Acacia tortuosa*				x						
Indian mallow	*Abutilon incanum*								x		
Johnsongrass	*Sorghum halepense*										x
kidneywood	*Eysenhardtia texana*	x		x				x			
knotweed leafflower	*Phyllanthus polygonoides*							x			
leatherstem	*Jatropha dioica*							x			
little bluestem	*Schizachyrium scoparium var. frequens*	x	x	x			x		x	x	
live oak	*Quercus virginiana*						x			x	x
lotebush	*Ziziphus obtusifolia*				x	x		x			
mat euphorbia	*Euphorbia serpens*	x	x	x	x			x			
meadow dropseed	*Sporobolus asper var. hookeri*		x								

TABLE 3. PLANT SPECIES ASSOCIATIONS FOR VEGETATION TYPES OF TEXAS[1].

Common Name	Scientific Name	Live Oak - Ashe Juniper Parks	Live Oak - Ashe Juniper Woods	Live Oak - Mesquite - Ashe Juniper Parks	Mesquite - Live Oak - Bluestem Parks	Mesquite - Granjeno Woods	Post Oak Woods, Forest, and Grassland	Mesquite - Blackbrush Brush	Live Oak - Mesquite Parks	Post Oak Woods and Forest	Pecan - Elm Forest
mescal bean	*Sophora secundiflora*		x								
mesquite	*Prosopis glandulosa*						x			x	
Mexican persimmon	*Diospyros texana*	x		x	x				x		
mustang grape	*Vitis mustangensis*										x
Neally grama	*Bouteloua uniflora*		x								
netleaf hackberry	*Celtis reticulata*	x		x							
noseburn	*Tragia ramosa*		x								
pellitory	*Parietaria pensylvanica*		x								
pink pappusgrass	*Pappophorum bicolor*				x	x		x			
poison oak	*Rhus toxicodendron*		x				x			x	x
post oak	*Quercus stellata*								x		
purple three-awn	*Aristida purpurea*	x		x	x	x		x	x		
rabbit tobacco	*Evax prolifera*	x		x							
rescuegrass	*Bromus unioloides*										x
retama	*Parkinsonia aculeata*					x					
Roemer three-awn	*Aristida roemeriana*				x						
sand lovegrass	*Eragrostis trichodes*						x			x	
sandjack oak	*Quercus incana*						x			x	
saw greenbriar	*Smilax bona-nox*	x	x	x							
sensitive briar	*Schrankia spp.*				x						
shin oak	*Quercus sinuata var. breviloba*	x	x	x							
sideoats grama	*Bouteloua curtipendula*								x		
silver bluestem	*Bothriochloa saccharoides*						x			x	
slim tridens	*Tridens muticus var. muticus*							x			
slimlobe poppymallow	*Callirhoe involucrata var. lineariloba*				x						
Spanish oak	*Quercus buckleyi*	x	x	x							
spranglegrass	*Chasmanthium sessiliflorum*						x			x	
spreading sida	*Sida filicaulis*		x								

TABLE 3. PLANT SPECIES ASSOCIATIONS FOR VEGETATION TYPES OF TEXAS[1].

Common Name	Scientific Name	Live Oak - Ashe Juniper Parks	Live Oak - Ashe Juniper Woods	Live Oak - Mesquite - Ashe Juniper Parks	Mesquite - Live Oak - Bluestem Parks	Mesquite - Granjeno Woods	Post Oak Woods, Forest, and Grassland	Mesquite - Blackbrush Brush	Live Oak - Mesquite Parks	Post Oak Woods and Forest	Pecan - Elm Forest
supplejack	*Berchemia scandens*						x			x	
sycamore	*Platanus occidentalis*										x
tasajillo	*Opuntia leptocaulis*				x	x		x			
Texas bluebonnet	*Lupinus texensis*								x		
Texas grama	*Bouteloua rigidiseta*	x	x	x					x		
Texas pricklypear	*Opuntia spp.*	x		x	x	x		x			
Texas wintergrass	*Nassella leucotricha*	x	x	x					x		
three-awn	*Aristida spp.*						x			x	
tickclover	*Desmodium spp.*						x			x	
tiquilia	*Coldenia spp.*							x			
trumpet creeper	*Campsis radicans*						x			x	
twistleaf yucca	*Yucca rupicola*		x								
two-leaved senna	*Cassia roemeriana*	x		x	x			x			
Virginia wildrye	*Elymus virginicus*										x
virgin's bower	*Clematis virginiana*					x					x
water oak	*Quercus nigra*										x
western ragweed	*Ambrosia psilostachya*										x
whitebrush	*Aloysia gratissima*				x	x		x	x		
woodsorrel	*Oxalis spp.*		x			x					
woollybucket bumelia	*Bumelia lanuginosa*				x	x			x		
yaupon	*Ilex vomitoria*						x			x	x
yucca	*Yucca spp.*							x			

[1] McMahan et al. (1984)

4.0 NATIONAL LAND COVER DATA

The National Land Cover Database includes land cover classifications for the conterminous U.S. and Puerto Rico at a pixel resolution of 30 meters. The dataset was developed by the Multi-Resolution Land Characteristics Consortium (MLRC) to provide relevant land cover information for a variety of scientific, economic, and governmental applications, such as analyzing ecosystem status and health, studying biodiversity patterns, and developing land management policies (Homer et al. 2004). Two iterations of the NLCD have been developed to date, based on satellite imagery and other data dated from circa 1992 and 2001.

4.1 NLCD 2001 LAND USE AND LAND COVER

The NLCD 2001 is based on Thematic Mapper data derived from Landsat 5 and Landsat 7 imagery collected circa 2001. This dataset updates an earlier publication produced in 1992 (Homer et al. 2004).

The 2001 NLCD maps approximately two-thirds of the SEP-HCP Plan Area as either shrub/scrub vegetation (approximately 1.6 million acres or 39 percent of the Plan Area) or evergreen forest (approximately 1.1 million acres or 26 percent of the Plan Area). Herbaceous vegetation was the next most extensive land use/land cover category, with approximately 465,000 acres (approximately 11 percent of the Plan Area). Developed land uses (including high, medium, and low intensity development and developed open spaces) accounted for approximately 361,000 acres of the Plan Area (approximately 8.7 percent of the Plan Area). Table 4 describes each of the land use / land cover categories. Figure 3 shows the distribution of land use / land cover types and Table 5 summarizes the extent of each land use / land cover type in the Plan Area.

TABLE 4. NLCD 2001 LAND USE / LAND COVER CATEGORIES[1].

Land Use / Land Cover Category	Description
Shrub/Scrub	Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20 percent of total vegetation. This class includes true shrubs, young trees in an early successional stage, or trees stunted from environmental conditions.
Evergreen Forest	Areas dominated by trees generally greater than 5 meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.
Deciduous Forest	Areas dominated by trees generally greater than 5 meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.
Mixed Forest	Areas dominated by trees generally greater than 5 meters tall, and greater than 20 percent of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of the total tree cover.
Herbaceous	Areas dominated by grammanoid or herbaceous vegetation, generally greater than 80 percent of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.

Developed, Low Intensity	Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20 to 49 percent of total cover. These areas most commonly include single-family housing units.
Developed, Medium Intensity	Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50 to 79 percent of the total cover. These areas most commonly include single-family housing units.
Developed, High Intensity	Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses, and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover.
Developed, Open Space	Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot, single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
Cultivated Crops	Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of the total vegetation. This class also includes all land being actively tilled.
Hay/Pasture	Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of the total vegetation.
Woody Wetlands	Areas where forest or shrubland vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
Emergent Herbaceuous Wetlands	Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
Open Water	All areas of open water, generally with less than 25 percent cover of vegetation or soil.
Barren Land	Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15 percent of the total cover.

[1] Homer et al. (2004)

FIGURE 3. NATIONAL LAND COVER DATASET 2001 LAND USE AND LAND COVER.

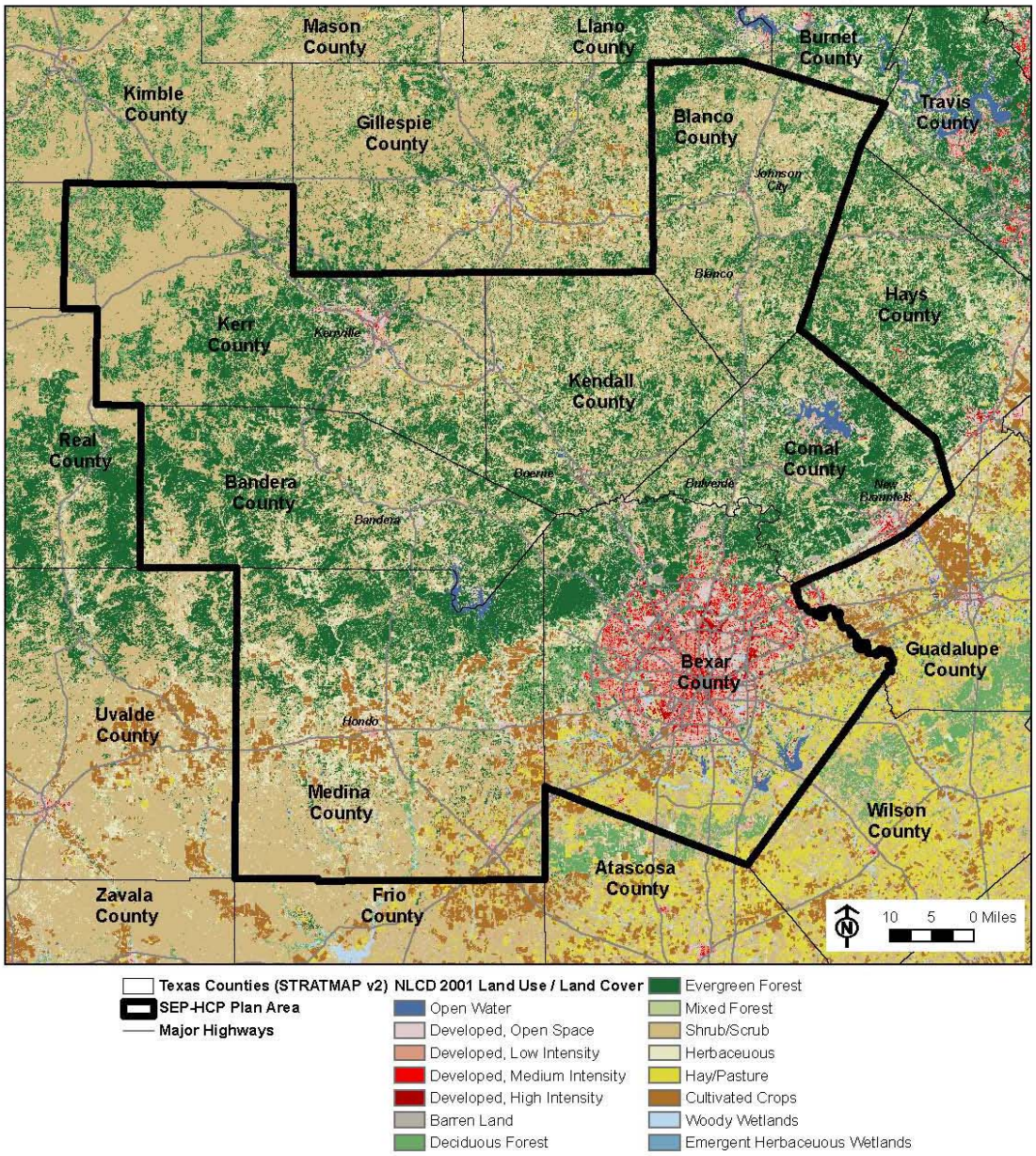


TABLE 5. NLCD 2001 LAND USE AND LAND COVER IN THE SEP-HCP PLAN AREA[1].

Category	Acres within the Plan Area	Percent of Plan Area
Shrub/Scrub	1,616,420	39.2%
Evergreen Forest	1,074,922	26.0%
Deciduous Forest	295,244	7.2%
Mixed Forest	6,010	0.1%
Herbaceous	464,856	11.3%

TABLE 5. NLCD 2001 LAND USE AND LAND COVER IN THE SEP-HCP PLAN AREA[1].

Category	Acres within the Plan Area	Percent of Plan Area
Developed, Low Intensity	106,520	2.6%
Developed, Medium Intensity	52,887	1.3%
Developed, High Intensity	29,274	0.7%
Developed, Open Space	172,449	4.2%
Cultivated Crops	139,302	3.4%
Hay/Pasture	109,237	2.6%
Woody Wetlands	27,790	0.7%
Emergent Herbaceuous Wetlands	789	0.0%
Open Water	27,287	0.7%
Barren Land	5,724	0.1%

[1] Homer et al. (2004)

4.2 NLCD 1992 – 2001 LAND USE/LAND COVER CHANGE

While the 1992 and 2001 versions of the NLCD were intended to maintain as much compatibility as possible, there were sufficient differences in the two datasets that direct comparison was not possible. To allow for comparison between the two datasets, the U.S. Geological Survey (USGS) prepared a "retrofit change project" between the 1992 and 2001 versions of the National Land Cover Dataset (USGS 2003).

The NLCD 1992 – 2001 change data indicate that the conversion of forest cover to another land cover type (most commonly grassland/shrub vegetation) was the most common land cover change in the Plan Area, resulting in a net loss of approximately 127,447 acres of forest cover. Conversion of grassland/shrub vegetation and agricultural areas were the next most common types of land cover changes, resulting in a net gain of 77,216 acres of grassland/shrub cover and a net loss of 23,166 acres of agricultural lands. During this period, there was a net gain of approximately 40,147 acres of urban land cover across the Plan Area, mostly converted from areas of prior forest or grassland/shrub cover.

Table 6 summarizes the land cover changes in the Plan Area between 1992 and 2001.

TABLE 6. NLCD LAND COVER CHANGES IN THE PLAN AREA BETWEEN 1992 AND 2001[1].

Category	Acres Lost or Converted	Acres Unchanged	Acres Gained	Net change (acres)	% Change from 1992
Forest	156,960	1,345,056	29,513	(127,447)	-8.5%
Forest to Open Water	335				
Forest to Urban	28,414				
Forest to Barren	1,888				
Forest to Grassland/Shrub	103,799				
Forest to Agriculture	17,414				
Forest to Wetlands	5,110				
Grassland/Shrub	51,902	1,952,299	129,118	77,216	3.9%
Grassland/Shrub to Open Water	1,832				

TABLE 6. NLCD LAND COVER CHANGES IN THE PLAN AREA BETWEEN 1992 AND 2001[1].

Category	Acres Lost or Converted	Acres Unchanged	Acres Gained	Net change (acres)	% Change from 1992
Grassland/Shrub to Urban	9,383				
Grassland/Shrub to Barren	458				
Grassland/Shrub to Forest	26,956				
Grassland/Shrub to Agriculture	11,208				
Grassland/Shrub to Wetlands	2,065				
Agriculture	32,163	221,126	8,997	(23,166)	-9.1%
Agriculture to Open Water	156				
Agriculture to Urban	2,538				
Agriculture to Barren	155				
Agriculture to Forest	2,520				
Agriculture to Grassland/Shrub	24,997				
Agriculture to Wetlands	1,797				
Urban	258	320,427	40,405	40,147	12.5%
Urban to Open Water	178				
Urban to Barren	5				
Urban to Forest	5				
Urban to Grassland/Shrub	58				
Urban to Agriculture	4				
Urban to Wetlands	8				
Barren	106	3,267	2,512	2,406	71.3%
Barren to Open Water	4				
Barren to Urban	64				
Barren to Forest	6				
Barren to Grassland/Shrub	20				
Barren to Agriculture	12				
Open Water	314	24,897	2,505	2,191	8.7%
Open Water to Urban	6				
Open Water to Barren	6				
Open Water to Forest	26				
Open Water to Grassland/Shrub	244				
Open Water to Agriculture	15				
Open Water to Wetlands	17				
Wetlands	-	19,935	8,997	8,997	45.1%

[1] USGS (2003)

5.0 SIGNATURES

This report was prepared by certified wildlife biologists at the consulting firm of Loomis Partners, Inc. in conformance with the methods and limitations described herein.

PREPARED BY:	APPROVED BY:
SIGNATURE	SIGNATURE
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DATE	DATE

6.0 REFERENCES

Griffith, G. E., S. A. Bryce, J. M Omernik, J. A. Comstock, A. C. Rogers, B. Harrison, S. L. Hatch, and D. Bezanson. 2004. Ecoregions of Texas (color poster with map, descriptive text, and photographs) (map scale 1:2,500,000). U.S. Geological Survey, Reston, Virginia.

Homer, C., C. Huang, L. Yang, B. Wylie, and M. Coan. 2004. Development of a 2001 National Landcover Database for the United States. Photogrammetric Engineering and Remote Sensing. 70(7): 829-840.

McMahan, C. A., R. G. Frye, and K. L. Brown. 1984. The vegetation types of Texas -- including cropland. Texas Parks and Wildlife Department, PWD Bulletin 7000-120. Austin, Texas.

U.S. Geological Survey (USGS). 2003. National Land Cover Database NLCD 1992/2001 Change (edition 1.0). U.S. Geological Survey, Sioux Falls, SD. www.mrlc.gov/multizone.php.

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DRAFT PRELIMINARY ASSESSMENT OF THE SOUTHERN EDWARDS PLATEAU HABITAT SONSERVATION PLAN AREA

Terrains, Soils and Geology

Groundwater and Aquifers

Prepared for Loomis Partners, Inc.
3101 Bee Cave Road, Suite 100
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30 March 2011

Terrain, Soils, and Geology

The terrain of the SEP-HCP Plan Area (which includes Bandera, Bexar, Blanco, Comal, Kendall, Kerr, and Medina counties) is highly variable; the Gulf Coastal Plain found at the southeast end of the Plan Area transitions to the Blackland Prairie and the Edwards Plateau across the Plan Area to the west. This transition occurs along the Balcones Fault Zone (BFZ), or Balcones Escarpment, which is a major geologic feature of this region with a significant vertical offset of the geologic strata, juxtaposing younger carbonate rocks in the southeast with older carbonate rocks to the northwest.

The regions to the southeast of the BFZ are characterized by rolling hills and subtle terrain characteristic of the weathering of younger, less-lithofied rocks and unconsolidated sediments. The southeastern-most portion of Bexar County is within the Interior Coastal Plain, with some areas of more resistant sands inter-mixed with areas of clay and loamy clay/loamy sand. The Blackland Prairie is a transition zone from the Interior Coastal Plain where older chalks and marls have weathered to produce deep, black soils with high clay contents. This zone has a relatively flat character and has been utilized extensively for agriculture (USDA 2010). The eastern-most portion of Comal County, central Bexar County, and much of southern Medina County are included in the Blackland Prairie province.

Northwest of the Balcones Escarpment, the terrain and soils change dramatically as the topography transitions to the Texas Hill Country, part of the Edwards Plateau (Bureau of Economic Geology 1996). This area includes the remainder of the SEP-HCP Plan Area including northern Medina County, northern Bexar County, most of Comal County (northwestern portion), and all of Blanco, Kendall, Bandera, and Kerr counties. The Hill Country is characterized by high topographic relief associated with incised valleys originating on the southeastern edge of the Edwards Plateau (Barker et al. 1994) (Figure 1). Increased erosion associated with tectonic uplift has weathered away all but a few cap-rock sections of the younger limestone, leaving only the underlying older carbonate rocks.

Geologic Setting

The geology surrounding the Plan Area includes Cretaceous limestone and Quaternary alluvial terrace deposits. The stratigraphic section of Cretaceous rocks is shown in Figure 2 (Lindgren 2004), and includes limestone of the Edwards

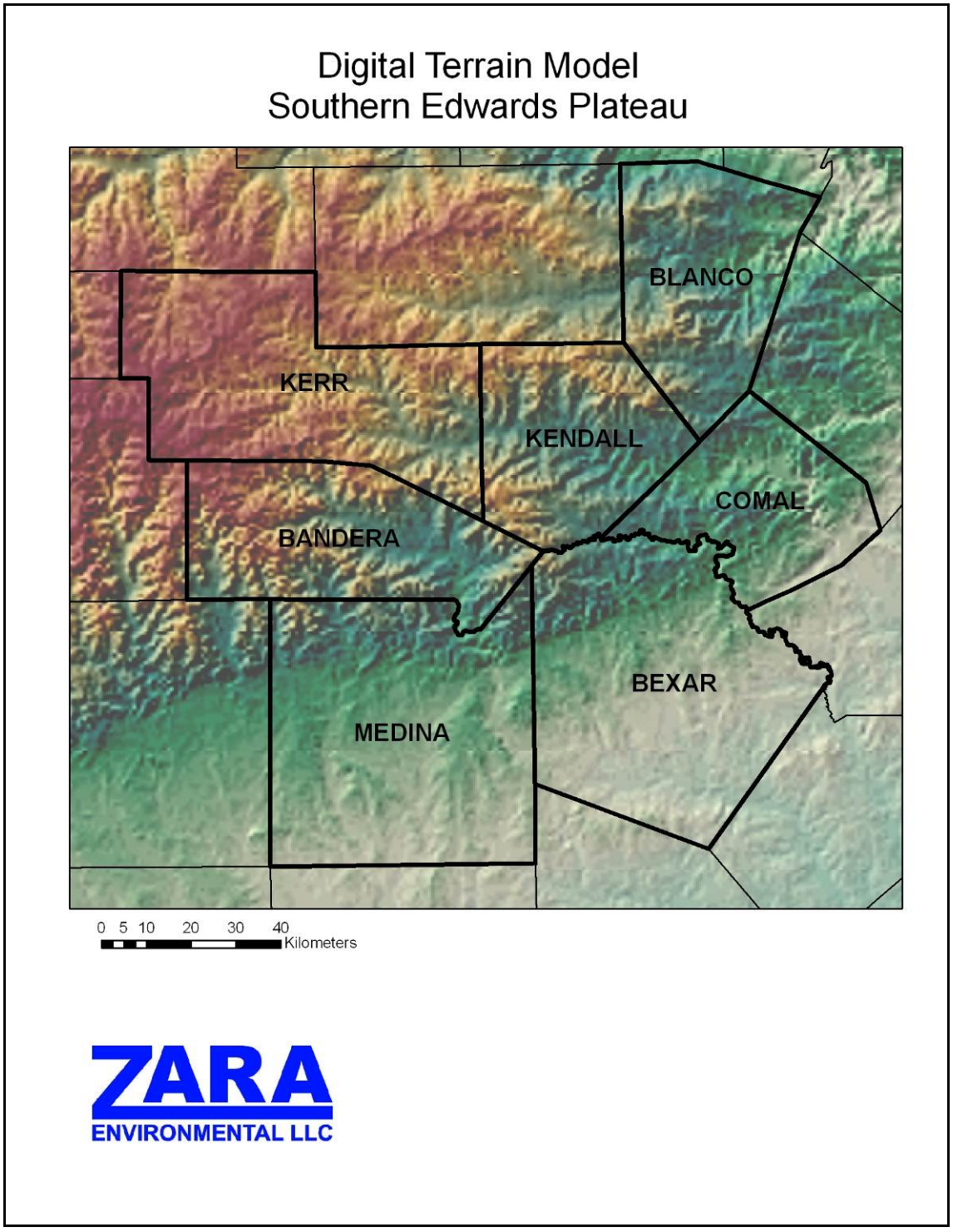

Figure 1. Digital Elevation Model of the seven counties included in the SEP-HCP Plan Area. The elevation generally increases from southeast to northwest.

Aquifer and confining units above and below the primary water bearing units of the Edwards Group and Georgetown Formation. Other significant aquifer units in the local region include the Trinity Aquifer, consisting of older Cretaceous limestone, primarily in the Glen Rose Formation, and to a lesser extent some usable groundwater is found in the Austin Chalk in rocks younger than the Edwards Group. In areas with significant surface water streams, alluvial terrace and associated clastic sediments provide a thin cover over the limestone.

Regional Geologic History

The pre-Cretaceous geologic history includes deposition of about 5,000 feet of Paleozoic carbonates, sandstone, and shale during the Early Cambrian (Flawn 1956). These sedimentary rocks were intensely uplifted, faulted and folded during the Ouachita orogeny peaking in the Late Pennsylvanian through Early Permian. A wide, shallow sea formed in a basin formed in the region and was eventually uplifted and aerially exposed by the end of the Paleozoic Era. During the Triassic and Jurassic Periods, most of central and west Texas was exposed to erosion as the Llano uplift created a topographic high in central Texas. The surrounding basin filled with Triassic red beds of the Dockum Group. By the end of the Jurassic, a large sea prograded westward and eventually covered most of central and much of west Texas.

The primary groundwater bearing geologic units in the area are Cretaceous age limestone and include Lower Cretaceous (Glen Rose Limestone, Edwards Group) and Upper Cretaceous (Del Rio Clay, Buda Limestone, Eagle Ford Group, Austin Chalk) and are shown in Figures 2 and 3. These carbonate rocks were deposited in a series of cycles where shallow oceans covered the region then regressed seaward (southeast) and prograded back to submerge the area. Thick sequences of limestone formed as a result of this process, and provide the primary framework for present day aquifers.

In the early Cenozoic time, these rocks were heavily faulted as the ancestral Gulf of Mexico to the southeast subsided. This high angle normal faulting produced as much as 1,200 feet of vertical displacement in the area now referred to as the Balcones Fault Zone (BFZ). The BFZ is defined by Cretaceous carbonates dissected by this network of faults and related fractures, including series of ramp-like structural features interconnected with major faults that strike generally east-northeast. Bedding on the downthrown fault blocks exhibits a steeper southeastward dip relative to the upthrown fault blocks of the Hill Country region (Marclay and Small 1986).

The BFZ is the principal structural geologic feature in the Plan Area, and has a great influence on groundwater flow. Fracture planes can act as conduits for or barriers to groundwater movement, depending on the amount of offset, stratigraphic juxtaposition, and post-tectonic erosional and dissolutional processes. The contact

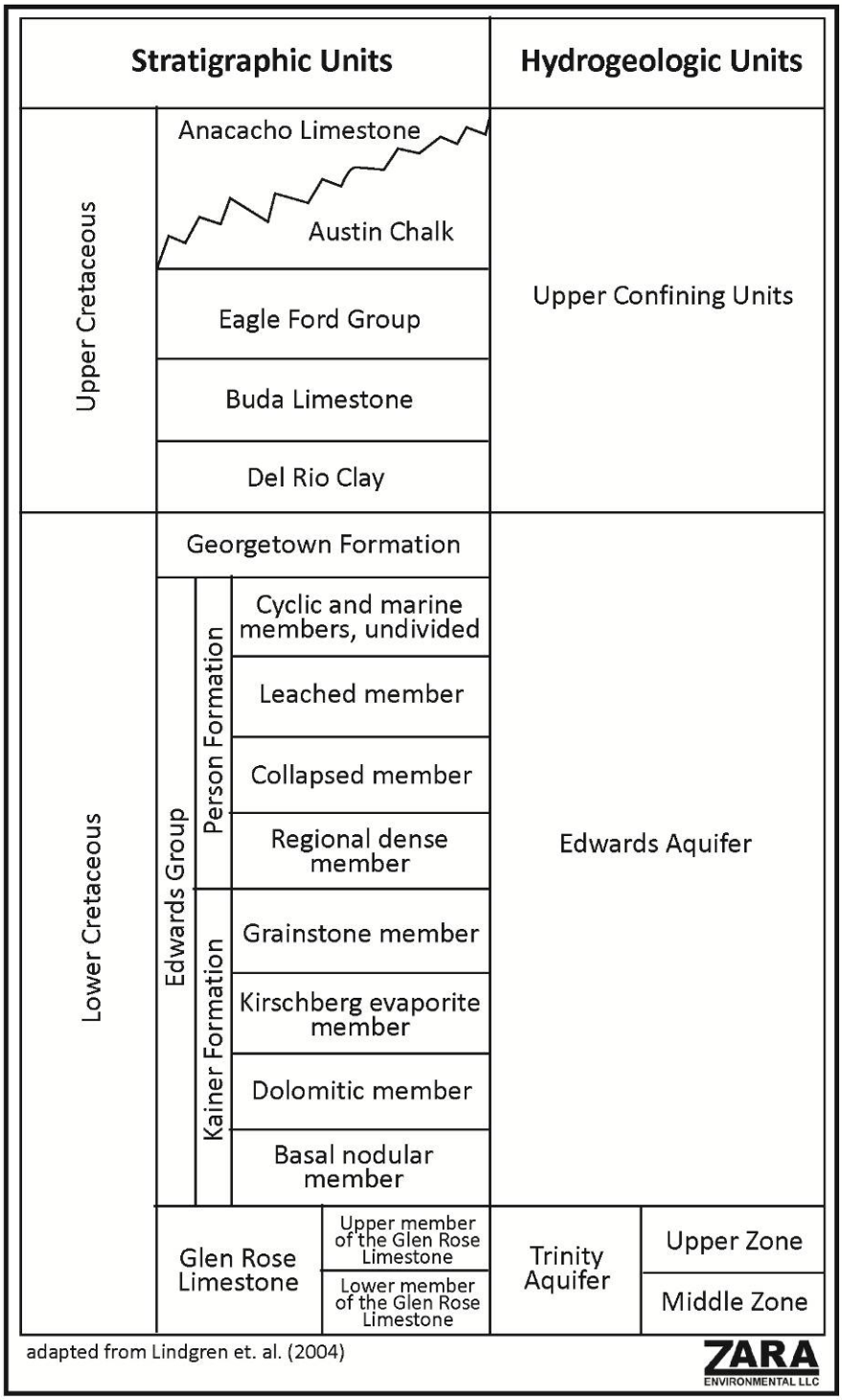

Figure 2. Stratigraphic section of limestone associated with the Edwards Aquifer.

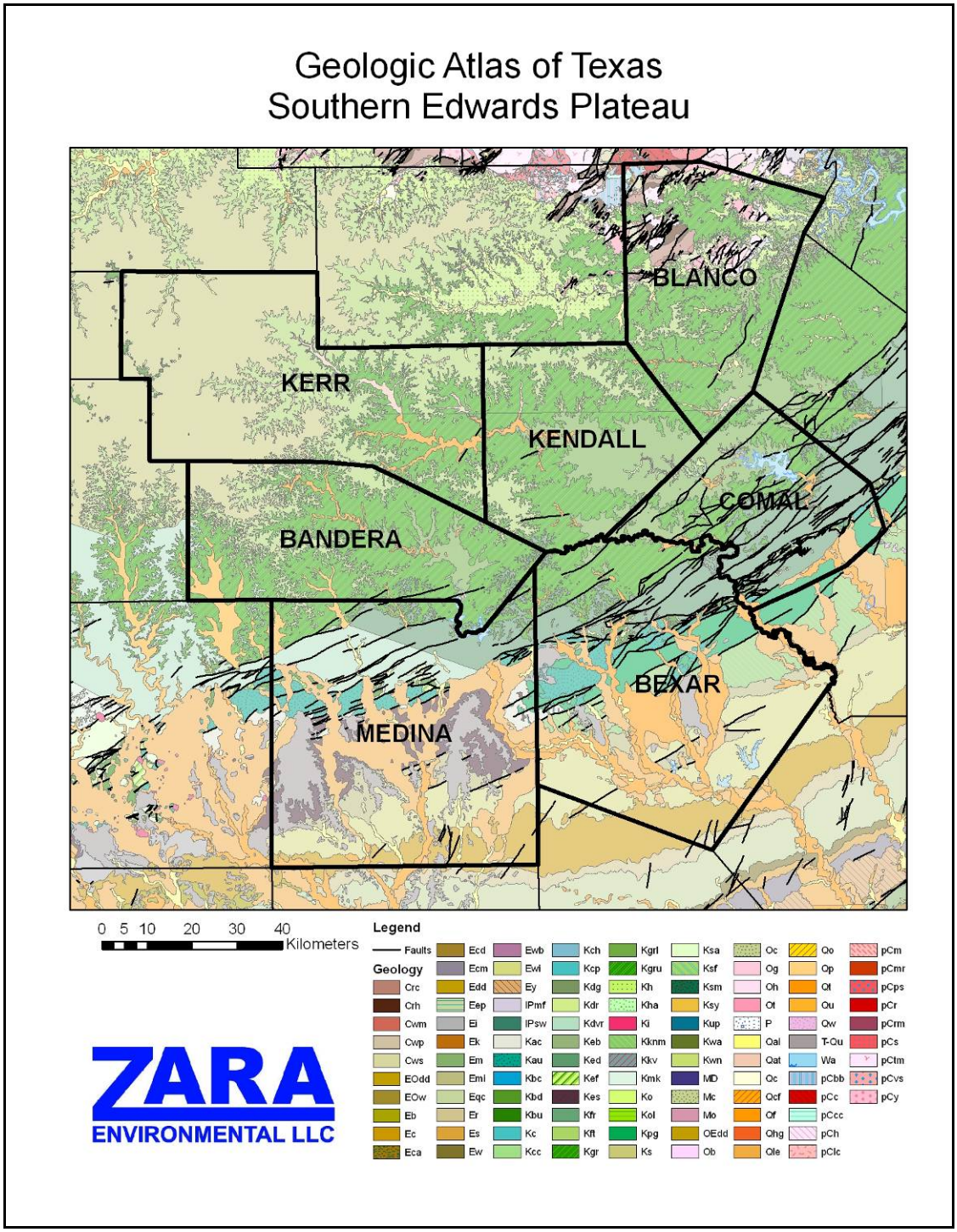

Figure 3. Geology of the SEP-HCP Plan Area from the Geologic Atlas of Texas (Texas Natural Resources Information System 2010).

between the Hill Country and the Balcones Fault Zone was determined structurally from the up-dip edge of major faults juxtaposing older Trinity Group rocks against younger Edwards Group rocks (Barker et al. 1994). Development of secondary porosity along fault planes heavily influenced the diagenetic processes occurring throughout the Cenozoic and into the Quaternary, including extensive karstification.

In areas of streams and rivers there has been some deposition of alluvial deposits, mostly silt, sand, and gravel that thinly cover the eroded limestone surface. A more detailed explanation of the regional geologic history can be found in Rose (1972), Maclay and Small (1986), and Barker et al. (1994), as well as many others.

Groundwater and Aquifers

Four major and two minor aquifers exist within the SEP-HCP Plan Area (Figure 4). The most significant aquifer from the standpoint of pumpage volume is the Edwards Balcones Fault Zone (BFZ) Aquifer. This karstic carbonate groundwater reserve supplies water to millions of users in Bexar, Medina, and Comal counties, and is the primary water source for the City of San Antonio. It is located within the limestone rocks of the Edwards Group, comprised of the Person and Kainer Formations.

The Edwards BFZ Aquifer is known to store and transmit large quantities of water, and is subject to very rapid recharge in the area where the aquifer is unconfined. This zone is referred to as the recharge zone (Figure 4), and is extremely sensitive to environmental impact, particularly from potential degradation to groundwater quality from anthropogenic contaminants. The Edwards BFZ Aquifer also provides the source water for many major springs in Texas, including the two largest: Comal Springs in Comal County and San Marcos Springs in Hays County. These spring systems serve as the sole known habitat for a number of federally listed aquatic species. The confined portion of the Edwards BFZ Aquifer extends to the south and southeast of the recharge zone and contains numerous very high capacity water wells.

Edwards Aquifer Structure

The limestone of the Edwards Group has focused recharge zones, enhanced secondary porosity, and excellent geochemical water quality conditions. These factors make the Edwards Aquifer one of the most productive groundwater reservoirs in the country (Sharp and Banner 1997). This is primarily the consequence of enhanced karstification, or dissolution of the soluble carbonate rocks, which has progressed since lithification; although, karstification processes were focused and accelerated after faulting occurred along the BFZ. The Edwards Aquifer is confined below by the Upper Glen Rose Formation and above by the Del Rio Clay. In the upthrown fault blocks to the northwest of the Plan Area, the Edwards Group rocks have been eroded away and are not present. Here, the Upper Glen Rose is exposed, and is classified as

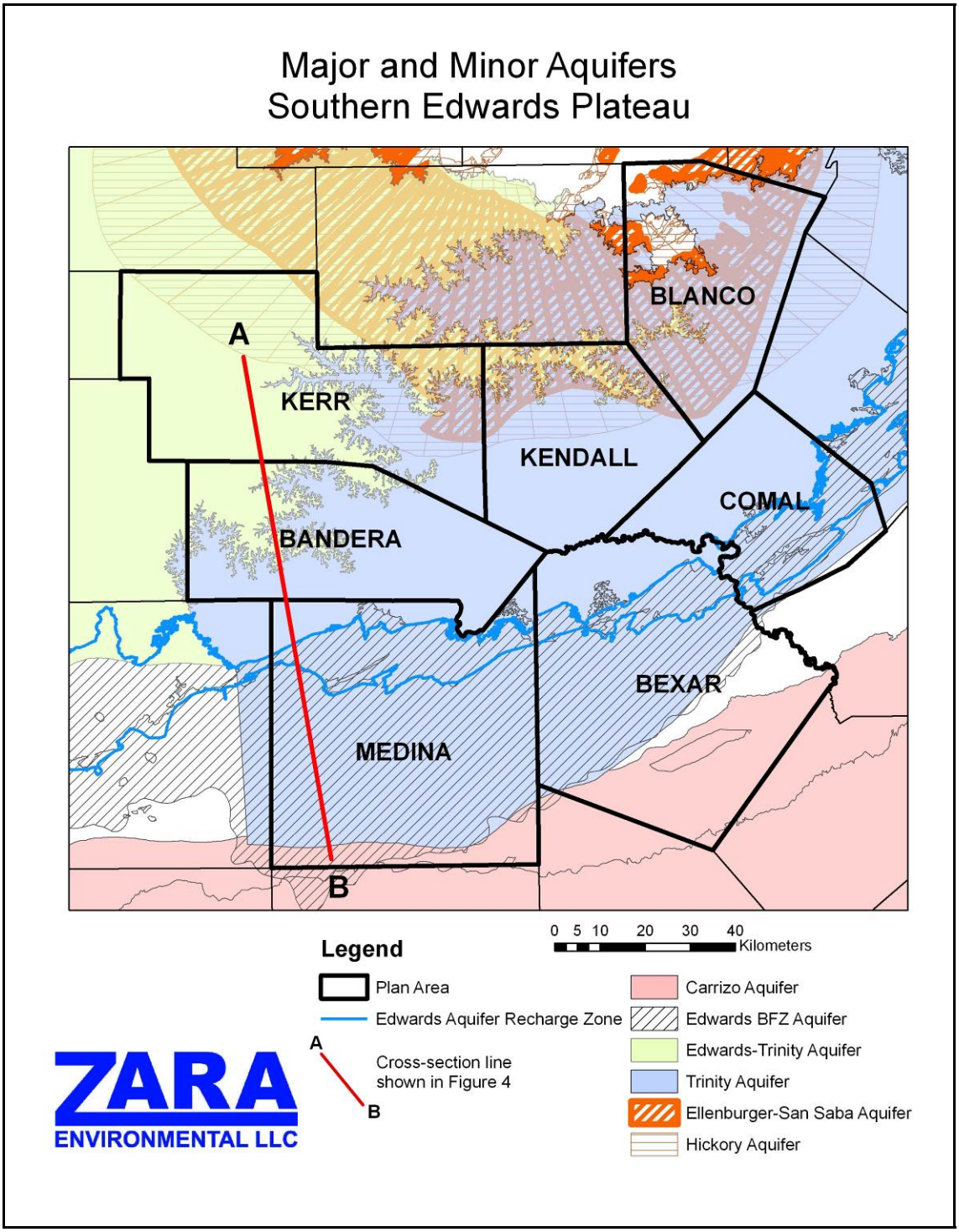

Figure 3. Major and minor aquifers of the SEP-HCP Plan Area with the location of cross-section A-B indicated, referring to Figure 4 (modified from Texas Water Development Board 2010).

being the “contributing zone” to the Edwards Aquifer. On the downthrown blocks, heading to the southeast from the contributing zone, the limestone of the Edwards Group becomes exposed to the surface and is referred to as the recharge zone.
Further southeast, and down progressive fault blocks, the units above the Edwards Group become exposed at the surface and the Edwards Aquifer becomes bounded by low permeability units of the Glen Rose below and Del Rio above (Ferrill et al. 2004). This zone is referred to as the confined zone, and is where the highest capacity wells and largest springs exist (Collins and Hovorka 1997).

Recharge and Groundwater Movement in the Edwards Aquifer
Approximately 80 percent of recharge into the Edwards Aquifer occurs in losing streams, where surface water flows over faults, fractures, and karst features that have been solutionally enhanced (Sharp and Banner 1997). Periods of recharge are intermittent as most streams in south-central Texas are ephemeral; however, the recharge capacity of surface water into the aquifer is extremely efficient due to the karstic nature of the system. Water passing over the contributing zone (Glen Rose outcrop) and into major fault zones and exposed, heavily karstified Edwards Group limestone (recharge zone), is rapidly transferred directly to the aquifer with little or no filtration. The geologic mechanisms that form karst are complex, and many factors affect how karst is expressed in current settings. These factors control the way the groundwater flow system evolves, and ultimately how groundwater is recharged, transmitted, and naturally discharged through the aquifer system. A great deal of literature exists that presents current perspectives of karst development in the Edwards Aquifer (Sharp and Banner 1997, Hovorka et al. 1998, Schindel et al. 2008, Palmer and Palmer 2009, and many others)

Groundwater movement in the phreatic zone is generally west to east in the Plan Area, based on groundwater elevations or potentiometric surface on a regional scale (Lindgren et al. 2004). Aquifer flow models for the entire Edwards Aquifer show groundwater flowing from Uvalde and Medina Counties east-northeast eventually discharging at Comal, Hueco, and San Marcos Springs, numerous small springs, or extracted by groundwater pumping from wells (Kuniansky et al. 2001). However, recent tracer studies in northern Bexar County performed by the Edwards Aquifer Authority indicate water flowing from north to south with very rapid flow velocities (Johnson et al. 2009). These observations indicate that flow paths may be more complex than originally thought, and rapid groundwater transport is dominated by karstic conduit flow.

Trinity Aquifer
The Trinity Aquifer is located within older carbonate rocks than those in the Edwards Group limestone, and the Trinity Aquifer lies below the Edwards Aquifer in areas where the Edwards is present. In the southeast portion of the SEP-HCP Plan Area, the Trinity Aquifer is below the Edwards BFZ Aquifer recharge and confined zones, although water quality in these deeper strata area is generally poor (i.e., the groundwater contains a high level of total dissolved solids). North and northwest of the Edwards BFZ Aquifer recharge zone is the outcrop section of the Trinity Aquifer, which is also considered the contributing zone to the Edwards BFZ Aquifer. The Trinity Aquifer in this area is karstic, and numerous minor springs exist, primarily in areas that have been incised by surface streams. The water in this portion of the Trinity Aquifer is generally of very good quality.

Edwards-Trinity Aquifer
The western-most portion of Kerr County and a limited portion of northern Kendall County are included in the Edwards-Trinity Aquifer system. This aquifer is located where the Edwards Group limestone caps the underlying Trinity limestone. Since both units have similar hydrologic properties in this region, they are classified as the same aquifer system. Water quality in the Edwards-Trinity Aquifer is generally good, but the amount of water available from the Edwards-Trinity Aquifer is less than from the Edwards BFZ Aquifer since faulting and karstification is not as extensive.

Ellenburber-San Saba and Hickory Aquifers
Much of Blanco County and portions of Kendall and Kerr counties are included in the extent of the Ellenburger-San Saba Aquifer. This aquifer is located in much older Paleozoic limestone and provides usable amounts of high quality groundwater. This aquifer underlies the Edwards-Trinity and Trinity Aquifers in much of this area. Also in northern Blanco County, the Hickory Aquifer is found in isolated outcrops. This is a sandstone aquifer of good quality and moderate quantity.

Carrizo-Wilcox Aquifer
To the southeast of the Edwards BFZ lies the Carrizo-Wilcox Aquifer, which is a sandstone aquifer supplying water to much of the Interior Coastal Plain Region. The rocks that make up this aquifer are much younger than those of the carbonate aquifers. The Carrizo-Wilcox Aquifer is characterized by relatively slow transport time and has a high degree of storage. The quality of the water is good.

A conceptual cross-section of the regional groundwater system is shown in Figure 4 relative to the line A-B noted in Figure 3 that runs from Kerr County through Bandera County and across Medina County. This generalized cross-section is typical throughout the SEP-HCP Plan Area from north-northwest to south-southeast. This cross-section shows the transition from the Edwards Plateau through the Hill Country, the placement of faults along the Balcones Escarpment (recharge zone), and into the Gulf Coastal Plain.

Groundwater Management
Groundwater in Texas is managed through a system of local or regional entities created by the Texas Legislature in Chapter 36 of the Texas Water Code to regulate usage and preservation of groundwater resources. In the SEP-HCP Plan Area, there are six groundwater districts, including the Edwards Aquifer Authority (EAA), that regulate groundwater (Figure 5). No groundwater conservation district exists in northwestern Comal County to manage that section of the Trinity Aquifer.

The EAA jurisdiction includes all of Medina, Bexar, and southeastern Comal County. The EAA was created in 1993 (implemented in 1996) by the Texas Legislature as a special groundwater district with the purpose to manage and regulate the San Antonio segment of the Edwards BFZ Aquifer. The Texas Commission on Environmental Quality (TCEQ) requires Edwards Aquifer Protection plans be produced in conjunction with any development within its defined Edwards Aquifer Recharge Zone regulatory area (TCEQ 2009). Components of a

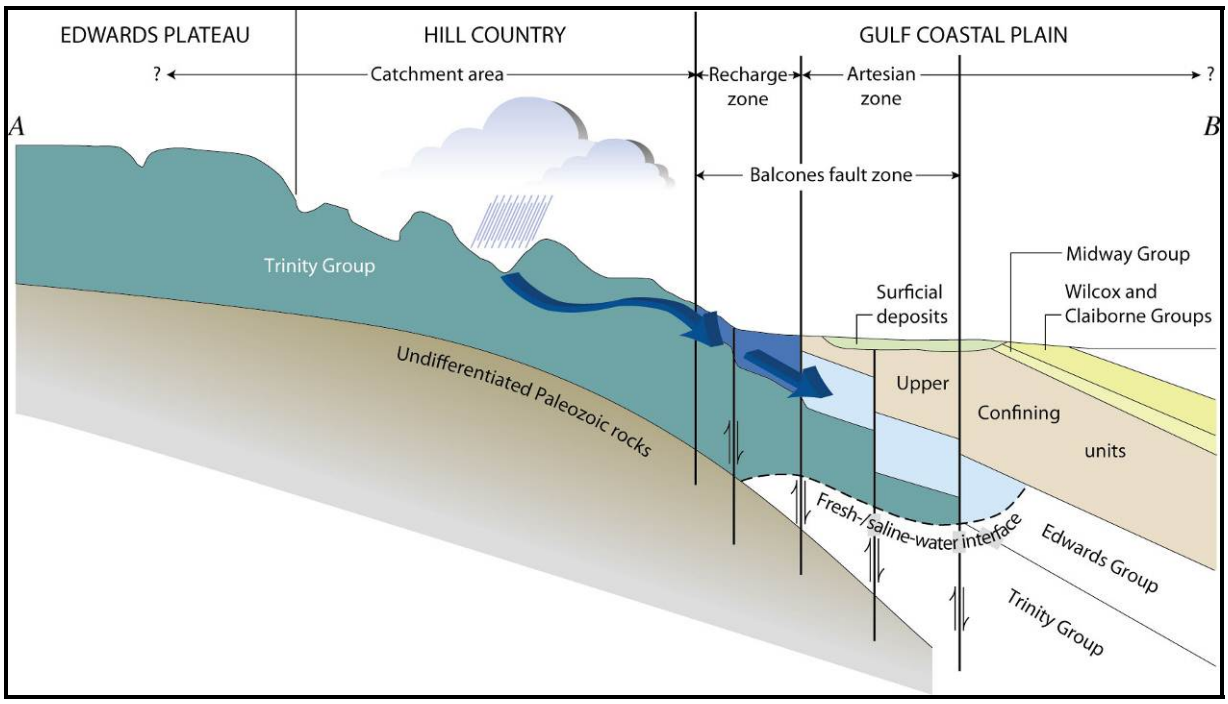

Figure 4. Conceptual cross-section of the aquifer system of the SEP-HCP Plan Area (from Clark et al. 2009).

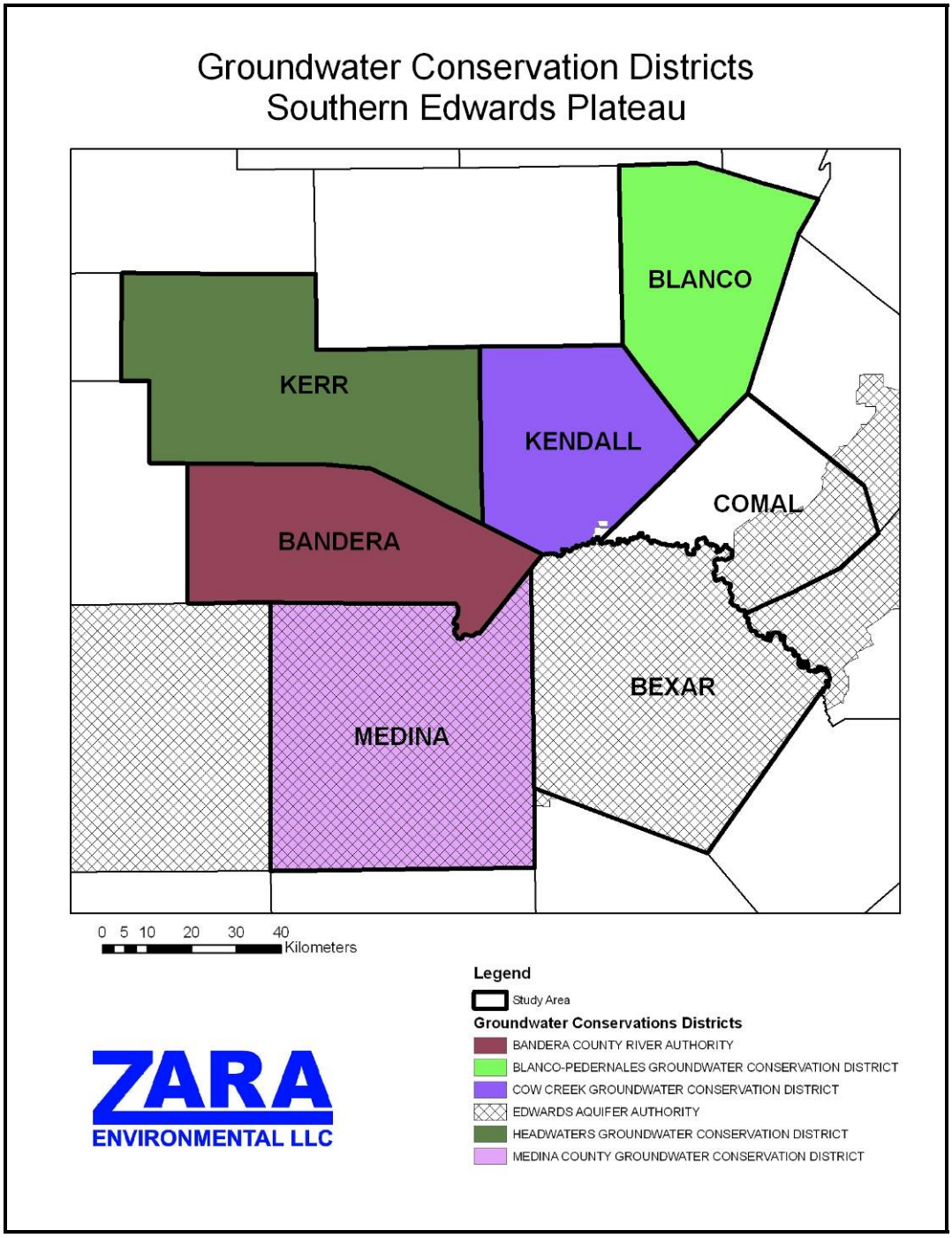

Figure 5. Map showing groundwater conservation districts and regulatory authorities in the SEP-HCP Plan Area.

plan include a Geological Assessment, Water Pollution Abatement Plan, Sewage Collection System Plan, and above and below ground Storage Tank Facility Plans. Regulations regarding storage tanks also apply over the transition zone of the Edwards Aquifer.
The Medina Groundwater Conservation District manages groundwater resources of the Trinity and Carrizo aquifers in that county. The Bandera County River Authority and Groundwater Conservation District (Bandera County), Headwaters Groundwater Conservation District (Kerr County), Cow Creek Groundwater Conservation District (Kendall County), and Blanco-Pedernales Groundwater Conservation District (Blanco County) regulate Trinity Aquifer pumping and management in these respective counties.

References

Barker, R. A., P. W. Bush, and E. T. Baker, Jr. 1994. Geologic history and hydrogeologic setting of the Edwards-Trinity aquifer system, west-central Texas. United States Geological Survey Water-Resources Investigation Report 94-4039. 51 pp.

Bureau of Economic Geology. 1996. Physiographic map of Texas. The University of Texas at Austin. 1 map sheet and 1 text sheet.

Clark, A. R., C. D. Blome, and J. R. Faith. 2009. Map showing the geology and hydrostratigraphy of the Edwards Aquifer catchment area, northern Bexar County, south-central Texas. U.S. Geological Survey Open-File Report 2009-1008. 24 pp + 1 pl.

Collins, E.W. and S. D. Hovorka. 1997. Structure map of the San Antonio Segment of the Edwards Aquifer and Balcones Fault Zone, South-central Texas: Structural framework of a major limestone aquifer: Kinney, Uvalde, Medina, Bexar, Comal, and Hays Counties, Texas. The University of Texas, Bureau of Economic Geology. Miscellaneous Map No. 38, 14 pp. + 1 sheet.

Ferrill, D. A., D. W. Sims, D. J. Waiting, A. P. Morris, N. M. Franklin, and A. L. Schultz. 2004. Structural framework of the Edwards Aquifer recharge zone in south-central Texas. Geological Society of America Bulletin. 116(3/4): 407-418.

Flawn, P. T. 1956. Basement Rocks of Texas and southeast New Mexico. Austin. University of Texas, Bureau of Economic Geology Publication 5605. 261 pp.

Hovorka, S. D., R. E. Mace, and E. W. Collins. 1998. Permeability structure of the Edwards Aquifer, South Texas – Implications for Aquifer Management, Texas. The University of Texas at Austin, Bureau of Economic Geology. Report of Investigations No. 250. 55 pp.

Johnson, S., G. M. Schindel, and G. Veni. 2009. Tracing groundwater flowpaths in the Edwards Aquifer Recharge Zone, Panther Springs Creek Basin, northern Bexar County, Texas. Proceedings of the 15th International Congress of Speleology. p. 1538.

Kuniansky, E.L., L. Fahlquist, and A. F. Ardis. 2001. Travel times along selected flowpaths of the Edwards Aquifer, central Texas. U. S. Geological Survey. Water-Resources Investigation Report 01-4011. p. 69-77.

Lingren, R. J., A. R. Dutton, S. D. Hovorka, S. R. H. Worthington, and S. Painter. 2004. Conceptualization and simulation of the Edwards Aquifer, San Antonio Region, Texas. U. S. Geological Survey Scientific Investigations Report 2004-5277. 143 pp.

Marclay, R. W., and T. A. Small. 1986. Carbonate geology and hydrology of the Edwards Aquifer in the San Antonio area, Texas. Texas Water Development Board Report 296. 90 pp.

Palmer, A. N., and M. V. Palmer. 2009. Caves and Karst of the U.S.A. National Speleological Society. Huntsville, AL. p. 208-209.

Rose, P.R., 1972. Edwards Group, surface and subsurface, central Texas. University of Texas, Bureau of Economic Geology. Report of Investigations 74. 198 pp.

Schindel, G.M., S. Johnson, and E. C. Alexander Jr. 2008. Hypogene processes in the Balcones Fault Zone Edwards Aquifer in south-central Texas, a new conceptual model to explain aquifer dynamics. Karst Waters Institute. Special Publication No. 14. p. 172.

Sharp, J. M., Jr., and J. L. Banner. 1997. The Edwards Aquifer: A resource in conflict. GSA Today. 7(8): 2-9.

Texas Commission for Environmental Quality,(TCEQ). 2009. available online at http://www.tceq.state.tx.us/compliance/field_ops/eapp/apps.html; accessed April 20, 2010.

Texas Natural Resource Information System (TNRIS). 2010. Geologic Atlas of Texas. Texas Natural Resource Information System. Available online at ftp://ftp2.tnris.org/GAT/GeologicDatabaseofTexas.zip; accessed March 22, 2010.

Texas Water Development Board. 2010. Major and minor aquifers of Texas. Available online at http://www.twdb.state.tx.us/mapping/gisdata.asp; accessed March 23, 2010.

United States Department of Agriculture (USDA). 2010. Web Soil Survey. USDA Natural Resources Conservation Service. Available online at http://websoilsurvey.nrcs.usda.gov; accessed March 30, 2010.

SURFACE WATER

RESOURCE ASSESSMENT FOR THE SOUTHERN EDWARDS PLATEAU HABITAT CONSERVATION PLAN

DRAFT SEPTEMBER 16, 2010

1.0 INTRODUCTION

This preliminary resource assessment describes the general character of the surface waters in the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP) Plan Area. The SEP-HCP Plan Area includes Bandera, Bexar, Blanco, Comal, Kerr, Kendall, and Medina counties. The purpose of this assessment is to document the basic background information for the Habitat Conservation Plan and associated Environmental Impact Statement.

The majority of information about surface waters and related topics was generated from the National Hydrography Dataset (NHD), the Texas Water Development Board (TWDB), the Texas Commission on Environmental Quality (TCEQ), and Texas Parks and Wildlife Department (TPWD). The NHD is a comprehensive set of digital spatial data that represents surface waters of the U.S., such as lakes, ponds, streams, rivers, and dams (Simley and Carswell 2009). The TWDB provides leadership, planning, financial assistance, information, and education for the conservation and responsible development of water for Texas (TWDB 2010). As the State of Texas's environmental agency, the TCEQ sets and implements surface water quality standards (TCEQ 2010). The TPWD is authorized to protect and regulate take of aquatic plant and animal species within the State of Texas, which includes participating in the designation of ecologically significant streams and rivers and initiating and supporting research to evaluate the effects of water development on wildlife (TPWD 2007a).

2.0 RIVER BASINS AND SUB-BASINS

The SEP-HCP Plan Area is located within the Texas-Gulf Geographic Region, which is the drainage area of a number of rivers that flow into the Gulf of Mexico and includes parts of Louisiana, New Mexico, and Texas (Seaber et al. 1987). According to the NHD, parts of four major river basins are present within the Plan Area boundaries (i.e., the Colorado, Guadalupe, Nueces, and San Antonio river basins) (Figure 1). Within the Plan Area, these four river basins are further divided into sixteen sub-basins (i.e., Atascosa, Austin-Travis Lakes, Buchanan-Lyndon B. Johnson Lakes, Cibolo, Hondo, Llano, Lower San Antonio, Medina, Middle Guadalupe, Pedernales, San Marcos, San Miguel, South Llano, Upper Frio, Upper Guadalupe, and Upper San Antonio), which are third-level classifications that encompass a more detailed area in the hierarchy of hydrologic units (Figure 1).

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The Colorado River Basin includes the drainage area for the Colorado River, which is the largest river completely within Texas (Texas State Historical Association (TSHA) 2010). The Colorado River Basin encompasses approximately 13% of the SEP-HCP Plan Area and covers portions of Blanco, Kendall, and Kerr counties. Within the Plan Area, five sub-basins occur within the Colorado River Basin, which include the Buchanan-Lyndon B. Johnson Lakes, Austin-Travis Lakes, Llano, South Llano, and Pedernales sub-basins.

The Guadalupe River Basin encompasses approximately 30% of the SEP-HCP Plan Area and covers portions of Blanco, Comal, Kendall, and Kerr counties. Within the Guadalupe River Basin, the San Marcos, Upper Guadalupe, and Middle Guadalupe sub-basins occur within the Plan Area.

The San Antonio River Basin encompasses approximately 35% of the SEP-HCP Plan Area and covers portions of Bandera, Bexar, Comal, Kendall, Kerr, and Medina counties. Within the Plan Area, four sub-basins (the Cibolo, Upper San Antonio, Lower San Antonio, and Medina sub-basins) occur within the San Antonio River Basin.

The Nueces River Basin encompasses approximately 22% of the SEP-HCP Plan Area and occurs in portions of Bandera, Kerr, and Medina counties. Four sub-basins occur within the Nueces River Basin within the Plan Area: Upper Frio, Hondo, San Miguel, and Atascosa.

3.0 MAJOR RIVERS

Four major rivers (the Guadalupe, Medina, Pedernales, and San Antonio rivers) bisect the SEP-HCP Plan Area, and represent approximately 323 miles of waterway within the Plan Area. These major waterways, and the numerous streams and creeks that feed them, are valuable surface water resources for the SEP-HCP Plan Area and support wildlife, riparian habitat, recreational uses, and scenic vistas (Figure 1). Of the four major rivers within the SEP-HCP Plan area, the Guadalupe, Medina, and Pedernales are included in the Nationwide Rivers Inventory (NRI). The NRI is a database of over 3,400 free-flowing river segments in the U. S. that are believed to possess one or more remarkable natural or cultural values that have more than local or regional significance (National Park Service (NPS) 2008).

The Guadalupe River begins in western Kerr County from the North and South Fork Guadalupe Rivers and runs its course in a southeasterly direction for approximately 230 miles before emptying in San Antonio Bay (TSHA 2010). Approximately 129 miles of this waterway cross through the SEP-HCP Plan Area. It provides critical resources in the form of water and electricity to much of the area and it is also a popular tourist and recreation attraction (TSHA 2010). Principle tributaries of the Guadalupe River within the Plan Area include Johnson Creek, Goat Creek, Town Creek, Camp Meeting Creek, Quinlan Creek, Cypress Creek, and Verde Creek. Canyon Dam impounds the Guadalupe River to form Canyon Lake in Comal County. According to the NRI, the Guadalupe River from the head of Canyon Lake upstream to the headwaters near Kerrville is rated as the best recreational river within the State of Texas and the second best scenic river (NPS 2008).

The Medina River originates from springs in northwest Bandera County and travels southeast for approximately 116 miles to its mouth at the San Antonio River in southern Bexar County (TSHA 2010). The Medina Dam impounds the Medina River to form Medina Lake in Medina County. The NRI identifies the Medina River from the head of Medina Lake upstream to the State Highway (SH) 173 bridge in Bandera as the fourth most popular river to float in Texas (NPS 2008).

The Pedernales River bisects Blanco County and originates from springs in Kimble County. The river courses northeast for approximately 106 miles to its mouth on Lake Travis in western Travis County. Approximately 45 miles of the Pedernales River occurs within the SEP-HCP Plan Area. From its confluence with Lake Travis upstream to its headwaters, the Pedernales River is recommended as a potential component of the National Wild and Scenic Rivers System and it is rated as the fifth best recreational river in the state according to the NRI (NPS 2008).

The San Antonio River begins at a group of springs in central Bexar County approximately 4 miles north of downtown San Antonio (TSHA 2010). The river flows southeast for approximately 180 miles before its confluence with the Guadalupe River north of Tivoli, Texas (TSHA 2010). Approximately 34 miles of the San Antonio River occurs within the SEP-HCP Plan Area. Principal tributaries include Medina River and Cibolo Creek, and two reservoirs impound the river – one for flood control and the other for irrigation (TSHA 2010).

4.0 MAJOR DAMS AND LAKES

The state of Texas has a long history of modifying streams and rivers for flood control, irrigation, and municipal, commercial, and industrial water use, and there are numerous dams and reservoirs on many of the major rivers and streams (Figure 1). Within the SEP-HCP Plan Area, Canyon Lake and Medina Lake (and their associated dams) represent the largest water control projects.

Canyon Lake is found within the Guadalupe River Basin in northern Comal County and collects water from a drainage area of approximately 1,432 square miles. The project is owned by the U. S. government and operated by the U. S. Army Corps of Engineers (USACE). Construction on the 6,830-foot long rolled earthfill dam across the Guadalupe River began in 1958 and was completed in 1964. Canyon Lake is comprised of 8,240 acres of surface water, a 60-mile shoreline, and a storage capacity of 382,000 acre-feet of impounded water. The lake and dam provided the first effective flood control to areas downstream, as well as water use for municipal, industrial, and irrigation purposes (TWDB 1974, TSHA 2010). Since its construction, the lake area has become a tourist and recreational destination for central Texas.

Medina Lake is found within the San Antonio River Basin along the southeastern Bandera and northeastern Medina county boundaries. The Medina Dam was constructed between 1912 and 1913, and provided important irrigation to the nearby agricultural areas, as well as flood control. The dam, which is approximately 14 miles north of Castroville in Medina County, captures water from 634 square miles of drainage area. Medina Lake covers 5,575 acres and has a shoreline of 100 miles. The lake has a capacity of 254,000 acre-feet of water and provides important recreational opportunities to the area (TWDB 1974, TSHA 2010).

5.0 SPRINGS

The majority of Texas springs issue forth from the Edwards Aquifer and associated limestone formations, and these springs feed the headwaters of all the major rivers within the SEP-HCP Plan Area. Springs have a historical and cultural significance in the formation of the State of Texas; however, a complete census of all spring locations has never been finalized (see Brune 1981). Springs, and the karst features that often connect them to the aquifers, provide habitat for several rare species, including karst invertebrates and salamanders, resulting in a high conservation value. According to data provided by the Texas Speleological Society (TSS), there are 482 known springs located within the SEP-HCP Plan Area (TSS 2010). Approximately 56 percent of the known springs within the Plan Area occur in

Bandera (35 percent) and Kerr (21 percent) counties. The remaining 46 percent of the known springs within the Plan Area occur within Kendall (13 percent), Bexar (10 percent), Medina (9 percent), Blanco (7 percent), and Comal (6 percent) counties.

6.0 WATER QUALITY AND USE

6.1 WATER QUALITY

6.1.1 IMPAIRED WATERS

Under the Clean Water Act, the State of Texas (through the TCEQ) has developed and enforces a comprehensive set of surface water quality standards that include chemical, physical, and biological criteria. The Texas Surface Water Quality Standards are found in the Texas Administrative Code (TAC) under Title 30, Chapter 307 and establish explicit water quality goals throughout the state for all types of surface water sources.

The state standards are set in an effort to maintain the quality of water in the state, consistent with public health and enjoyment, the protection of aquatic life, and the operation of existing industries and economic development. Surface waters are evaluated for the following five categories: aquatic life, contact recreation, public water supply, fish consumption, and general uses. Standards related to drinking water also apply to groundwater that is used as a public water supply.

Every two years, the TCEQ assesses water quality across the state and submits a report to the U.S. Environmental Protection Agency (EPA) regarding how each body of water meets the state water quality standards. This water quality inventory is the basis of the Clean Water Act 303(d) list, which identifies all "impaired" water bodies that do not meet the water quality criteria established to support designated uses. The following table lists the impaired waters in the SEP-HCP Plan Area from the 2008 Texas Water Quality Inventory and 303(d) List (Table 1) (Figure 2) (TCEQ 2008).

TABLE 1: 2008 IMPAIRED WATERS IN THE SEP-HCP PLAN AREA AND THEIR ASSOCIATED IMPAIRMENT CATEGORY.*

Water Bodies by County	Bacteria	Impaired Fish Community	Depressed Dissolved Oxygen	Impaired Macrobenthic Community	Mercury In Edible Tissue
Bandera					
none listed					
Bexar					
Lower Cibolo Creek	X	X			
Lower Leon Creek	X		X		
Salado Creek		X		X	
Upper San Antonio River		X			
Mid Cibolo Creek	X				
Blanco					
none listed					
Comal					

TABLE 1: 2008 IMPAIRED WATERS IN THE SEP-HCP PLAN AREA AND THEIR ASSOCIATED IMPAIRMENT CATEGORY.*

Water Bodies by County	Bacteria	Impaired Fish Community	Depressed Dissolved Oxygen	Impaired Macrobenthic Community	Mercury In Edible Tissue
Upper Cibolo Creek	X				
Mid Cibolo Creek	X				
Canyon Lake					X
Kendall					
Upper Cibolo Creek	X				
Kerr					
Camp Meeting Creek			X		
Medina					
none listed					

*(TCEQ 2008)

6.1.2 ECOLOGICALLY SIGNIFICANT RIVER AND STREAM SEGMENTS

In 1997, Senate Bill 1 made water planning the responsibility of regional planning groups rather than TWDB. The TWDB was directed to create the boundaries for 16 planning regions in Texas that took into consideration river basin and aquifer delineations, water development patterns, socioeconomic characteristics, existing regional water planning areas, political subdivision boundaries, public comment, and other factors (Norris et al. 2005). The SEP-HCP Plan Area encompasses portions of three planning areas (Region J: Plateau - Kerr and Bandera counties, Region K: Lower Colorado - Blanco County, and Region L: South Central - Bexar, Comal, Kendall, and Medina counties) (Figure 2). The regional water planning groups are responsible for drafting regional water plans that identify how to conserve water supplies, meet future water supply needs, and respond to future droughts in the planning areas. The regional water planning groups must submit and update regional water plans every five years (TWDB 2010a).

Another facet to the regional water plans are recommendations for ecologically significant river and stream segments within each region. Modifications of the natural river and stream systems for water use for municipal, agricultural, industrial, and other needs and to control flooding can alter habitat diversity, reduce stream productivity, and degrade water quality (Norris et al. 2005). The regional water planning groups follow the process outlined in TAC Section 357 and Texas Water Code (TWC) Section 16.051 for designating ecologically significant river or stream segments. The criteria used to designate a stream or river segment as ecologically significant are based on biological function, hydrologic function, presence of riparian conservation areas, high water quality/exceptional aquatic life/high aesthetic value, and threatened or endangered species or unique communities (TPWD 2007, Norris et al. 2005). Official designation is a combined effort of the regional water planning groups, the TWDB, and the Texas Legislature. The designation does not protect a segment from degradation, but precludes a state agency or political subdivision of the state to finance the construction of a reservoir in an ecologically significant river or stream segment (Norris et al. 2005).

The following table identifies ecologically significant stream and river segments within the SEP-HCP Plan Area and the criteria used to award the designation (Table 2).

TABLE 2: ECOLOGICALLY SIGNIFICANT STREAM AND RIVER SEGMENTS OF THE SEP-HCP PLAN AREA.*

	Biological Function	Hydrologic Function	Riparian Conservation Area	High Water Quality/ Aesthetic Value	Endangered Species/Unique Communities
Region J					
Fessenden Branch	X	X	X		
Johnson Creek	X	X	X	X	
Guadalupe River	X	X	X	X	
North Fork Guadalupe River	X	X	X	X	
South Fork Guadalupe River	X	X		X	
Medina River	X	X	X	X	
Sabinal River	X	X	X	X	X
West Verde Creek	X	X	X	X	
Region K					
Blanco River			X	X	
Little Blanco River				X	
Pedernales River	X		X	X	
Region L					
Blanco River		X	X	X	X
Carpers Creek				X	
Comal River	X	X		X	X
Upper Guadalupe River		X	X	X	X
Middle Guadalupe River					X
Honey Creek	X	X	X		X
West Verde Creek		X	X		X

*(TPWD 2007)

6.2 WATER USE

Communities within the SEP-HCP Plan Area, including but not limited to San Antonio, New Braunfels, Boerne, Bandera, Hondo, Johnson City, and Kerrville, use surface water from area reservoirs for municipal, industrial, agricultural, and other non-consumptive uses. The San Antonio River Authority, Nueces River Authority, Guadalupe-Blanco River Authority, Upper Guadalupe River Authority, and Lower Colorado River Authority are the primary wholesale water providers in the Plan Area. River Authorities were established by the Texas Legislature, Section 59, Article 16 of the Constitution of Texas, as water conservation and reclamation districts and public corporations. They were given powers to conserve, store, control, preserve, utilize, and distribute the waters of a designated geographic region for the benefit of the public (TSHA 2010).

Surface water use is publicly owned and governed by the State of Texas, and permits are required from the TCEQ to use surface water with the exception of use for domestic and livestock purposes (Texas Groundwater Protection Committee (TGPC) 2008). To facilitate water resources planning, the TWDB conducts an annual survey of ground and surface water use by municipal and industrial entities. Table 3 compares ground and surface water use survey results for municipal, manufacturing, steam electric, mining, irrigation, and livestock purposes for the SEP-HCP Plan Area between 1998 and 2008 (last year of available data) (TWDB 2010b). The survey results indicate increased surface water use by all the counties within the SEP-HCP Plan Area with the exception of Bandera County. Blanco, Kendall, and Medina counties are decreasing groundwater use, and Blanco and Medina counties are decreasing water use overall regardless of source. For 2008, surface water use for municipal purposes in Comal County exceeded groundwater use, and Medina County exclusively used groundwater for municipal purposes (Table 3).

As population numbers continue to increase across the State of Texas, managing and protecting water resources will be one of the most critical issues facing residents. Increased water demand will create challenges in developing effective water plans, adequate regulatory mechanisms, broad conservation measures, and viable economies.

TABLE 3: TWDB GROUNDWATER AND SURFACE WATER SURVEY RESULTS FOR THE SEP-HCP PLAN AREA IN ACRE-FEET.*

	Municipal		Manufacturing		Steam Electric		Mining		Irrigation		Livestock		Total	
	Ground water	Surface Water	Ground water	Surface Water	Ground water	Surface Water	Ground water	Surface Water	Ground water	Surface Water	Ground water	Surface Water	Ground water	Surface Water
Bandera														
1998	2,065	84	0	0	0	0	23	0	279	185	230	58	2,597	327
2008	2,660	0	0	0	0	0	0	0	374	0	184	61	3,218	61
CHANGE	595	-84	0	0	0	0	-23	0	95	-185	-46	3	621	-266
Bexar														
1998	228,804	278	19,041	161	1,982	17,152	1,854	753	33,708	16,053	115	1,036	285,504	35,433
2008	263,552	15,659	15,231	895	1,450	41,147	3,224	1,020	6,905	4,500	279	652	290,641	63,873
CHANGE	34,748	15,381	-3,810	734	-532	23,995	1,370	267	-26,803	-11,553	164	-384	5,137	28,440
Blanco														
1998	839	307	0	0	0	0	6	0	449	55	374	93	1,668	455
2008	949	327	1	0	0	0	0	0	68	0	469	201	1,487	528
CHANGE	110	20	1	0	0	0	-6	0	-381	-55	95	108	-181	73
Comal														
1998	7,797	6,410	6,456	2,194	0	0	2,224	0	26	14	227	57	16,730	8,675
2008	9,193	11,955	1,662	735	0	0	5,879	542	0	171	80	185	16,814	13,588
CHANGE	1,396	5,545	-4,794	-1,459	0	0	3,655	542	-26	157	-147	128	84	4,913
Kendall														
1998	2,942	620	0	0	0	0	6	0	808	416	302	76	4,058	1,112
2008	3,212	1,618	0	0	0	0	0	0	12	176	300	53	3,524	1,847
CHANGE	270	998	0	0	0	0	-6	0	-796	-240	-2	-23	-534	735
Kerr														
1998	3,510	3,459	9	33	0	0	173	0	396	970	342	86	4,430	4,548
2008	5,101	3,768	24	0	0	0	0	0	72	1,015	367	65	5,564	4,848
CHANGE	1,591	309	15	-33	0	0	-173	0	-324	45	25	-21	1,134	300
Medina														
1998	7,008	0	54	0	0	0	118	0	57,472	18,011	124	1,117	64,776	19,128
2008	6,991	0	23	0	0	0	0	0	36,694	32,806	897	100	44,605	32,906
CHANGE	-17	0	-31	0	0	0	-118	0	-20,778	14,795	773	-1,017	-20,171	13,778

*An acre-foot is an amount of water to cover one acre with one foot of water and equals 325,851 gallons (TWDB 2010b).

7.0 SIGNATURES

This report was prepared by professional wildlife biologists at the consulting firm of Loomis Partners, Inc. in conformance with the methods and limitations described herein.

PREPARED BY:	APPROVED BY:
SIGNATURE	SIGNATURE
.	.
PRINTED NAME	PRINTED NAME
DATE	DATE

8.0 REFERENCES

Brune, G. 1981. Springs of Texas: Volume 1. Branch-Smith, Inc. Fort Worth, Texas. 566 pp.

National Park Service (NPS). 2008. National River Inventory (NRI): Texas Segments. Accessed on June 14, 2010 at http://www.nps.gov/ncrc/programs/rtca/nri/states/tx.html.

Norris, C. W., D. W. Moulton, A. El-Hage, and D. Bradsby. 2005. Ecologically Significant River and Stream Segments of Region L (South Central) Regional Water Planning Area. Texas Parks and Wildlife Department Water Resources Technical Series WRTS-2005-01. 75 pp.

Seaber, P. R., F. P. Kapinos, and G. L. Knapp. 1987. Hydrologic Unit Maps. U. S. Geological Survey Water-Supply Paper 2294. 63 pp.

Simley, J. D., and W. J. Carswell, Jr. 2009. The National Map – Hydrography. U. S. Geological Survey Fact Sheet 2009-3054. 4 pp.

Texas Commission on Environmental Quality (TCEQ). 2008. 2008 Texas 303(d) List (March 19, 2008). Accessed on May 24, 2010 at http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/08twqi/twqi08.html.

Texas Commission on Environmental Quality (TCEQ). 2010. Texas Surface Water Quality Standards and Surface Water Quality Monitoring. Accessed May 24, 2010 at http://www.tceq.state.tx.us/nav/main/water_main.html.

Texas Groundwater Protection Committee (TGPC). 2008. Water in Texas – Who Owns It?. TGPC Fact Sheet. 2 pp.

Texas Parks and Wildlife Department (TPWD). 2002. Ecologically Significant River and Stream Segments: Statewide and Regional Maps: Maps for Region J, K, and L. Accessed on June 15, 2010 at http://www.tpwd.state.tx.us/landwater/water/environconcerns/water_quality/sigsegs/listofreports.phtml.

Texas Parks and Wildlife Department (TPWD). 2007a. Statutory Authority. Accessed on June 15, 2010 at http://www.tpwd.state.tx.us/landwater/water/environconcerns/water_quality/legal/.

Texas Parks and Wildlife Department (TPWD). 2007b. Ecologically Significant Stream Segments: Designation Criteria (31 TAC 357.8). Accessed June 14, 2010 at http://www.tpwd.state.tx.us/landwater/water/environconcerns/water_quality/sigsegs/.

Texas Speleological Survey (TSS). 2010. TSS Database Statistics. Accessed on May 24, 2010 at http://www.utexas.edu/tmm/sponsored_sites/tss/longdeep/index.html.

Texas State Historical Association (TSHA). 2010. The Handbook of Texas Online. Accessed on June 11, 2010 at http://www.tshaonline.org/handbook/online/.

Texas Water Development Board (TWDB). 1974. Engineering Data on Dams and Reservoirs in Texas Part I and Part II. Report 126. Accessed on May 24, 2010 at http://www.twdb.state.tx.us/mapping/index.asp.

Texas Water Development Board (TWDB). 2010a. Regional Water Planning. Accessed on May 21, 2010 at http://www.twdb.state.tx.us/wrpi/rwp/rwp.asp.

Texas Water Development Board (TWDB). 2010b. Water Resources Planning and Information: Water Use Survey Summary Estimates. Accessed on September 16, 2010 at http://www.twdb.state.tx.us/wrpi/wus/summary.asp.

FIGURE 2. IMPAIRED STREAM SEGMENTS AND REGIONAL WATER PLANNING AREAS.

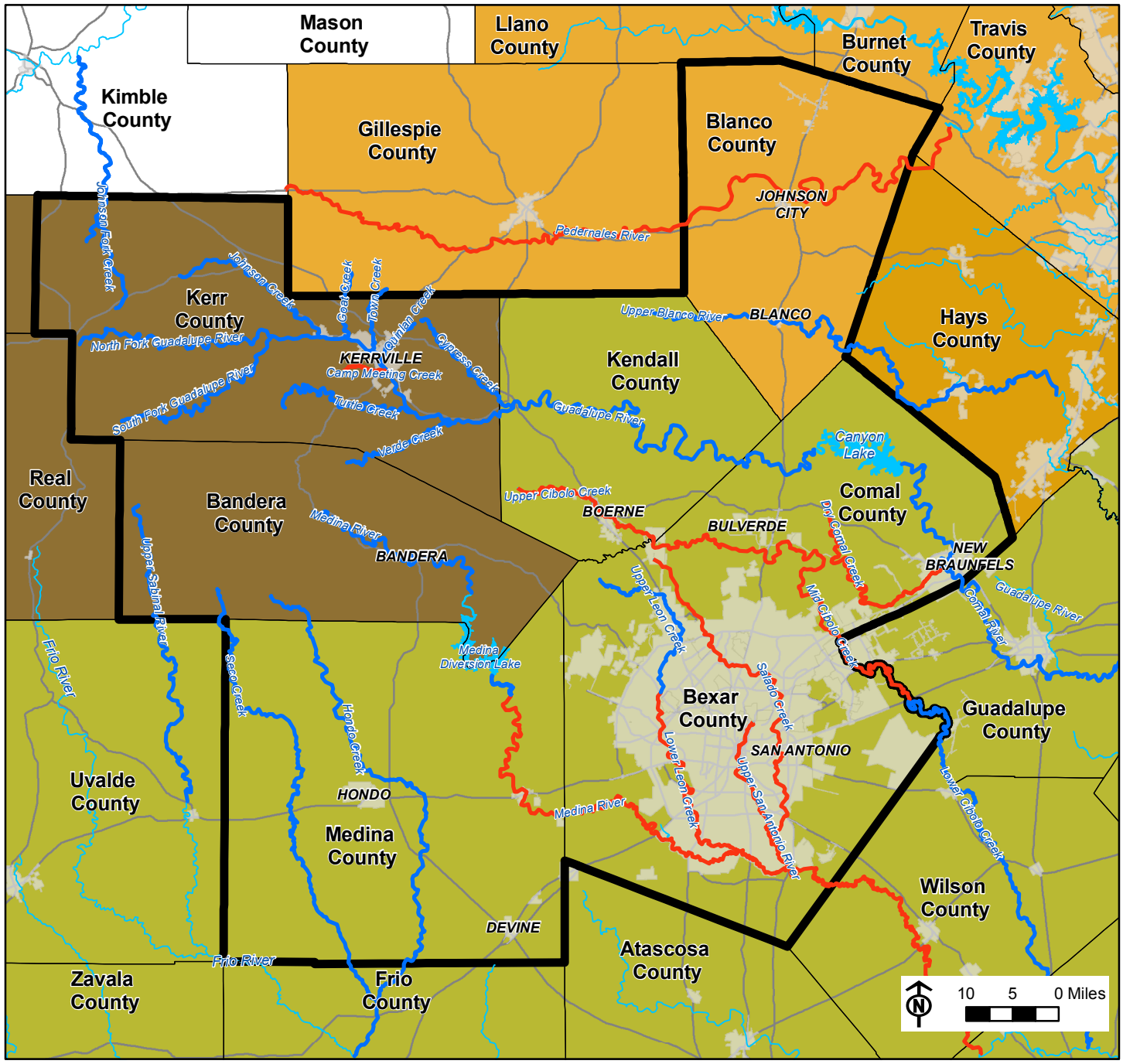
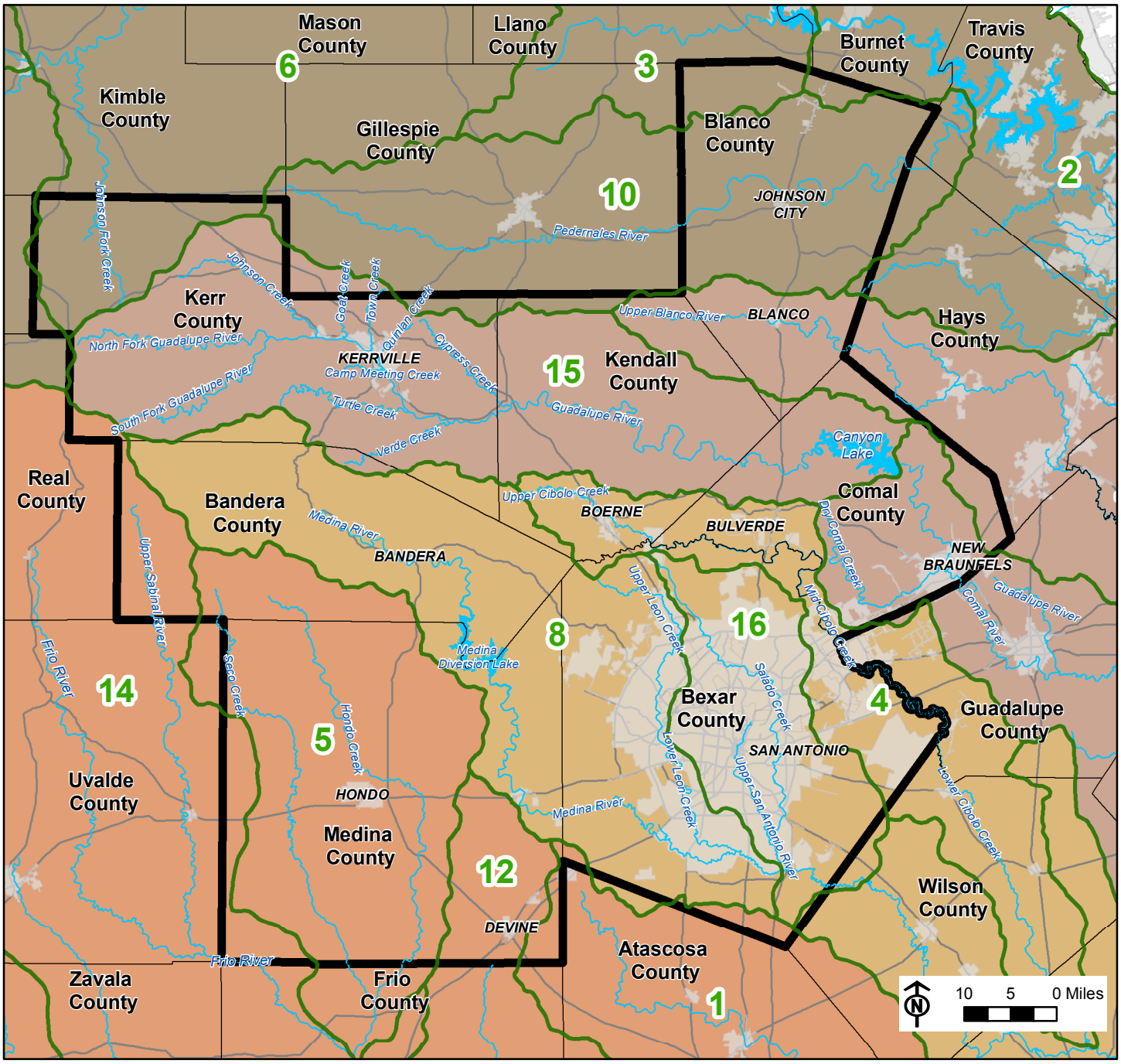


FIGURE 1. RIVER BASINS AND SUB-BASINS.



SEP-HCP Plan Area
Texas Counties (STRATMAP v2)
City Limits (STRATMAP v2)
Major Highways

River Basins
San Antonio
Nueces
Guadalupe
Colorado

River Sub-basins
1 - Atascosa
2 - Austin-Travis Lakes
3 - Buchanan-LBJ Lakes
4 - Cibolo
5 - Hondo
6 - Llano
7 - Lower San Antonio
8 - Medina
9 - Middle Guadalupe
10 - Pedernales
11 - San Marcos
12 - San Miguel
13 - South Llano
14 - Upper Frio
15 - Upper Guadalupe
16 - Upper San Antonio

Rivers and Major Streams
Major Waterbodies

GENERAL WILDLIFE COMMUNITIES

RESOURCE ASSESSMENT FOR THE SOUTHERN EDWARDS PLATEAU HABITAT CONSERVATION PLAN

DRAFT MARCH 30, 2011

1.0 INTRODUCTION

This preliminary resource assessment describes the general character of the ecological regions and associated wildlife communities in the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP). The SEP-HCP Plan Area includes Bexar, Medina, Bandera, Kerr, Kendall, Blanco, and Comal counties. The purpose of this assessment is to document the basic background information for the Habitat Conservation Plan and associated Environmental Impact Statement.

For the purpose of this report, general wildlife communities are defined as: Wildlife occupying the habitats that would be lost or modified as a result of activities covered for incidental take and areas protected and managed as mitigation that could be affected by the action alternatives.

2.0 WILDLIFE COMMUNITIES BY ASSOCIATED ECOLOGICAL REGIONS

The SEP-HCP Plan Area crosses parts of six different ecological subregions, as described by the U.S. Environmental Protection Agency (Griffith et al. 2004). These six distinct ecological subregions include the following communities: Balcones Canyonlands, Edwards Plateau Woodland, Northern Blackland Prairie, Llano Uplift, Northern Nueces Alluvial Plains, and Southern Post Oak Savanna.

- Balcones Canyonlands - This ecological subregion represents approximately 54 percent of the SEP-HCP Plan Area. The Balcones Canyonlands has rugged topography with steep-sided canyons formed by the erosion and solution of the underlying limestone bedrock by the numerous springs, streams, and rivers that flow above and below the surface. The Balcones Canyonlands subregion supports a number of endemic plant and wildlife species that are not commonly found elsewhere on the Edwards Plateau. This is the region where most of the habitat for the Covered Species occurs.
- Edwards Plateau Woodland - The Edwards Plateau Woodlands represent the central part of the Edwards Plateau (and the northern part of the SEP-HCP Plan Area). Edwards Plateau Woodland is characterized by a savanna of grasslands with scattered oak, juniper, and

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mesquite trees. Some woodlands or shrublands in this region provide habitat for the golden-cheeked warbler (GCW) or black-capped vireo (BCV).

- Northern Blackland Prairie - The Northern Blackland Prairie region represents the relatively flat southeastern end of the Plan Area. Habitat for the GCW and BCV generally does not occur in this area; although, some portions of this ecological subregion are underlain by karst geology.
- Northern Nueces Alluvial Plains - The Northern Nueces Alluvial Plains are part of the South Texas Plains ecoregion and occurs at the southern edge of the SEP-HCP Plan Area. Alluvial geology and deep soils support parkland vegetation dominated by mesquite and live oak. This region does not generally support habitat for the Covered Species.
- Southern Post Oak Savanna - The far southeastern edge of the SEP-HCP Plan Area is included within the Southern Post Oak Savanna ecological subregion. This area is a mosaic of post oak savanna, improved pasture, and rangeland. This region does not support habitat for the Covered Species.
- Llano Uplift - A very small area at the northern end of the Plan Area occurs within the Llano Uplift, which is unique because of its granite outcrops and acidic soils. This region may contain some areas of habitat for the GCW or BCV.

Wildlife communities associated with these ecological subregions are as diverse as the ecological subregions themselves. A total of approximately 520 species of amphibians, reptiles, mammals, and birds make up the various wildlife communities within the Plan Area (Dixon 2000, Schmidly 1994, Lockwood and Freeman 2004). Wildlife communities within the Balcones Canyonlands subregion are the most diverse, with approximately 95 percent of the total wildlife species within the Plan Area occurring within this region. Table 1 includes the species diversity of wildlife communities by taxon and associated ecological region within the SEP-HCP Plan Area.

Table 1. Species Diversity of Wildlife Communities by Taxon and Associated Ecological Region within the SEP-HCP Plan Area.

	Species Diversity						
Taxon	Plan Area	Balcones Canyonlands	Edwards Plateau Woodlands	Llano Uplift	Northern Blackland Prairies	Northern Nueces Alluvial Plains	Southern Post Oak Savanna
Amphibians	33	33	25	22	30	21	28
Reptiles	79	77	65	63	76	72	74
Mammals	76	72	71	56	65	60	63
Birds	332	311	289	276	303	263	298
Total	**520**	**493**	**450**	**417**	**474**	**416**	**463**

A complete list of individual wildlife species by taxon, their general distribution within the Plan Area, associated ecological regions, and habitat requirements are included in Appendix A.

3.0 TEXAS WILDLIFE ACTION PLAN

The 2005 Texas Wildlife Action Plan (formerly known as the Texas Comprehensive Wildlife Conservation Strategy) developed by TPWD identifies threats to the State's wildlife resources associated with changing demands on land resources (such as land development and fragmentation that threaten the viability of natural habitats and the sustainability of wildlife populations), introduced species (non-native plants and animals that displace native species and threaten habitat integrity for native wildlife), noxious brush and invasive plants (excessive quantities of even native plants can reduce the quality of wildlife habitat), overgrazing and fire suppression (improper application of these management tools or uses have contributed to a drastic alteration of the historic landscape), and limited understanding of complex natural systems (lack of reliable knowledge about the function of natural systems can lead to inappropriate conservation or management decisions) (TPWD 2005).

TPWD identified 192 native wildlife species of conservation concern that occur in the Blackland Prairie ecoregion, 326 native wildlife species of conservation concern that occur in the South Texas Plains, 300 native wildlife species of conservation concern that occur in the Edwards Plateau ecoregion and 157 native wildlife species of conservation concern that occur in the Post Oak Savannah ecoregion. These lists identify species with low or declining populations that are important to the health and diversity of the State's wildlife resources. The 2005 Texas Wildlife Action Plan prepared by the Texas Parks and Wildlife Department identified 514 native wildlife species of conservation concern that may occur in the SEP-HCP Plan Area.

Habitat for the SEP-HCP's Covered Species occurs over the Edwards Plateau ecoregion and this portion of the Plan Area will be where both Covered Activities and the Plan's conservation actions occur. While this area contains a high degree of biodiversity and endemism, the relatively high percentage of private land managed under wildlife management plans has already benefitted the Edwards Plateau. As such, the 2005 Texas Wildlife Action Plan considers the Edwards Plateau ecoregion to be a secondary priority for management and conservation efforts.

The 2005 Texas Wildlife Action Plan identifies the Blackland Prairie ecoregion as a high priority for management and conservation efforts, due largely to the drastic reduction of native prairie since European settlement and associated declines in prairie species. The South Texas Plains ecoregion is also considered a high priority due to the expanding human population, fragmentation, conversion to croplands, urban development, insufficient river flow, and introduction of exotic plants. The Post Oak Savannah ecoregion is considered a tertiary priority because of the small percentage of public or non-profit conservation land (TPWD 2005).

4.0 POTENTIAL IMPACTS TO WILDLIFE

Wildlife occupying the habitats that would be (1) lost or modified as a result of activities covered for incidental take and (2) areas protected and managed as mitigation could potentially be affected by the SEP-HCP.

4.1 POTENTIAL IMPACTS FROM LAND DEVELOPMENT ACTIVITIES

Impacts to wildlife may depend on whether a particular wildlife species thrives or deteriorates as a result of human encroachment. Urban-adapted or tolerant wildlife species (such as raccoons, squirrels, grackles, and blue jays) could benefit from an increase in human activity, while other species

(such as cave-dependent bats, bobcats, forest dwelling birds, and many reptiles) would decrease as humans convert or encroach upon natural landscapes.

It is anticipated that approximately 241,000 acres of new land development will occur in SEP-HCP Plan Area over the next 30 years (Wendell Davis and Associates 2010). Residential development impacts natural environments in several ways, such as replacing native vegetation with buildings, pavement, and other man-made structures (e.g., direct habitat loss) (McIntyre and Hobbs 1999); decreasing the amount of continuous open-space (e.g., fragmentation); and increasing vegetational disturbance, erosion, and soil compaction (Bradley 1995). Residential development often results in the introduction of non-native vegetation through invasion or landscaping with non-native, ornamental plants (Whitney and Adams 1980, Mills et al. 1989, Bolger et al. 1997). Urbanization also can change the abundance of predators and competitors in an area (Wilcove 1985, Engels and Sexton 1994, Jokimaki and Huhta 2000) and increase disturbance from human activity (Whitcomb et al. 1981). Physical changes to the natural landscape, as well as the possible alteration in predator or competitor interactions resulting from urbanization, can have a profound impact on wildlife communities (Freisen et al. 1995).

Thus, while certain species may benefit from human activities, land development typically alters the processes that maintain balance in native wildlife communities, resulting in adverse effects to self-sustaining native wildlife communities. Therefore, projected future land development activities have the potential to adversely impact wildlife populations through habitat changes, introduction of non-native species, and other alterations to the natural balance of native wildlife species within the SEP-HCP Plan Area.

Wildlife species known to occur within the SEP-HCP Plan Area are included in Appendix A. Impacts to these species would vary based on the type of habitat impacted by development activities and the sensitivity of each species to human-induced changes to native habitats or wildlife communities. However, in general, the natural composition and stability of native wildlife communities would decline concurrently with the expansion of the human population into their habitats. Should this projected future development incorporate areas of natural green space, this anticipated decline could be minimized.

4.2 POTENTIAL IMPACTS FROM CONSERVATION ACTIONS

Title 5 of the Texas Parks and Wildlife Code describes laws and matters regarding forests, water district and river authority parks, Texas trails systems, wildlife and plant conservation, hunting and fishing licenses, commercial and fish farmer's licenses, the Uniform Wildlife Regulatory Act, hunting, endangered species, crustaceans and mollusks, wildlife management areas, sanctuaries, and preserves, including Federal-state agreements. The code also establishes special standards for non-game species, such as bats (Texas Parks and Wildlife Code, Title 5, Chapter 63.101).

Most urbanized animals are not seasonally hunted or treated as game, while the hunting of game animals such as white-tailed deer are restricted to specific seasons and heavily regulated. Avian species are protected by both the provisions of the Texas Parks and Wildlife Code, and the Migratory Bird Treaty Act, which prohibits the taking, killing, or possession of all migratory birds (with the exception of several non-native species). While these regulations protect wildlife to some degree, they provide no protection to the habitat required for wildlife survival.

Without the implementation of the proposed SEP-HCP, it is likely that some development on land that provides habitat for endangered species would be mitigated on a case-by-case basis and that

some land development would commence without conservation of open spaces as mitigation for impacts. However, as this mitigation would be specific to the affected listed species, these lands would likely not be suitable for all wildlife species. Project-by-project mitigation is also likely to result in small and isolated patches of protected habitat with a high potential for adverse edge effects from adjacent human activities.

As described above, anticipated land development over the next 30 years would convert currently undeveloped open space used by a wide variety of wildlife species to developed land uses. While some wildlife species thrive in urbanized environments, most wildlife communities currently present in the Plan Area would experience a decrease in habitat and likely declines in population sizes. However, the proposed conservation measures of the SEP-HCP would help to reduce the potential negative impacts to wildlife communities.

The primary conservation measure of the proposed SEP-HCP is the acquisition and perpetual management of endangered species habitats within the Plan Area. Protecting contiguous open space is crucial for many wildlife species as they depend on numerous habitats throughout their lives. In addition, contiguous forest habitat supports native wildlife species that require large areas to survive. Such habitat supports natural ecological processes, such as predator/prey interactions and natural disturbance. It also serves to buffer species against the negative consequences of fragmentation. In the absence of such habitat, many birds are greatly affected by increased rates of nest predation from raccoons, skunks, and squirrels, as well as nest parasitism from brown-headed cowbirds. Many of the native migratory songbird populations are now in decline due, in part, to the loss of contiguous forest habitat (Terborgh 1989).

The SEP-HCP's preserve system would incidentally benefit a variety of native wildlife species in the Plan Area, particularly those that utilize forest habitats, shrubland habitats, and karst habitats. However, given the mosaic of habitat types across the landscape of the Plan Area, it is likely that the preserve system (while targeting areas of potential habitat for the covered species) would also contain substantial native vegetation communities that would support the sheltering, nesting, and foraging requirements for many other wildlife species.

5.0 SIGNATURES

This report was prepared by certified wildlife biologists at the consulting firm of Loomis Partners, Inc. in conformance with the methods and limitations described herein.

PREPARED BY:	APPROVED BY:
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DATE	DATE

6.0 REFERENCES

Bolger, D. T., T. A. Scott, and J. T. Rotenberry. 1997. Breeding bird abundance in an urbanizing landscape in coastal southern California. Conservation Biology 11(2): 406 – 421.

Bradley, G. 1995. Urban forest landscapes: integrating multidisciplinary perspectives. In: Urban forest landscapes: integrating multidisciplinary perspectives. G. Bradley (ed.). University of Washington Press, Seattle, Washington. Pages 3 – 12.

Dixon, James. 2000. Amphibians and Reptiles of Texas, Second Edition. College Station: Texas A&M University Press.

Engels, T. M., and C. W. Sexton. 1994. Negative correlation of blue jays and golden-cheeked warblers near an urbanizing area. Conservation Biology 8(1): 286-290.

Friesen, L. E., P. F. J. Eagles, and R. J. Mackay. 1995. Effects of residential development on forest-dwelling neotropical migrant songbirds. Conservation Biology 9(6):1408 – 1414.

Griffith, G. E., S. A. Bryce, J. M Omernik, J. A. Comstock, A. C. Rogers, B. Harrison, S. L. Hatch, and D. Bezanson. 2004. Ecoregions of Texas (color poster with map, descriptive text, and photographs) (map scale 1:2,500,000). U.S. Geological Survey, Reston, Virginia.

Jokimaki, J., and E. Huhta. 2000. Artificial nest predation and abundance of birds along an urban gradient. Condor 102:838-847.

Lockwood, Mark W. and Brush Freeman. 2004. The Texas Ornithological Society Handbook of Texas Birds. Texas A&M University Press: College Station. 261 pp.

McIntyre, S., and R. Hobbs. 1999. A framework for conceptualizing human effects on landscapes and its relevance to management and research models. Conservation Biology 13(6):1282 – 1292.

Mills, G. S., J. B. Dunning, Jr., and J. M Bates. 1989 Effects of urbanization on breeding bird community structure in southwestern desert habitats. Condor 91:416-428.

Schmidly, David J. 1994. The Mammals of Texas Revised Edition. University of Texas Press: Austin. 501 pp.

Terborgh, J. 1989. Where have all the birds gone? Essays on the biology and conservation of birds that migrate to the American tropics. Princeton University Press. 224 pp.

Texas Parks and Wildlife Department (TPWD). 2005. Texas Comprehensive Wildlife Conservation Strategy 2005 – 2010. Texas Parks and Wildlife Department. Austin, Texas.

Wendell Davis and Associates (WDA). 2010. Preliminary land use projection scenarios for the Southern Edwards Plateau Habitat Conservation Plan. Version date: December 17, 2010. Prepared for Loomis Partners, Inc. Wendell Davis and Associates, San Antonio, TX.

Whitcomb, R., C. Robbins, J. Lynch, B. Whitcomb, M. Klimkiewicz, and D. Bystrak. Effects of forest fragmentation of avifauna of the eastern deciduous forest. In: Forest island dynamics in man-dominated landscapes. R. L. burgess and D. M. Sharpe (eds.). Springer-Verlag, New York. Pages 125 – 205.

Whitney, G. D., and S. D. Adams. 1980. Man as maker of new plant communities. Journal of Applied Ecology 17:441-448.

Wilcove, D. S. 1985. Nest predation in forest tracts and the decline of migratory songbirds. Ecology 66(4): 1211 – 1214.

Table 1. Mammalian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[1,3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Virginia opossum	*Didelphis virginiana*	X	X	GR	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Very adaptable; may be found in most habitats. Prefers wooded riparian habitats. Also in suburban areas. Abandoned burrows, buildings, hollow logs, and tree cavities are generally used for den sites.
Least shrew	*Cryptotis parva*	X	GR	GR	GR		GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Inhabitant of grasslands where it utilizes the surface runways of cotton rats (*Sigmodon*) and other grassland rodents. It seldom occurs in forests but occasional individuals have been found under logs and leaf litter in moist, forested areas.
Desert shrew	*Notiosorex crawfordi*	X		GR		X	GR	X	BC, EPW, NBP, NNAP, SPOS	Found in the more arid, western and southern parts of the state but do not appear to be restricted to any particular habitat. Specimens have been taken in cattail marshes, in beehives, under piles of cornstalks, among yuccas, in wood rat nests, and beneath piles of brush and refuse. Desert shrews do not appear to construct or make use of underground burrows.
Eastern mole	*Scalopus aquaticus*	X	GR	GR	GR	GR	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Moles spend most of their life in underground burrows they excavate for themselves or usurp from other mammals, particularly pocket gophers (genus Geomys). Because of this, they are restricted in their distribution by the nature of the soil. In Texas, they occur largely in moist (not wet), sandy soils. Deep, dry sands and heavy clays are avoided.
Ghost-faced bat	*Mormoops megalophylla*	X		GR	GR	GR	GR	X	BC, EPW, NBP, NNAP, SPOS	Various habitats from desert scrub and river floodplains (cottonwood/sycamore/willow) to pine/oak and tropical forests. This is a colonial, cave-dwelling bat whose distribution is closely correlated with the distribution of caves, crevices, and abandoned mine tunnels which serve as daytime roosts.
Cave myotis	*Myotis velifer*	X	GR	GR	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Colonial, cave dwelling bat, which may also roost in rock crevices, old buildings, carports, under bridges, and even in abandoned cliff swallow nests. The cave myotis is the most abundant bat of the Edwards Plateau and hibernates in central Texas caves in winter. Utilizes deserts, grasslands; frequents watercourses.
Silver-haired bat	*Lasionycteris noctivagans*	GR	GR	GR	GR	GR	GR	X	BC, EPW, LU, NBP, NNAP, SPOS	Prefers forested (frequently coniferous) areas adjacent to lakes, ponds, and streams. During migration, sometimes occurs in xeric areas. Summer roosts and nursery sites are in tree foliage, cavities, or under loose bark, sometimes in buildings.
Western pipistrelle	*Pipistrellus hesperus*			GR		GR			BC, EPW	Associated chiefly with rocky situations along watercourses. Its daytime retreat is in the cracks and crevices of canyon walls or cliffs, under loose rocks, or in caves.

Table 1. Mammalian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]								
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Ecoregions of Occurrence[2]	Habitat Description[1,3]
Eastern pipistrelle	*Pipistrellus subflavus*	X	GR	X	X	X	X	GR	BC, EPW, LU, NBP, NNAP, SPOS	Prefers partly open country with large trees and woodland edges. Avoids deep woods and open fields. Probably roosts in the summer in tree foliage and occasionally in buildings; may use cave as night roost between foraging forays.
Big brown bat	*Eptesicus fuscus*	X	GR		GR		GR		BC, EPW, LU, NBP, SPOS	This species is normally a forest dweller, but it does not hesitate to utilize attics and crevices in buildings, caves, and crevices in rocks for daytime retreats. Favorite roosts are under the loose bark of dead trees and in cavities of trees.
Eastern red bat	*Lasiurus borealis*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Prefers forested areas, wooded hedgerows, and areas with large shade trees (e.g., city parks). Summer roosts usually are in tree foliage (or in Spanish moss in some regions). They do not use sites such as caves, mine tunnels, or similar sites often frequented by other species.
Hoary bat	*Lasiurus cinereus*	X	X	GR	X	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Prefers deciduous and coniferous forests and woodlands. Roosts usually in tree foliage, often at the edge of a clearing and commonly in hedgerow trees. Sometimes roosts in rock crevices, rarely uses caves in most of range.
Northern yellow bat	*Lasiurus intermedius*	X	GR		GR		GR		BC, NBP, SPOS	Typically occurs in wooded areas in the vicinity of permanent water. Closely associated with Spanish moss, which is its preferred roosting site. In South Texas, however, these bats roost in palm trees, where they are well concealed beneath the large, drooping fronds.
Evening bat	*Nycticeius humeralis*	GR	GR	X	GR	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Prefers deciduous and mixed forest interspersed with cultivated areas. Commonly found along waterways. Summer roosts include attics of buildings, tree cavities, and spaces behind loose tree bark. May also use Spanish moss for summer roosting, and cave mouths in fall. Hibernation site not known.
Townsend's big-eared bat	*Plecotus townsendii*					GR			BC, EPW	Maternity and hibernation colonies typically are in caves and mine tunnels. Prefers relatively cold places for hibernation, often near entrances and in well-ventilated areas. Does not use crevices or cracks; hangs from the ceiling, generally near the zone of total darkness.
Pallid bat	*Antrozous pallidus*			GR		X		GR	BC, EPW, NNAP	Arid deserts and grasslands, often near rocky outcrops and water. Less abundant in evergreen and mixed conifer woodland. Usually roosts in rock crevice or building, less often in cave, tree hollow, mine, etc.

Table 1. Mammalian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[1,3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Brazilian free-tailed bat	*Tadarida brasiliensis*	X	GR	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	These bats utilize caves, mine tunnels, old wells, hollow trees, human habitations, bridges, and other buildings as daytime retreats. The prime necessity for a roost seems to be some relatively dark, dry retreat where from several dozen to several million individuals can hang up in close association and have an unobstructed space below into which they can drop when taking wing.
Big free-tailed bat	*Nyctinomops macrotis*	GR	GR	GR	GR	GR	GR	GR	BC, EPW, NBP, NNAP, SPOS	Seem to be seasonal inhabitants of rugged, rocky country in both lowland and highland habitats.
Nine-banded armadillo	*Dasypus novemcinctus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Prefers brushy areas with loose soil; also common in pinelands and hardwood uplands. Individuals make several burrows, often placed at side of creek. In the rocky terrain of the Edwards Plateau, tend to concentrate in the alluvial stream bottoms and den in the cracks and crevices of the numerous limestone outcroppings in that area.
Swamp rabbit	*Sylvilagus aquaticus*	X	GR		GR				BC, EPW, NBP, SPOS	Usually restricted to floodplains, bottomlands, riparian areas. Prefers mature forests. Associated with dense, brushy thickets in wooded floodplains along borders of lakes, river, and swamps. Commonly seeks water to escape danger.
Desert cottontail	*Sylvilagus audubonii*		GR	GR		X	GR	GR	BC, EPW, LU, NNAP	Various habitats; dry uplands as well as low valleys and canyons. May inhabit open grasslands, brushlands, edges of foothill woodlands, willow thickets, sometimes in cultivated fields or under buildings. May occupy burrows of other species. Rests in shallow burrow, slight depression in ground surrounded vegetative cover, or in thick vegetation.
Eastern cottontail	*Sylvilagus floridanus*	X	GR	X	GR	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Early mid-successional habitats over much of continental U.S. May be found in brushy areas, open woodlands, swampy areas, stream valleys, grasslands, and suburbs. Very adaptable species. Usually absent from boreal habitats and dense woods. Nests usually are in shallow depressions in thick vegetation or in underground burrows. Does not dig burrows.
Black-tailed jackrabbit	*Lepus californicus*	X	GR	GR	X	X	X	GR	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits open plains, fields and deserts; open country with scattered thickets or patches of shrubs.
Mexican ground squirrel	*Spermophilus mexicanus*	X	GR	GR	X	X	GR	X	BC, EPW, LU, NBP, NNAP, SPOS	Level grasslands associated with mesquite, creosote bush, brush and cactus. Prefers sandy or gravelly soil and avoids rocky areas. Occurs in cemeteries, golf courses, gardens, fields, and roadsides. In Kerr County, they are most common in pastures and along the highways.

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		Distribution within SEP-HCP Plan Area[1]								
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Ecoregions of Occurrence[2]	Habitat Description[1,3]
Rock squirrel	*Spermophilus variegatus*	X	GR	X	X	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Rocky habitats; cliffs, canyons, hillsides, arroyos, talus slopes, old buildings, bridges, terraced roads, stone walls. Usually not in open plains, wide valleys, deserts, or high montane forest. Burrows under rocks, bushes, trees, etc.
Black-tailed prairie dog	*Cynomys ludovicianus*	X	GR	GR	GR	GR	GR	GR	BC, EPW, LU, NBP	Habitat consists of dry, flat or gently sloping, open grasslands with low, relatively sparse vegetation, including areas overgrazed by cattle. The species occurs in open vacant lots at town edges in some areas.
Eastern gray squirrel	*Sciurus carolinensis*	X			GR				BC, EPW, NBP, SPOS	Prefers mature deciduous and mixed forests with abundant supplies of mast (e.g., acorns, hickory nuts). A diversity of nut trees is needed to support high densities. Also uses city parks and floodplains. Seldom far from permanent open water.
Eastern fox squirrel	*Sciurus niger*	X	X	X	GR	X	X	GR	BC, EPW, LU, NBP, NNAP, SPOS	Often in open mixed hardwood forest or mixed pine-hardwood associations, but has adapted well to disturbed areas, hedgerows, and city parks.
Botta's pocket gopher	*Thomomys bottae*			GR		GR			BC, EPW	Found in a wide variety of habitats from valleys to high mountain meadows. Usually not in forested areas. Inhabits a wide variety of soils from soft sands to friable loams to hard clays.
Attwater's pocket gopher	*Geomys attwateri*	X	GR	GR	GR		X		BC, EPW, NBP, SPOS	Sandy soils of bunchgrass and annual forb community; also occurs in silty clay loam soils and in habitat dominated by annual plants. Fossorial; rarely occurs above ground.
Llano pocket gopher	*Geomys texensis*			GR		GR	GR	X	BC, EPW, LU, NNAP	This fossorial species inhabits deep, brown loamy sands or gravelly sandy loams; it is isolated from other Geomys by shallow stony to gravelly clayey soils.
Merriam's pocket mouse	*Perognathus merriami*	X	GR	X	GR	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Uplands and lowlands of shortgrass prairie and desert scrubland (including mesquite-grass associations) over most of the range; most common in open and arid brushlands; occurs in fallow fields and juniper savanna in some areas; occurs in a wide range of soil types.
Hispid pocket mouse	*Chaetodipus hispidus*	X	GR	GR	GR	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Prefers prairie areas with sparse or moderate vegetation; various dry grassland habitats. Occurs in rocky or gravelly areas with heavy soils. Has been found in irrigated cornfields.
Gulf Coast kangaroo rat	*Dipodomys compactus*	X			GR			GR	NBP, NNAP, SPOS	Prefers sparsely vegetated areas with sandy soils; beach dunes; mainland sites include overgrazed mesquite savanna, cleared brushland supporting various grasses and weedy forbs, and post oak-blackjack oak association with deep sandy soil.

Table 1. Mammalian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]								
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Ecoregions of Occurrence[2]	Habitat Description[1,3]
American beaver	*Castor canadensis*	GR	X	GR	GR	GR	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Beavers inhabit permanent sources of water of almost any type in their range. They prefer low gradient streams (which they modify), ponds, and small mud-bottomed lakes with dammable outlets.
Fulvous harvest mouse	*Reithrodontomys fulvescens*	X	GR	GR	GR	X	X	GR	BC, EPW, NBP, NNAP, SPOS	Occur chiefly in grassy or weedy areas dotted with shrubs, or in creek bottoms with their tangles of grasses, vines, and bushes.
Plains harvest mouse	*Reithrodontomys montanus*	X	GR	GR	GR	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Well-developed grasslands. Occupies areas with less than 50 percent bare soil. Old hayfields, highway medians, cultivated fields (wheat, sorghum), grazed riparian woodland. Also desert scrub and chaparral.
Texas mouse	*Peromyscus attwateri*	X	GR	X	X	X	X	X	BC, EPW, LU, NBP, NNAP	Prefers rocky slopes or cliffs, wooded or with scrub vegetation. Primary habitat is rocky outcroppings in juniper dominated areas or mixed hardwood forest. Habitat generalist in west-central Texas, where it is at least semi arboreal and travels primarily in trees.
White-footed mouse	*Peromyscus leucopus*	X	X	GR	GR	X	X	GR	BC, EPW, LU, NBP, NNAP, SPOS	Prefers woodland edges, brushy fields, clearcuts, riparian zones; primarily a forest dweller.
Deer mouse	*Peromyscus maniculatus*	X	GR	GR	GR	X	X	GR	BC, EPW, LU, NBP, NNAP, SPOS	In Texas, they usually inhabit grasslands or areas of open brush, especially where weeds and grasses offer concealment and a source of food. Weed-choked fence rows and washes offer almost ideal habitat.
White-ankled mouse	*Peromyscus pectoralis*	X	GR	X	X	X	X	X	BC, EPW, LU, NBP, NNAP	Prefers rocky areas in a wide variety of arid or more humid habitats, including desert and grassland habitats, brush-covered foothills, pinyon-oak woodlands, ravines and rocky arroyos.
Northern pygmy mouse	*Baiomys taylori*	X	GR	X	GR	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Prefer grassy areas, and are commonly found in old fields, pastures, and along railroad and highway rights-of-way, where they usually live in close association with cotton rats (*Sigmodon hispidus*) and harvest mice (*Reithrodontomys* spp.). If other types of ground cover such as rocks, cactus, and fallen logs are available, may be found in areas where grass is relatively sparse.
Hispid cotton rat	*Sigmodon hispidus*	X	X	GR	GR	X	X	GR	BC, EPW, LU, NBP, NNAP, SPOS	Favors dense, grassy fields and roadside edges; also in brushy or weedy areas or among reeds and cattails along streams or ponds, in irrigated fields, and in desert scrub with little grass.
White-throated woodrat	*Neotoma albigula*	X	GR	GR	GR	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Prefer desert shrub vegetation as prickly pear, cholla cactus, mesquite, sotol, lechuguilla, and creosote bush.

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Eastern woodrat	*Neotoma floridana*	X	GR	GR	GR	X	GR	GR	BC, EPW, LU, NBP, SPOS	Wooded areas, ravines, floodplain forest; swamps and osage orange and other hedges in some areas in southern U.S. In central Texas (Kerr County) they frequently live in rocky canyon walls.
Southern plains woodrat	*Neotoma micropus*	X		GR	GR	X	GR	X	BC, EPW, NBP, NNAP, SPOS	Shrubby grassland, shortgrass-cholla, desert shrubland (creosotebush-blackbush, prickly pear-cholla, shortgrass-mesquite, creosotebush-lechuguilla), riparian cane and mesquite. Low valleys and plains, sometimes bottomland forest.
Norway rat*	*Rattus norvegicus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Buildings and other structures in cities, villages, and farm country, also dumps and open areas near abundant food. Most common in colder climates of high latitudes; in warmer regions restricted to habitats highly modified by humans.
Roof rat*	*Rattus rattus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Often associated with humans; buildings, sewers, seaports.
House mouse*	*Mus musculus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occupies buildings/other structures, as well as natural habitats such as fields, cropland, and low elevation forests, beaches, sometimes high elevation forest and scrub.
Woodland vole	*Microtus pinetorum*		GR	GR		X	GR		BC, EPW, LU	Lives in a wide variety of habitats, but in many areas prefers upland wooded areas with a thick layer of loose soil and humus. Spends most of time underground in shallow burrow systems.
Porcupine	*Erethizon dorsatum*	GR	GR	GR	GR	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Prefers coniferous and mixed forests; also inhabits riparian zones, grasslands, shrublands, and deserts in some parts of the range. Winter den may be in a rock outcrop, live hollow tree, hollow log, or outbuilding. May shelter in dense conifers in winter.
Nutria*	*Myocastor coypus*	X	GR	X	X	X	GR	X	BC, EPW, LU, NBP, NNAP, SPOS	Prefer a semiaquatic existence in swamps, marshes, and along the shores of rivers and lakes, also in brackish marshes.
Coyote	*Canis latrans*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Found in a wide range of habitats in its extensive range, from open prairies to the heavily forested regions. In cities in some areas.
Red fox*	*Vulpes vulpes*	X	GR	GR	X	GR	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Found in various open and semi-open habitats. Usually avoids dense forest, although open woodlands frequently are used. Sometimes occurs in suburban areas or even cities.
Common gray fox	*Urocyon cinereoargenteus*	X	GR	GR	X	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Essentially an inhabitant of wooded areas, particularly mixed hardwood forests. Often found in woodland and shrubland in rough, broken country. Usually avoids open areas. May climb tree to avoid danger.

Table 1. Mammalian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[1,3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Ringtail	*Bassariscus astutus*	X	GR	GR	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occupy a variety of habitats within their range, but prefer rocky areas such as rock piles, stone fences, canyon walls, and talus slopes. They occur less commonly in woodland areas where they live in hollow trees and logs, and they are also known to live in buildings. Usually within 0.5 miles of water.
Common raccoon	*Procyon lotor*	X	GR	GR	X	X	GR	X	BC, EPW, LU, NBP, NNAP, SPOS	Primarily inhabitants of broadleaf woodlands, although they are rather common in the mixed-pine forests of southeastern Texas. They seldom occur far from water, which seems to have more influence on their distribution than does any particular type of vegetation.
White-nosed coati	*Nasua narica*	GR		GR	GR	X	GR	GR	BC, EPW, NBP, NNAP, SPOS	Habitat ranges from broken tropical forests of coastal plains, pine forest, mesquite grassland, oak scrub, canyons (oak-sycamore-walnut, oak-pine, shrub-grass); usually near water.
Long-tailed weasel	*Mustela frenata*	X	GR	GR	GR	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Found in a wide variety of habitats, usually near water. Favored habitats include brushland and open woodlands, field edges, riparian grasslands, swamps, and marshes.
Mink	*Mustela vison*	GR	GR	GR	GR	GR	GR		BC, EPW, LU, NBP, SPOS	Favors forested, permanent or semipermanent wetlands with abundant cover, marshes, and riparian zones.
American badger	*Taxidea taxus*	X	GR	GR	GR	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Occupy a variety of habitats. Prefers open areas and may also frequent brushlands with little groundcover.
Western spotted skunk	*Spilogale gracilis*	X	GR	GR	GR	X	X	GR	BC, EPW, NBP, NNAP, SPOS	Brushy canyons, rockym outcrops (rimrock) on hillsides and walls of canyons. ost often associated with rocky bluffs, cliffs, and brush-bordered canyon streams or stream beds. In the Edwards Plateau, rock fences seem to be especially attractive.
Eastern spotted skunk	*Spilogale putorius*	X	GR	GR	GR	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Prefer forested areas or habitats with significant cover. Also open and brushy areas, rocky canyons and outcrops in woodlands and prairies.
Striped skunk	*Mephitis mephitis*	X	GR	GR	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Prefers semi-open country with woodland and meadows interspersed, brushy areas, bottomland woods. Frequently found in suburban areas.
Common hog-nosed skunk	*Conepatus mesoleucus*	X	GR	GR	GR	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Occur in rocky, sparsely timbered areas such as the Edwards Plateau of central Texas and the Chisos, Davis, and Guadalupe mountains of Trans-Pecos Texas.
River otter	*Lutra canadensis*	GR	GR		GR		GR		BC, EPW, LU, NBP, SPOS	Largely aquatic and frequent streams, lakes, ponds, swamps, marshes, estuaries, beaver flowages, and exposed outer coast.

Table 1. Mammalian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[1,3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Mountain lion	*Felis concolor*	X	X	X	GR	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Now associated generally with mountainous or remote undisturbed areas. May occupy wide variety of habitats: swamps, riparian woodlands, broken country with good cover of brush or woodland.
Ocelot	*Felis pardalis*	GR		X		X		GR	BC, EPW, NBP, NNAP, SPOS	Habitats with good cover; when active by day, tends to keep hidden in dense brush. Inhabits dense chaparral thickets in Texas. Elsewhere, occurs in humid tropical forests, mangrove forests, swampy savannas, brushland, and riverine scrub in deserts. Where not hunted, adapts well to disturbed habitats around villages; often uses man-made trails.
Bobcat	*Lynx rufus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Various habitats including deciduous-coniferous woodlands and forest edge, hardwood forests, swamps, forested river bottomlands, brushlands, deserts, mountains, and other areas with thick undergrowth. Large tracts of habitat are most favorable. Primarily terrestrial.
Feral pig*	*Sus scrofa*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Densely forested mountainous terrain, brushlands, dry ridges, swamps; sometimes in fields, marshes. Often in mixed hardwood forest with permanent water source. Seasonal changes in habitat use are linked to food availability. In southern Texas, prime habitat is open brush-savanna with free water.
Collared peccary	*Tayassu tajacu*	GR	H	GR	H	GR	H	GR	BC, EPW, LU, NBP, NNAP, SPOS	Occupy the brushy semidesert where prickly pear is a conspicuous part of the flora. They are commonly found in dense thickets of prickly pear, chaparral, scrub oak, or guajillo; also in rocky canyons where caverns and hollows afford protection and in barren wastelands.
Axis deer*	*Cervus axis*									The most abundant exotic ungulate in Texas. Inhabit areas of secondary forest lands broken here and there by glades, with an understory of grasses, forbs, and tender shoots which supply adequate drinking water and shade. They tend to avoid rugged terrain.
Fallow deer*	*Cervus dama*									Often found in brushy, hilly areas near grassy meadows; prefers older forest interspersed with areas of grass; tolerates diverse habitats: mixed forest, broadleaf forest, subalpine vegetation, grassland, scrub, savanna.
Elk*	*Cervus elaphus*									Variable according to location. Uses open areas such as alpine pastures, marshy meadows, river flats, and aspen parkland, as well as coniferous forests, brushy clear cuts or forest edges, and semi-desert areas.
Sika deer*	*Cervus nippon*									Sika have been introduced in 77 counties of central and southern Texas, with free-ranging populations known from 12 of these counties.

Table 1. Mammalian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]								
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Ecoregions of Occurrence[2]	Habitat Description[1,3]
White-tailed deer	*Odocoileus virginianus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occupy many types of habitats in mountains and lowlands, including various forests and woodlands, forest edges, shrublands, grasslands with shrubs, and residential areas. They are often associated with successional vegetation, especially near agricultural lands. Within arid regions, white-tailed deer prefer mesic situations (riparian zones, montane woodlands).
Barbary sheep*	*Ammotragus lervia*									Present in the Edwards Plateau, Trans-Pecos, South Texas, Rolling Plains, and Post Oak Savannah regions as a result of private introductions. Adapted to a dry, rough, barren, and waterless habitat.
Blackbuck*	*Antilope cervicapra*									More than 80% of the blackbuck in Texas inhabit the Edwards Plateau region, where the patchwork of open grassland and brush provides both excellent forage and cover.

1 - Source: Schmidly, David J. 1994. The Mammals of Texas Revised Edition. University of Texas Press: Austin. 501 pp.

X - Individual locality records of the species occurrence within the county based on records from museums or collections.

GR - General range of species occurrence within Texas, but no documented museum or collection records of occurrence for that species in the county.

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2 - Ecoregions of Occurrence - BC: Balcones Canyonlands; EPW: Edwards Plateau Woodland; LU: Llano Uplift; NBP: Northern Blackland Prairie; NNAP: Northern Nueces Alluvial Plains; SPOS: Southern Post Oak Savanna

3 - Source: NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed March 3, 2011.

* Non-native, introduced and/or invasive species.

Table 2. Amphibian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]								
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Ecoregions of Occurrence[2]	Habitat Description[3]
Smallmouth Salamander	*Ambystoma texanum*	X	GR		X		GR		BC, EPW, LU, NBP, SPOS	Tolerates a wide range of ecological conditions: tall grass prairie, moist pine woodland, flood plain forest, oak woodland, dense hardwood forest, and intensely farmed areas.
Barred Tiger Salamander	*Ambystoma tigrinum mavortium*		GR	GR		GR	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Found in virtually any habitat, providing there is a terrestrial substrate suitable for burrowing and a body of water nearby suitable for breeding.
Eastern Tiger Salamander	*Ambystoma tigrinum tigrinum*	X			GR				BC, NBP, SPOS	Found in virtually any habitat, providing there is a terrestrial substrate suitable for burrowing and a body of water nearby suitable for breeding.
Cascade Caverns Salamander	*Eurycea latitans*						X		BC, EPW	Strictly aquatic, this salamander lives in freshwater cave pools and streams.
San Marcos Salamander	*Eurycea nana*				X				BC, NBP	Strictly aquatic, this salamander may be seen among algae in the spring-fed pool at head of the San Marcos River.
Texas Salamander	*Eurycea neotenes*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Strictly aquatic, this salamander is found in subterranean streams and creek headwaters.
Comal Blind Salamander	*Eurycea tridentifera*	X			X				BC, NBP, SPOS	Strictly aquatic, this salamander is found in the underground waters of limestone caves.
Valdina Farms Salamander	*Eurycea troglodytes*							X	BC, NNAP	Strictly aquatic, this salamander is found in underground waters within its range.
Western Slimy Salamander	*Plethodon albagula*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Commonly under rocks or logs in damp ravines and moist wooded hillsides; may retreat underground or burrow into piles of leaf litter in dry summer weather; sometimes occurs in the twilight zone of caves. Wooded ravines and floodplains, along shale banks of rivers and streams, cave entrances.
Black-spotted Newt	*Notophthalmus meridionalis*	?							BC, NBP, SPOS	Prefers warm, shallow waters with vegetative cover, such as those in ponds, ditches, and swamps.
Eastern Lesser Siren	*Siren intermedia nettingi*	GR			GR				BC, NBP, SPOS	Prefers warm, shallow waters with vegetative cover, such as those in ponds, ditches, and swamps.
Green Toad	*Bufo debilis*	X	GR	X	X	GR	GR	X	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits arid and semiarid plains, valleys, and foothills in grasslands and desert shrublands.
Red-spotted Toad	*Bufo punctatus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits rocky canyons and gullies in deserts, grasslands, and dry woodlands

Table 2. Amphibian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Texas Toad	*Bufo speciosus*	X	GR	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Found in grasslands, cultivated areas, and mesquite savanna. It burrows underground when inactive. It is often found in areas with sandy soil.
Gulf Coast Toad	*Bufo valliceps*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Found in a wide variety of habitats from coastal prairies and barrier beaches along the Gulf of Mexico to roadside and irrigation ditches to urban/suburban sewers and backyard gardens.
Woodhouse's Toad	*Bufo woodhousii*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits grasslands, desert and semi-desert shrublands, river valleys and floodplains, and agricultural areas, usually in areas with deep friable soils.
Northern Cricket Frog	*Acris crepitans*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occurs along the edges of sunny marshes, marshy ponds, and small slow-moving streams in open country. It may periodically range into adjacent non-wetland habitats in some regions.
Cope's Gray Treefrog	*Hyla chrysoscelis*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occupies wooded areas and woodland edges (including woodlots in prairies), usually within a few hundred meters of the aquatic habitats in which they breed. Often they occur in recently disturbed areas with abundant shrubs, herbaceous growth, and vines.
Green Treefrog	*Hyla cinerea*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Inhabit swamps, marshes, and areas adjacent to ponds, lakes, and slow streams, particularly where aquatic habitats include abundant floating and emergent vegetation. May overwinter in upland situations near wetlands.
Gray Treefrog	*Hyla versicolor*	X	GR	GR	X	GR	GR	X	BC, EPW, LU, NBP, NNAP, SPOS	Inhabit various kinds of wooded and forested habitats and may occur on the ground or more often in shrubs or trees. Inactive individuals may be in tree holes, under bark, in rotten logs, under leaves, and under tree roots.
Spotted Chorus Frog	*Pseudacris clarkii*	X	X	GR	X	GR	X	GR	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes open prairie grasslands, pastures, meadows, shrubby areas, lawns near breeding habitat, and the edges of woodlands.
Strecker's Chorus frog	*Pseudacris streckeri*	X	X	GR	X	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Basically terrestrial. Moist woods, sand prairies, ravines, along streams and swamps, around ponds, and cultivated areas.
Eastern Barking Frog	*Hylactophryne augusti*	X	GR	X	X	X	X	GR	BC, EPW, LU, NBP, NNAP, SPOS	Found in relatively low elevation areas in shrublands and deserts including treeless, dry, yucca-covered hills and brushy woodland; open pine forests; juniper-live oak woodland (Texas); in large, low clumps of cactus (Sonora); often in rocky limestone areas.

Table 2. Amphibian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Chirping Frog	*Syrrhophus cystignathoides*	X							BC, NBP, SPOS	Inhabits low and moderate elevations in foothills. It is found in moist shaded vegetation, palm groves, thickets, ditches, resacas, lawns and gardens.
Cliff Chirping Frog	*Syrrhophus marnockii*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Cracks, caves, and crevices in cliffs and limestone hills in areas of woodland, scrubland, grassland, and desert; also among human-generated debris and on watered lawns.
Eastern Narrowmouth Toad	*Gastrophryne carolinensis*	GR	GR	GR	X	X	GR		BC, EPW, NBP	Occurs in a wide variety of habitats, usually in areas with sandy or loamy soils. On land, they range up to several hundred meters from water.
Great Plains Narrowmouth Toad	*Gastrophryne olivacea*	X	GR	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits semi-arid and arid lowlands such as mesquite and shrublands. It is also known from grasslands, rocky wooded hills, marsh edges, near springs, streams, and rain pools, river floodplains, scrub desert, and cultivated fields.
Couch's Spadefoot	*Scaphiopus couchii*	X	GR	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes arid and semi-arid shrublands, shortgrass plains, mesquite savanna, creosote bush desert, thornforest, cultivated areas, and tropical deciduous forest (Mexico).
Hurter's Spadefoot	*Scaphiopus hurterii*	X			GR				BC, NBP, SPOS	Areas of sandy, gravelly, or soft, light soils in wooded or unwooded terrain; sandy open woodland and savanna, mesquite scrub.
New Mexico Spadefoot	*Spea multiplicata*		GR			GR	GR		BC, EPW, LU	Frequently found in desert grassland, shortgrass plains, creosote bush, sagebrush, and semi-desert shrublands, mixed grassland/chaparral, pinyon-juniper and pine-oak woodland and open pine forest.
Rio Grande Leopard Frog	*Rana berlandieri*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Along streams and rivers, springs, stock ponds, backwaters, canals, drainage ditches, and arroyo pools in grassland, shrubland, savanna, desert, and woodland areas; chiefly a stream dweller. Utilizes both temporary and permanent water.
Bullfrog	*Rana catesbeiana*	X	GR	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits ponds, swamps, lakes, reservoirs, marshes, brackish ponds, stream margins, and irrigation ditches, especially sites with abundant floating, emergent, or submerged vegetation. They may disperse from water in wet weather and sometimes are found in temporary waters hundreds of meters from permanent water.
Southern Leopard Frog	*Rana sphenocephala*	X					X		BC, EPW, NBP, SPOS	Occur in the vicinity of virtually any freshwater habitat and in some locations inhabit slightly brackish marshes. In summer they may disperse from water into moist upland vegetation.

1 - Source: Dixon, James. 2000. Amphibians and Reptiles of Texas, Second Edition. College Station: Texas A&M University Press.

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GR - General range of species occurrence within Texas, but no documented museum or collection records of occurrence for that species in the county.

Table 2. Amphibian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]								
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Ecoregions of Occurrence[2]	Habitat Description[3]

? - Questionable county records. May represent errors in identification, erroneous locality data, and/or an escaped pet that found its way into a museum or collection.

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3 - Source: NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed March 3, 2011.

Table 3. Reptilian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]								
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Ecoregions of Occurrence[2]	Habitat Description[3]
Slender Glass Lizard	*Ophisaurus attenuatus*	X	GR	GR	GR	X	X	GR	BC, EPW, LU, NBP, SPOS	Habitats include open grassland, prairie, woodland edge, open woodland, oak savannas, longleaf pine flatwoods, scrubby areas, fallow fields, and areas near streams and ponds, often in habitats with sandy soil.
Eastern Collared Lizard	*Crotaphytus collaris*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	The habitat consists of rocky areas with sparse vegetation and encompasses open woodlands, bunchgrass areas, canyons, gullies, slopes, and mesa tops.
Texas Banded Gecko	*Coleonyx brevis*	X		GR			GR	X	BC, NBP, NNAP, SPOS	Habitats include rocky limestone foothills with desert scrub vegetation such as creosotebush, acacia, and juniper; canyons, creviced escarpments, and low earthen hills. The species is particularly common in areas of flat rock and succulent vegetative debris.
Mediterranean Gecko	*Hemidactylus turcicus turcicus*	X	GR	X	X	GR	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Usually on or in occupied buildings, on walls and ceilings; also under palm leaves, tree bark crevices, and rocky outcrops.
Texas Earless Lizard	*Cophosaurus texanus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Prefer rocky desert flats, streambeds, and limestone cliffs.
Plateau Earless Lizard	*Holbrookia lacerata lacerata*	GR	X	GR	X	X	X	GR	BC, EPW, LU	Habitats include moderately open prairie-brushland regions, particularly fairly flat areas free of vegetation or other obstructions (e.g., open meadows, old and new fields, graded roadways, cleared and disturbed areas, prairie savanna); also, oak-juniper woodlands and mesquite-prickly pear associations.
Southern Earless Lizard	*Holbrookia lacerata subcaudalis*	X						X	NBP, NNAP, SPOS	Habitats include moderately open prairie-brushland regions, particularly fairly flat areas free of vegetation or other obstructions (e.g., open meadows, old and new fields, graded roadways, cleared and disturbed areas, prairie savanna); also, oak-juniper woodlands and mesquite-prickly pear associations.
Keeled Earless Lizard	*Holbrookia propinqua*	X			GR			X	BC, NBP, NNAP, SPOS	Habitats include coastal dunes, barrier islands, and other sandy areas (Axtell 1983).
Texas Horned Lizard	*Phrynosoma cornutum*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits open arid and semiarid regions with sparse vegetation (deserts, prairies, playa edges, bajadas, dunes, foothills) with grass, cactus, or scattered brush or scrubby trees.
Texas Spiny Lizard	*Sceloporus olivaceus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Primarily arboreal, occurs on mesquite, oak, and other trees, and on buildings, fences, and bridges; it is often associated with scrub vegetation.

Table 3. Reptilian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Crevice Spiny Lizard	*Sceloporus poinsettii*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occupies rocky canyons, gullies, hillsides, and outcrops in largely barren areas, mesquite grassland, creosote bush desert, arid woodland (e.g., oak/pinyon pine/juniper), and spruce-fir forest. It is invariably closely tied to rocks and seeks shelter in crevices (Stebbins 2003).
Fence/Prairie Lizard	*Sceloporus undulatus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitat varies geographically; various populations are primarily arboreal, terrestrial, or saxicolous. Usually occur in sunny/open situations.
Rosebelly Lizard	*Sceloporus variabilis*	X		X	X			X	BC, NBP, NNAP, SPOS	Inhabits a wide range of conditions, from ocean beaches to moderately high elevations. In Texas, it climbs on scrubby trees (e.g., mesquite) and also often occurs terrestrially, such as on and among fence posts, cactus, and rocks.
Eastern Tree Lizard	*Urosaurus ornatus ornatus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes a wide range of situations from desert to the lower edge of the spruce-fir zone; usually perches on massive rocks or trees (mesquite, oak, pine, juniper, alder, cottonwood, tamarisk, rough-bark eucalyptus)(Stebbins 2003), sometimes on fence posts or buildings. It is often associated with river courses.
Green Anole	*Anolis carolinensis*	X	X	X	X	GR	X	GR	BC, EPW, LU, NBP, NNAP, SPOS	Mostly arboreal, occupies a wide variety of habitats, including upland forests, pine-palmetto scrublands, rocky escarpments, swamps, wooded parks, cleared fields, maritime scrub, and residential lots of coastal towns.
Brown Anole	*Anolis sagrei*	X							BC, NBP, SPOS	Various sunny habitats; rarely in deep woods or forests. Coastal areas and mountains, dry areas and in lush vegetation. Trunk-ground species. Found on trees, shrubs, fences, walls, lumber and rock piles, trash piles, around buildings, and on or near ground.
Great Plains Skink	*Eumeces obsoletus*	X	X	X	GR	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	In the eastern part of the range, inhabits prairie regions: rocky areas, canyon bottoms, sandhills, and floodplains; in the west, it occurs in canyons, mesas, and mountains in semiarid regions, especially in shrubby rock outcrops along stream courses.
Southern Prairie Skink	*Eumeces septentrionalis obtusirostris*	X			GR				BC, NBP, SPOS	Habitat includes open sandy areas of pine barrens and bracken grassland, grassy dunes, sandy banks of creeks and rivers and along roadsides, open grass-covered rocky hillsides near streams, and forest edges and woodland; this semifossorial lizard is often under ground cover.

Table 3. Reptilian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[3]
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Four-Lined Skink	*Eumeces tetragrammus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits rocky hillsides in arid and semiarid country, brushlands, grasslands, thornscrub, edges of open pine-oak woodlands, pond edges, gullies near small streams, gallery forest of riparian corridors, and trash piles and dumps; it is often in leaf litter, rotting brush, old packrat houses, cactus clumps, or other debris, such as that around isolated delapidated houses; may take cover in water.
Ground Skink	*Scincella lateralis*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occurs in a wide variety of habitats; generally in areas with ground cover (grass, leaf litter, forest floor debris, rocks, etc.), including dry upland woodlands as well as stream and pond edges (Bartlett and Bartlett 1999); often it can be found under ground surface cover.
Texas Spotted Whiptail	*Cnemidophorus gularis*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitats include desert grassland, shortgrass prairies, rocky slopes, plateaus, washes, weedy areas, and shrubby river bottoms, in areas of sandy, gravelly, or rocky soil and sparse ground cover, including disturbed and undisturbed areas.
Six-lined Racerunner	*Cnemidophorus sexlineatus*	X	GR	X	X	X	GR	X	BC, EPW, LU, NBP, NNAP, SPOS	Inhabit grassland, sandhills, sandy or gravelly banks and floodplains of streams, sparsely vegetated rocky areas at the base of mountains, woodland edges and open woods, beach dunes, and similar situations with full or partial sun exposure.
Common Snapping Turtle	*Chelydra serpentina*	X	GR	X	GR	X	X	GR	BC, EPW, LU, NBP, NNAP, SPOS	Found in all types of freshwater habitats (streams, lakes, reservoirs, ponds, marshes, swamps), especially those with soft mud bottoms and abundant aquatic vegetation or submerged brush and logs. They occur in brackish water in some areas.
Cagle's Map Turtle	*Graptemys caglei*	X	X	GR	X	X	X	GR	BC, EPW, LU, NBP, NNAP, SPOS	Occupies rivers with shallow average depth, muddy moderate flow, substrates of mostly silt and gravel (or limestone), and gravel bars connecting long pool areas of varying depth; optimal habitat appears to include both riffles and pools (riffles may be an important producers of insect prey). Also occurs in slow-moving waters 1-3 meters deep behind impoundments.
Texas Map Turtle	*Graptemys versa*		X		GR	GR			BC, EPW, LU	Found in rivers with moderate current, abundant aquatic vegetation, and basking logs; also associated oxbows and lakes (Bartlett and Bartlett 1999).
Texas River Cooter	*Pseudemys texana*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occurs primarily in rivers and tributaries, and nearby ponds; sites with abundant underwater vegetation and plenty of basking sites (Garrett and Barker 1987).
Eastern Box Turtle	*Terrapene carolina*	X	GR	GR	GR	GR	gr	GR	BC, EPW, LU, NBP, NNAP, SPOS	Inhabit forests, fields, forest-brush, and forest-field ecotones. In some areas they move seasonally from fields in spring to forest in summer.

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Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Ornate Box Turtle	*Terrapene ornata*	X	X	X	X	GR	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Inhabit prairie grassland, pasture, fields, sandhills, and open woodland.
Slider	*Trachemys scripta*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Usually in quiet water with abundant aquatic vegetation, soft bottom, and basking sites.
Yellow Mud Turtle	*Kinosternon flavescens*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits various quiet or slow-flowing bodies of water, usually with soft mud or sand bottom, in areas of grassland and open woodland, desert in Southwest.
Eastern Mud Turtle	*Kinosternon subrubrum*	X	GR	GR	X	X	GR	X	BC, EPW, LU, NBP, NNAP, SPOS	Shallow, slow- or nonflowing fresh or brackish water with soft bottom and abundant aquatic vegetation; also wet meadows. Frequently travels overland. Basically a bottom-dweller.
Common Musk Turtle	*Sternotherus odoratus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits virtually any permanent body of freshwater having a slow current and soft bottom. May bask on tree limbs well above water.
Texas Tortoise	*Gopherus berlandieri*	X	GR	GR	X		GR	X	BC, NBP, NNAP, SPOS	Open scrub woods, arid brush, lomas, grass-cactus association; often in areas with sandy well-drained soils.
Spiny Softshell	*Apalone spinifera*	X	X	X	X	X	X	GR	BC, EPW, LU, NBP, NNAP, SPOS	Large rivers, river impoundments, lakes, ponds along rivers, pools along intermittent streams, bayous, oxbows; usually in areas with open sandy or mud banks and soft bottom.
Texas Blind Snake	*Leptotyphlops dulcis*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitat consists of arid and semiarid areas with sandy or loamy soils, usually near moisture, including rocky and sandy desert, cedar-ocotillo associations, rock-strewn hillsides and mountain slopes, thornbrush, cedar savanna, live oak and juniper woodlands, mesquite-lined creek banks, open grassy plains, and sometimes residential areas.
Texas Glossy Snake	*Arizona elegans*	X	GR	GR	X		GR	X	BC, NBP, NNAP, SPOS	The varied habitats include barren to sparse shrubby desert, sagebrush flats, grassland, sandhills, coastal scrub, chaparral slopes, and sometimes oak-hickory woodland, generally in open areas with sandy or loamy soil, though rocks may be present.
Eastern Racer	*Coluber constrictor*	X	GR	GR	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitats encompass a wide range of lowland and montane areas, including deserts, prairies, sandhills, shrublands, woodlands, forests, canyons, streamsides, and semi-agricultural areas. Absent from the driest deserts and highest mountains (subalpine zones and higher). It commonly climbs shrubs and small trees.
Ringneck Snake	*Diadophis punctatus*	X	X	X	GR	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occurs in forests, woodlands, grassland, chaparral, and riparian corridors in arid regions (Stebbins 2003). Habitats are moist, at least seasonally.

Table 3. Reptilian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Texas Indigo Snake	*Drymarchon corais*	X		GR				X	BC, NBP, NNAP, SPOS	In Texas, it occurs primarily along riparian corridors in thorn brush woodland and mesquite savanna of the coastal plain, but also in prairies, coastal sandhills, and limestone desert (Tennant 1998). This is a primarily terrestrial snake that often uses burrows.
Baird's Rat Snake	*Elaphe bairdi*			X		X		X	BC, EPW, LU, NBP, NNAP	In Texas, this terrestrial and arboreal snake inhabits wooded rocky canyons of Edwards Plateau, pinyon pine-needle grass uplands in Chisos Mountains, barren road-cut bluffs with scattered seep willow, and mesic canyons in montane forest and low desert areas in the Trans-Pecos region. Rocky, igneous or limestone habitats apparently are favored, especially those with caves, deep crevices, and/or sheer canyon walls; eaves and wooded crevices associated with ranch outbuildings are also occasionally used.
Great Plains Rat Snake	*Elaphe emoryi*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes rocky hillsides, meadows, stream courses and river bottoms, canyons and arroyos, barnyards, abandoned houses and ranch buildings, areas near springs, caves (near entrance), and wooded areas.
Texas Rat Snake	*Elaphe obsoleta*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Seen in a wide range of habitats from grassy prairies to coastal plains to rocky slopes.
Western Hognose Snake	*Heterodon nasicus*	X	X	GR	GR	GR	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Habitat consists of areas with sandy or gravelly soils, including prairies, sandhills, wide valleys, river floodplains, bajadas, mesquite grassland, thornscrub, semidesert areas, creosotebush desert, open montane woodland, semiagricultural areas (but not intensively cultivated land), margins of irrigation ditches, and sometimes mountain canyon bottoms.
Eastern Hognose Snake	*Heterodon platirhinos*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitats include openly wooded upland hills, forest edges, fields, woodland meadows, prairies, forest-grassland ecotones, sand plains, barrier islands, fire-managed pinelands, river valleys, riparian zones, and various other habitats with loose soils and amphibian prey.
Night Snake	*Hypsiglena torquata*	X	GR	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Generally inhabits arid and semiarid plains, canyons, and hillsides, usually in rocky, dissected or hilly terrain with sandy or gravelly soils, including areas dominated by desert, grassland, shrubland, savanna, or woodland.
Prairie Kingsnake	*Lampropeltis calligaster*	X	X		X		X		BC, NBP, NNAP, SPOS	Habitats include various open and semi-open areas, including weedy fields, farmland, barnyards, pastures, prairies, rocky hillsides, thickets, open woodland, sandhills, pine flatwoods, landward side of barrier beaches, coastal salt-grass savannas, marsh borders, and residential areas.

Table 3. Reptilian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Common Kingsnake	*Lampropeltis getula*	X	GR	GR	GR	X	GR	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitats vary geographically and include open coniferous forest, woodland, swamps, coastal marshes, river bottoms, farmland, prairie, chaparral, and desert. This snake is primarily terrestrial.
Milk Snake	*Lampropeltis triangulum*	X	GR	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitats vary greatly among different geographic regions: semiarid to wet, lowland valleys to mountains, grasslands and shrublands to forests and forest edges, primary forest to secondary forest, sand dunes to rocky areas, and wilderness to semi-agricultural and suburban.
Coachwhip Snake	*Masticophis flagellum*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occurs in a wide range of habitats: desert, prairie, scrubland, juniper-grassland, woodland, thornforest, farmland, creek valleys, and sometimes swamps; usually in relatively dry open terrain. It is terrestrial but also climbs into vegetation.
Schott's Whipsnake	*Masticophis schotti*	X		GR				x	BC, NBP, NNAP, SPOS	Habitats include tropical dry forest, semideciduous forest, shrublands, grasslands, canyons, woodlands of pine/juniper/oak, rocky stream courses, and pond edges. In Texas, this snake occurs in savanna (mesquite/live oak; dry, rocky, and often sandy areas) and Tamaulipan thorn woodland; it is often associated with streambeds and ponds.
Striped Whipsnake	*Masticophis taeniatus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitats include shrublands, arid grasslands, sagebrush flats, canyons, pinyon-juniper woodland, pine-oak woodland, and rocky stream courses. Microhabitats are terrestrial and arboreal.
Plainbelly Water Snake	*Nerodia erythrogaster*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occurs in a wide array of aquatic/wetland habitats, generally with permanent or semipermanent water, such as forested and shrubby swamps, marshes, edges of ponds and lakes, ditches, and slow streams. It often basks or rests in water-edge vegetation. It wanders far from water, especially during warm wet weather.
Diamondback Water Snake	*Nerodia rhombifer*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	This semiaquatic snake occurs in a wide range of habitats, including the margins and shallows of lakes, ponds, rivers, smaller streams, swamps, marshes, canals, and ditches. It basks on banks and in edge vegetation and may wander on land, especially in wet weather.
Rough Green Snake	*Opheodrys aestivus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Typically inhabits dense vegetation (vines, shrubs, trees) near water; often at forest edges or in fairly open forests; also overgrown pasture, tallgrass prairie, thickets, barrier islands; and pine-oak, mesic hardwood hammocks. It is mostly arboreal but less so in spring and fall.

Table 3. Reptilian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Gopher Snake	*Pituophis catenifer*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occurs in a wide range of habitats, extending from lowlands to mountains: desert, prairie, shrubland, woodland, open coniferous forest, farmland, and marshes. Midwestern populations inhabit prairies; western and Mexican populations range from coastal grasslands and forests through deserts into montane forests.
Graham's Crayfish Snake	*Regina grahamii*	X			GR			GR	NBP, SPOS	Inhabits sluggish streams, river-bottom sloughs, bayous, pond and lake margins, marshes, swamps, rice fields, and roadside ditches, often in water-edge vegetation, under shore debris, or in crayfish burrows.
Longnose Snake	*Rhinocheilus lecontei*	X	GR	GR	X	GR	GR	X	BC, EPW, LU, NBP, NNAP, SPOS	Typical habitats include deserts, dry prairies, arid river valleys, thornbrush, and shrubland; sometimes oak-hackberry woodland.
Mountain Patchnose Snake	*Salvadora grahamiae*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	In the western part of the range, habitats include rocky canyons, plateaus, and mountain slopes with open woodland or open ponderosa pine forests; in the east, the habitat includes prairies, arid shrublands, oak-juniper savanna, thorn brush woodland, and woodland-grassland-farmland mosaics.
Ground Snake	*Sonora semiannulata*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitats include arid and semiarid regions: river bottoms, desert flats, sand hummocks, rocky hillsides with pockets of loose soil; from prairie and desert lowlands to pinyon-juniper and oak-pine zone; soil may be rocky to sandy, vegetation dense to sparse.
Brown Snake	*Storeria dekayi*	X	GR	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occurs in nearly all terrestrial and wetland habitat types in its range, including cities. Habitats in Mexico include cloud forest and tropical deciduous forest. Usually it inhabits moist situations, but it is not an aquatic species.
Flathead Snake	*Tantilla gracilis*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitats include rocky prairie, wooded hillsides, rocky forest edges, pine-oak uplands, oak-juniper brakes, pine woods, moist deciduous woods, thorn woodland, and grass-brushland.
Southwestern Blackhead Snake	*Tantilla hobartsmithi*			X		X		X	BC, EPW, NNAP	Habitats include pinyon-juniper woodland, chaparral-woodland, riparian woodland, mesqite-yucca grassland, sagebrush-greasewood, cedar-ocotillo, persimmon-shin oak, mesquite-creosote bush, and cedar-savanna.
Plains Blackhead Snake	*Tantilla nigriceps*	X	GR	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitats include plains and desert grassland, shrubland, sandhills, rocky canyons, riparian zones along prairie streams, and thorn brush woodland.

Table 3. Reptilian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Blackneck Garter Snake	*Thamnophis cyrtopsis*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occurs in a wide range of habitats, from desert flats, dry grasslands, and tropical lowlands to pine-oak habitats and cloud forest in mountains; in the southwestern United States it is often in the vicinity of permanent and intermittent streams, spring seepages, and irrigation canals, usually in canyons, foothills, or mountains (Stebbins 2003). It inhabits rocky hillsides and limestone ledges, and wooded ravines and cedar brakes, in the Texas Hill Country (Tennant 1984).
Checkered Garter Snake	*Thamnophis marcianus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occurs in the vicinity of ponds, springs, streams, rivers, marshes, swamps, flooded areas, and irrigation ditches (in arid and semiarid regions in the north, usually grasslands and deserts, but also thornbrush savanna, backyards, gardens, and other terrestrial habitats in southern Texas).
Western Ribbon Snake	*Thamnophis proximus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	This semiaquatic snake occurs a wide range of often shrubby habitats in the vicinity of streams, lakes, ponds, sloughs, ditches, swamps, and marshes.
Common Garter Snake	*Thamnophis sirtalis*	X	X	GR	GR	GR	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Marshy, flooded pastureland or meadows, particularly in spring when frogs are present in numbers; at other times, grassy or brushy terrain near hill country streams and ponds (Tennant 1984). Seems to prefer vicinity of permanent sources of water or soil damp enough to support earthworm populations; northern disjunct population is largely restricted to stock tanks, streams, and permanent springs (Tennant 1984).
Lined Snake	*Tropidoclonion lineatum*	X	GR	GR	X	X	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	Habitats include prairie hillsides and canyon bottoms, woodland edges, vacant city lots, residential yards, and abandoned trash dumps, in moist situations that may or may not be close to a body of water or wetland; in daytime, this snake can be found under rocks, logs, trash, and other cover.
Rough Earth Snake	*Virginia striatula*	X	X	GR	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitats include rocky hillsides of dry open woods, limestone and sandstone cedar glades, woodland edge, mesic woodland and grassland, pastures, thickly wooded bottomlands, dry and mesic hammocks, pine flatwoods, wooded margins of streams in arid landscapes, swamp borders, gardens, and (often) vacant lots or woodlots in urban areas.
Western Earth Snake	*Virginia valeriae*	X	GR	GR	X	X	X	GR	BC, EPW, LU, NBP, NNAP, SPOS	Habitats include deciduous woods, exposed rocky slopes in mixed deciduous-pine associations, pine woodland, grassy slopes with rocks in areas of deciduous forest, mesic hammocks, moist woodland along floodplains, wooded areas around marshes and other damp places, rocky sparse woods and forest edge, old fields, vacant lots, and wooded or brushy residential areas.

Table 3. Reptilian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Texas Coral Snake	*Micrurus tener*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	In Texas, habitats include rocky creek banks and canyons of oak-juniper brakes, live oak woodland, thornbrush chaparral of the coastal plain, sandy grass/mesquite, Cross Timbers woodland/thickets, and pine-hardwood forest; also gardens, wooded lots, and undeveloped parklands in cities; habitat is generally partially wooded and has organic ground litter (Werler and Dixon 2000).
Copperhead	*Agkistrodon contortrix*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Found in or near deciduous forest in hilly situations, usually in the vicinity of rock outcrops; they occur also on floodplains and at edges of swamps in the south and in mesic situations near water in the arid west. Hibernation generally occurs in dens among rocks, or in caves, animal burrows, under objects, in hollow logs or stumps, or in similar sites. Usually in areas with abundant surface cover such as rocks, logs, stumps, or leaf litter.
Cottonmouth	*Agkistrodon piscivorus*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Occurs in a wide range of aquatic and wetland habitats: swamps, sloughs, delta bayous, bayheads, ponds and streams in pine flatwoods, pine-palmetto forest, offshore keys, marshes, river bottoms, lowland floodplains, tidal stream courses, dune and beach areas, clear upland brooks, drainage ditches in some southern cities, brackish waters, and sometimes salt marshes.
Western Diamondback Rattlesnake	*Crotalus atrox*	X	X	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitat encompasses arid and semiarid regions, from plains to mountains and from sandy flats to rocky uplands, including desert, grassland, shrubland, woodland, open pine forest, river bottoms, and coastal islands.
Timber Rattlesnake	*Crotalus horridus*	X			GR				BC, NBP, SPOS	Can be found in the wooded forests, as well as the well-vegetated lowlands. In Texas, it can be found associated along heavily vegetated riparian waterways found in the eastern part of the state.
Rock Rattlesnake	*Crotalus lepidus*	GR		X	GR	X	GR	X	BC, EPW, NBP, NNAP	Occurs mainly in rocky mountainous areas, including talus slopes, gorges, rimrock, limestone outcrops, and rocky streambeds, often in arid or semiarid areas vegetated with pine-oak, oak-juniper, pinyon pine, ponderosa pine, or agave-shrub; it also inhabits mesquite grasslands and rocky desert flats and canyons, as well as mixed boreal-tropical forest and tropical deciduous forest in Mexico.
Blacktail Rattlesnake	*Crotalus molossus*	X	GR	X	X	X	X	X	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes rocky areas (rock slides, outcrops, canyon slopes, areas near cliff, stream courses), with vegetation ranging from arid tropical scrub, tropical deciduous forest, mixed boreal-tropical forest, paloverde-cactus-thornbush associations, oak-grass savanna, and mesquite grasslands to chaparral and the pine-oak and pine-fir belts.

Table 3. Reptilian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Ecoregions of Occurrence[2]	Habitat Description[3]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina		
Massasauga	*Sistrurus catenatus*	GR	GR	GR	GR	GR	GR	GR	BC, EPW, LU, NBP, NNAP, SPOS	In Texas, this snake often occurs near moist microhabitats or sources of water (Werler and Dixon 2000).
American Alligator	*Alligator mississippiensis*	X			GR			GR	BC, NBP, NNAP, SPOS	Inhabit fresh and brackish marshes, ponds, lakes, rivers, swamps, bayous, canals, and large spring runs.

1 - Source: Dixon, James. 2000. Amphibians and Reptiles of Texas, Second Edition. College Station: Texas A&M University Press.

X - Individual locality records of the species occurrence within the county based on records from museums or collections.

GR - General range of species occurrence within Texas, but no documented museum or collection records of occurrence for that species in the county.

? - Questionable county records. May represent errors in identification, erroneous locality data, and/or an escaped pet that found its way into a museum or collection.

2 - Ecoregions of Occurrence - BC: Balcones Canyonlands; EPW: Edwards Plateau Woodland; LU: Llano Uplift; NBP: Northern Blackland Prairie; NNAP: Northern Nueces Alluvial Plains; SPOS: Southern Post Oak Savanna

3 - Source: NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed March 3, 2011.

Additional citations used in NatureServe description also included and are as follows:

Axtell, R. W. 1983. Holbrookia propinqua. Cat. Am. Amph. Rep. 341.1-341.2.
Bartlett, R. D., and P. P. Bartlett. 1999. A field guide to Texas reptiles & amphibians. Gulf Publishing Company, Houston, Texas. xviii + 331 pp.
Garrett, J. M., and D. G. Barker. 1987. A Field Guide to Reptiles and Amphibians of Texas. Texas Monthly Press, Austin, Texas. 225 pp.
Stebbins, R. C. 2003. A field guide to western reptiles and amphibians. Third edition. Houghton Mifflin Company, Boston.
Tennant, A. 1984. The Snakes of Texas. Texas Monthly Press, Austin, Texas. 561 pp.
Werler, J. E., and J. R. Dixon. 2000. Texas snakes: identification, distribution, and natural history. University of Texas Press, Austin. xv + 437 pp.

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Black-bellied Whistling-Duck	*Dendrocygna autumnalis*	Y			Y			Y	Uncommon to locally common	NBP, NNAP, SPOS	Freshwater and brackish marshes, lagoons, and borders of ponds and streams; often forages in cultivated fields (AOU 1983); wet pastures (NatureServe 2010).
Greater White-fronted Goose	*Anser albifrons*	W	M	M	M	M	M	W	Common	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter, inhabits wetlands, grainfields, grassy fields, marshes, lakes and ponds (NatureServe 2010).
Snow Goose	*Chen caerulescens*	M	M	M	M	M	M	W	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Winters in both freshwater and coastal wetlands, wet prairies and extensive sandbars, foraging also in pastures, cultivated lands and flooded fields (AOU 1983).
Ross's Goose	*Chen rossii*	M	M	M	M	M	M	M	Uncommon, but increasing	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter mainly in marshy lakes, wet prairies, foraging in grassy areas, pastures and cultivated fields. Sometimes in coastal lakes, bays and river mouths (NatureServe 2010).
Canada Goose	*Branta canadensis*	W	W	W	W	W	W	W	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Various habitats near water, from temperate regions to tundra. In migration and winter, coastal and freshwater marshes, lakes, rivers, fields, etc. (NatureServe 2010).
Wood Duck	*Aix sponsa*	Y	Y	Y	Y	Y	Y	Y	Locally uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Quiet inland waters near woodland, such as wooded swamps, flooded forest, greentree reservoirs, ponds, marshes, and along streams. Winters on both freshwater and brackish marshes, ponds, streams, and estuaries (AOU 1983, Dugger and Fredrickson 1992, NatureServe 2010).
Gadwall	*Anas strepera*	W	W	W	W	W	W	W	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Lakes, ponds, rivers, marshes. Prefers freshwater but may be found on any open water during migration and winter (NatureServe 2010).
American Wigeon	*Anas americana*	W	W	W	W	W	W	W	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Large marshes and lakes; when not breeding, in both freshwater and brackish areas and foraging in marsh edges, sloughs and sheltered bays (AOU 1983, NatureServe 2010).
Mallard	*Anas platyrhynchos*	W	W	W	W	W	W	W	Common to locally abundant	BC, EPW, LU, NBP	Primarily shallow waters such as ponds, lakes, marshes, and flooded fields; in migration and in winter mostly in fresh water and cultivated fields, less commonly in brackish situations (AOU 1983, NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Blue-winged Teal	*Anas discors*	M	M	M	M	M	M	M	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Marshes, ponds, sloughs, lakes, and sluggish streams. In migration and when not breeding, in both freshwater and brackish situations (AOU 1983); prefers freshwater marshes, ponds, and sloughs, but occurs also in river pools, salt ponds, coastal lagoons, estuaries, and flooded pastures (Gammonley and Fredrickson 1995, NatureServe 2010).
Cinnamon Teal	*Anas cyanoptera*	W	W	W	W	W	W	W	Common	BC, EPW, LU, NBP, NNAP, SPOS	Shallow lake margins, reed beds, ponds, lagoons, sluggish streams and marshes, primarily in freshwater but found in winter occasionally in marine situations (Tropical to Temperate zones) (AOU 1983, NatureServe 2010).
Northern Shoveler	*Anas clypeata*	W	W	W	W	W	W	W	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter in both freshwater and brackish habitats, and in cultivated fields (not typical) (AOU 1983, NatureServe 2010).
Northern Pintail	*Anas acuta*	W	W	W	W	W	W	W	Locally common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter in both fresh-water and brackish situations (AOU 1983, NatureServe 2010).
Green-winged Teal	*Anas crecca*	W	W	W	W	W	W	W	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Freshwater ponds, marshes, shallow edges of lakes; also, in migration and winter, shallow salt and brackish water and shores (NatureServe 2010).
Canvasback	*Aythya valisineria*	W	W	W	W	W	W	W	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Marshes, ponds, lakes, rivers and bays. Winters on deep, freshwater lakes and rivers as well as on sheltered bays and estuaries (AOU 1983, NatureServe 2010).
Redhead	*Aythya americana*	W	W	W	W	W	W	W	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Large marshes, lakes, lagoons, rivers and bays, wintering mostly in brackish and marine lagoons and bays, less frequently in inland fresh-water situations (AOU 1983, NatureServe 2010).
Ring-necked Duck	*Aythya collaris*	W	W	W	W	W	W	W	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Marshes, lakes, rivers, swamps, especially in wooded areas. Winters primarily on freshwater and brackish situations of larger lakes, rivers, and estuaries (AOU 1983, NatureServe 2010).
Greater Scaup	*Aythya marila*	W	W	W	W	W	W	W	Rare to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter, found in bays, estuaries, and large open inland lakes and rivers (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Lesser Scaup	*Aythya affinis*	W	W	W	W	W	W	W	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	During migration and when not breeding, found along coast in sheltered bays, estuaries, and marshes or inland on lakes, ponds, and rivers; on salt water especially if lakes and ponds frozen. In southern winter range, prefers freshwater ponds, lakes, and sloughs with reasonably clear water 1 m or more deep (NatureServe 2010).
Bufflehead	*Bucephala albeola*	W	W	W	W	W	W	W	Common	BC, EPW, LU, NBP, NNAP, SPOS	Wintering on sheltered bays and estuaries as well as open freshwater situations (AOU 1983, NatureServe 2010).
Common Goldeneye	*Bucephala clangula*	W	W	W	W	W	W	W	Uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	Ponds, lakes, rivers and coastal bays, wintering primarily in bays and estuaries, less commonly on rivers and lakes (AOU 1983, NatureServe 2010).
Hooded Merganser	*Lophodytes cucullatus*	W	W	W	W	W	W	W	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Streams, lakes, swamps, marshes, and estuaries; winters mostly in freshwater but also regularly in estuaries and sheltered bays (AOU 1983, NatureServe 2010).
Ruddy Duck	*Oxyura jamaicensis*	W	W	W	W	W	W	W	Common	BC, EPW, LU, NBP, NNAP, SPOS	Marshes, lakes and coastal areas; when not breeding, on sheltered brackish and marine coastal areas as well as lakes and rivers (Temperate Zone) (AOU 1983, NatureServe 2010).
Scaled Quail	*Callipepla squamata*							Y	Uncommon to locally common	NNAP	Preferred habitat is arid-semiarid, mixed shrub-grassland (NatureServe 2010).
Northern Bobwhite	*Colinus virginianus*	Y	Y	Y	Y	Y	Y	Y	Locally uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits a wide variety of vegetation types, particularly early successional stages. Occurs in croplands, grasslands, pastures, fallow fields, grass-brush rangelands, open pinelands, open mixed pine-hardwood forests, and habitat mosaics (Brennan 1999, NatureServe 2010).
Wild Turkey	*Meleagris gallopavo*	Y	Y	Y	Y	Y	Y	Y	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Forest and open woodland, scrub oak, deciduous or mixed deciduous-coniferous areas, especially in mountainous regions (Subtropical and Temperate zones) (AOU 1983, NatureServe 2010).
Common Loon	*Gavia immer*	W	W	W	W	W	W	W	Uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	In winter and during migration, common loons use inland lakes and rivers and marine and estuarine coastal waters. Most non-breeding subadults apparently remain in coastal areas during breeding season (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Least Grebe	*Tachybaptus dominicus*	Y							Uncommon to locally common	SPOS	Freshwater lakes, streams, ponds, lagoons, marshes, and temporary bodies of water, generally in sluggish or quiet situations. Often in intermittent ponds and roadside ditches in north. Small intermittent ponds and roadside ditches and canals. (NatureServe 2010)
Pied-billed Grebe	*Podilymbus podiceps*	Y/W	W	W	W	W	W	W	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Occurs in ponds, sloughs, and marshes, in marshy inlets and along edges of rivers, lakes, and reservoirs, and occasionally in estuarine wetlands (NatureServe 2010).
Horned Grebe	*Podiceps auritus*	W	W	W	W	W	W	W	Rare to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Marshes, ponds and lakes, occasionally along sluggish streams (breeding); bays, estuaries and seacoasts, and in migration commonly in inland freshwater habitats, especially lakes and rivers (non-breeding) (AOU 1983, NatureServe 2010).
Eared Grebe	*Podiceps nigricollis*	W	W	W	W	W	W	W	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Marshes, ponds and lakes; in migration and winter also salt lakes, bays, estuaries and seacoasts (AOU 1983, NatureServe 2010).
Neotropic Cormorant	*Phalacrocorax brasilianus*	Y	S					Y	Uncommon to common	BC, NBP, NNAP, SPOS	Rivers, lakes, marshes, and seacoasts (NatureServe 2010).
Double-crested Cormorant	*Phalacrocorax auritus*	W	W	W	W	W	W	W	Uncommon to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Lakes, ponds, rivers, lagoons, swamps, coastal bays, marine islands, and seacoasts; usually within sight of land. Nests on the ground or in trees in freshwater situations, and on coastal cliffs (usually high sloping areas with good visibility) (NatureServe 2010).
Anhinga	*Anhinga anhinga*	Y						Y	Rare to locally uncommon	NBP, NNAP, SPOS	Freshwater swamps, lakes, and sluggish streams at low elevations and, in tropical regions, primarily around brackish lagoons and in mangroves (AOU 1983, NatureServe 2010).
American White Pelican	*Pelecanus erythrorhynchos*	W	W	W	W	W	W	W	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes rivers, lakes, reservoirs, estuaries, bays, and open marshes, sometimes inshore marine habitats (NatureServe 2010).
Great Blue Heron	*Ardea herodias*	Y	Y	Y	Y	Y	Y	Y	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Freshwater and brackish marshes, along lakes, rivers, bays, lagoons, ocean beaches, mangroves, fields, and meadows. Nests commonly high in trees in swamps and forested areas, less commonly in bushes, or on ground, rock ledges, and coastal cliffs (NatureServe 2010).
Great Egret	*Ardea alba*	Y	Y	Y	Y	Y	Y	Y	Common	BC, EPW, LU, NBP, NNAP, SPOS	Marshes, swampy woods, tidal estuaries, lagoons, mangroves, streams, lakes, and ponds; also fields and meadows (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Snowy Egret	*Egretta thula*	S	M	M	S	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Marshes, lakes, ponds, lagoons, mangroves, and shallow coastal habitats (NatureServe 2010).
Little Blue Heron	*Egretta caerulea*	S			S				Common	NBP, SPOS	Marshes, ponds, lakes, meadows, mudflats, lagoons, streams, mangrove lagoons, and other bodies of calm shallow water; primarily in freshwater habitats (NatureServe 2010).
Cattle Egret	*Bubulcus ibis*	S	S	S	S	S	S	S	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Wet pastureland and marshes, fresh water and brackish situations, dry fields, agricultural areas (especially irrigated ones), garbage dumps (NatureServe 2010).
Green Heron	*Butorides virescens*	S	S	S	S	S	S	S	Common	BC, EPW, LU, NBP, NNAP, SPOS	Swamps, mangroves, marshes, and margins of ponds, rivers, lakes, and lagoons. Eggs are laid in platform nest in tree, thicket, or bush over water or sometimes in dry woodland or orchard; nests in both freshwater and brackish situations (NatureServe 2010).
Black-crowned Night-Heron	*Nycticorax nycticorax*	Y	Y	Y	Y	Y	Y	Y	Common	BC, EPW, LU, NBP, NNAP, SPOS	Marshes, swamps, wooded streams, mangroves, shores of lakes, ponds, lagoons; salt water, brackish, and freshwater situations. Roosts by day in mangroves or swampy woodland (NatureServe 2010).
Yellow-crowned Night-Heron	*Nyctanassa violacea*	S	S		S		S		Uncommon to locally common	BC, EPW, LU, NBP, SPOS	Marshes, swamps, lakes, lagoons, and mangroves; chiefly coastal. . Along U.S. Gulf Coast from Alabama to Texas, seems to prefer inland freshwater habitats and riverine swamps for nesting (Spendelow and Patton 1988, NatureServe 2010).
White Ibis	*Eudocimus albus*	S							Common to abundant	NBP, SPOS	Various salt water and freshwater habitats: marshes, mangroves, lagoons, lakes, marsh prairie, pasture, coastal swamps (AOU 1983, Kushlan 1979, NatureServe 2010).
White-faced Ibis	*Plegadis chihi*	M	M	M	M	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Marshes, swamps, ponds and rivers, mostly in freshwater habitats (Tropical to Temperate zones) (AOU 1983, NatureServe 2010).
Black Vulture	*Coragyps atratus*	Y	Y	Y	Y	Y	Y	Y	Common to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Nearly ubiquitous except in heavily forested regions; more common in lowland than in highland habitats. More abundant toward the coast in eastern North America (NatureServe 2010).
Turkey Vulture	*Cathartes aura*	Y	Y	Y	Y	Y	Y	Y	Common to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Forested and open situations, more commonly in the latter, from lowlands to mountains (AOU 1983, NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Osprey	*Pandion haliaetus*	W	W	W	W	W	W	W	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Ospreys occur primarily along rivers, lakes, reservoirs, and seacoasts. They often cross land between bodies of water (NatureServe 2010).
Mississippi Kite	*Ictinia mississippiensis*	M	M	M	M	M	M	M	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Tall forest, open woodland, prairie, semiarid rangeland, shelterbelts, wooded areas bordering lakes and streams in more open regions, scrubby oaks and mesquite, and lowland/floodplain forests (NatureServe 2010).
Bald Eagle	*Haliaeetus leucocephalus*	W	W	W	W	W	W	W	Rare to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Breeding habitat most commonly includes areas close to (within 4km) coastal areas, bays, rivers, lakes, or other bodies of water that reflect the general availability of primary food sources including fish, waterfowl, and seabirds. Preferentially roosts in conifers or other sheltered sites in winter in some areas; typically selects the larger, more accessible trees. Wintering areas are commonly associated with open water though in some areas eagles use habitats with little or no open water if other food resources (e.g. rabbit or deer carrion) are readily available (NatureServe 2010).
Northern Harrier	*Circus cyaneus*	W	W	W	W	W	W	W	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Habitats used by harriers during the non-breeding season in both coastal and inland areas include agricultural fields (croplands, hayfields, and pastures), abandoned fields, and freshwater wetlands (NatureServe 2010).
Sharp-shinned Hawk	*Accipiter striatus*	W	W	W	W	W	W	W	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Forest and open woodland, coniferous, mixed, or deciduous, primarily in coniferous in more northern and mountainous portion of range (AOU 1983, NatureServe 2010).
Cooper's Hawk	*Accipiter cooperii*	Y	Y	Y	Y	Y	Y	Y	Uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	Generally is an inhabitant of deep woods, utilizing thick cover both for nesting and hunting. Openings, especially where hedgerows or windbreaks offer shelter for prey species, may also be used when foraging (NatureServe 2010).
Harris's Hawk	*Parabuteo unicinctus*	Y						Y	Common to uncommon	NBP, NNAP, SPOS	Mainly savanna, open woodland, and semidesert, especially vicinity of marshes, swamps, and large bodies of water (AOU 1983); also near small water sources such as man-made cattle-watering ponds and catchments. River woodland, mesquite forest, saguaro-paloverde desert, brushy flatlands (Harrison 1979, NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Red-shouldered Hawk	*Buteo lineatus*	Y	Y	Y	Y	Y	Y	Y	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Breeding: varies from bottomland hardwoods and riparian areas to upland deciduous or mixed deciduous-conifer forest. Non-breeding: less restricted than that used for breeding; favors lowland areas near water, either standing or running, including river valleys, swamps, marshes, and perhaps canyon bottoms, and level, open country with scattered large trees (NatureServe 2010).
Broad-winged Hawk	*Buteo platypterus*	M			M				Common to abundant	BC, NBP, NNAP, SPOS	Migrates along ridges, river valleys, and shorelines. In winter, may perch and feed along heavily traveled highways (NatureServe 2010).
Short-tailed Hawk	*Buteo brachyurus*				X	X			Accidental	BC, EPW, NBP	This species occurs in a wide range of habitats. Generally it occupies open country, from mangrove and cypress swamps to open pine-oak woodland, avoiding heavily forested situations (AOU 1983). It is most common in mixed woodland-savanna habitats (NatureServe 2010).
Swainson's Hawk	*Buteo swainsoni*	M	M	M	M	M	M	M	Common to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Savanna, open pine-oak woodland and cultivated lands (e.g., alfalfa and other hay crops, and certain grain and row croplands) with scattered trees. In migration and winter also in grasslands and other open country (AOU 1983, NatureServe 2010).
Zone-tailed Hawk	*Buteo albonotatus*		S	S		S	S	S	Uncommon to local	BC, EPW, LU	Arid open country, especially open deciduous or pine-oak woodland (AOU 1983). Mesa and mountain country, often near watercourses. Wooded canyons and tree-lined rivers along middle slopes of desert mountains (NatureServe 2010).
Red-tailed Hawk	*Buteo jamaicensis*	Y	Y	Y	Y	Y	Y	Y	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Wide variety of open woodland and open country with scattered trees, rarely in denser forest (AOU 1983, NatureServe 2010).
Ferruginous Hawk	*Buteo regalis*	W	W	W	W	W	W	W	Common to locally uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Open country, primarily prairies, plains and badlands; sagebrush, saltbush-greasewood shrubland, periphery of pinyon-juniper and other woodland, desert (NatureServe 2010).
Rough-legged Hawk	*Buteo lagopus*		W						Uncommon to rare	BC, EPW, LU	Non-breeding: grasslands, field, marshes, sagebrush flats, and open cultivated areas; sometimes rat-infested garbage dumps (NatureServe 2010).
Golden Eagle	*Aquila chrysaetos*					W			Rare to locally uncommon	BC, EPW	Generally open country, in prairies, arctic and alpine tundra, open wooded country, and barren areas, especially in hilly or mountainous regions (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Crested Caracara	*Caracara cheriway*	Y		Y	Y			Y	Uncommon to common	BC, NBP, NNAP, SPOS	Open country, including pastureland, cultivated areas, and semi-desert, in both arid and moist habitats but more commonly in the former (AOU 1983); also coastal lowlands and beaches in some areas. Often occurs on the ground in company of vultures (National Geographic Society 1983, NatureServe 2010).
American Kestrel	*Falco sparverius*	W	W	W	W	W	W	W	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Open or partly open habitat; prairies, deserts, wooded streams, burned forest, cultivated lands and farmland with scattered trees, open woodland, along roads, sometimes in cities (NatureServe 2010).
Merlin	*Falco columbarius*	W	W	W	W	W	W	W	Rare to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	A wide variety of habitats including marshes, deserts, seacoasts, near coastal lakes and lagoons, open woodlands, fields, etc. May roost in conifers in winter (NatureServe 2010).
Peregrine Falcon	*Falco peregrinus*	M	M	M	M	M	M	M	Uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	Various open situations from tundra, moorlands, steppe, and seacoasts, especially where there are suitable nesting cliffs, to mountains, open forested regions, and human population centers (AOU 1983). When not breeding, occurs in areas where prey concentrate, including farmlands, marshes, lakeshores, river mouths, tidal flats, dunes and beaches, broad river valleys, cities, and airports (NatureServe 2010).
Prairie Falcon	*Falco mexicanus*	W	W	W	W	W	W	W	Rare to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	During winter, falcons use a number of other habitats that are not typical of those used during the breeding season. Dryland wheat fields, irrigated winter wheat and other irrigated croplands also are used for foraging in winter (NatureServe 2010).
Virginia Rail	*Rallus limicola*	M	M	M	M	M	M	M	Uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Freshwater and occasionally brackish marshes, mostly in cattails, reeds, and deep grasses (AOU 1983), also in or close to other emergent vegetation. Inhabits shallow, freshwater, emergent wetlands of every size and type, from roadside ditches and borders of lakes and streams to large cattail marshes (NatureServe 2010).
Sora	*Porzana carolina*	W	W	W	W	W	W	W	Rare to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Primarily shallow freshwater emergent wetlands (e.g., marshes of cattail, sedge, blue-joint, or bulrush), less frequently in bogs, fens, wet meadows, and flooded fields, sometimes foraging on open mudflats adjacent to marshy habitat. Also occurs locally in swamps, along slough borders, and in mangroves (NatureServe 2010).

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		Distribution within SEP-HCP Plan Area[1]									
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Common Moorhen	*Gallinula chloropus*	Y	S	S	Y	S	S	S	Uncommon to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Freshwater marshes, canals, quiet rivers, lakes, ponds, mangroves, primarily in areas of emergent vegetation and grassy borders. Nests usually among marsh plants over water, occasionally in shrub in or near water. Builds nest like platforms on which to brood young (NatureServe 2010).
American Coot	*Fulica americana*	Y	Y	Y	Y	Y	Y	Y	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Freshwater lakes, ponds, marshes, and larger rivers, wintering also on brackish estuaries and bays. Also on land bordering these habitats. Calm open water with plenty of algae and other aquatic vegetation (NatureServe 2010).
Sandhill Crane	*Grus canadensis*	W	M	M	W	M	M	W	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: roost at night in shallow water along river channels, on alluvial islands of braided rivers, or in natural basin wetlands. A communal roost site consisting of an open expanse of shallow water is a key feature of wintering habitat (NatureServe 2010).
Whooping Crane	*Grus americana*		M						Rare	BC, EPW, LU, NBP, SPOS	Habitat during migration and winter includes marshes, shallow lakes, lagoons, salt flats, grain and stubble fields, and barrier islands (AOU 1983, NatureServe 2010).
Black-bellied Plover	*Pluvialis squatarola*	M	M	M	M	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Mudflats, beaches, salinas, wet savanna, shores of ponds and lakes, wet meadows, flooded fields; sometimes mangroves or rocky shores (NatureServe 2010).
American Golden-Plover	*Pluvialis dominica*	M	M		M				Very rare to common	BC, EPW, LU, NBP, SPOS	Nonbreeding: short grasslands, pastures, golf courses, mudflats, sandy beaches, and flooded fields (AOU 1983, NatureServe 2010).
Snowy Plover	*Charadrius alexandrinus*	M	M	M	M	M	M	M	Very rare to casual	BC, EPW, LU, NBP, NNAP, SPOS	Primarily coastal areas, such as beaches, flats, lagoons, and salt-evaporation ponds; but also inland at wastewater ponds and saline lakes (Page et al. 1995, NatureServe 2010).
Semipalmated Plover	*Charadrius semipalmatus*	M	M	M	M	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Nonbreeding: mudflats, shallow marshes, beaches, flooded fields, salinas, shores of river mouths, and shores of lakes and ponds (AOU 1983). Use of freshwater habitats occurs mostly during migration (NatureServe 2010).
Piping Plover	*Charadrius melodus*	M							Very rare to casual	NBP, SPOS	Sandy upper beaches, especially where scattered grass tufts are present, and sparsely vegetated shores and islands of shallow lakes, ponds, rivers, and impoundments (NatureServe 2010).

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Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina			
Killdeer	*Charadrius vociferus*	Y	Y	Y	Y	Y	Y	Y	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes various open areas such as fields, meadows, lawns, pastures, mudflats, and shores of lakes, ponds, rivers, and seacoasts (AOU 1983). Nests are on the ground in open dry or gravelly situations, sometimes in similar situations on roofs, driveways, etc. (NatureServe 2010).
Mountain Plover	*Charadrius montanus*	M	M	M	M	M	M	M	Rare	BC, EPW, LU, NBP, NNAP, SPOS	Preferred winter habitat consists of short-grass plains and fields, plowed fields, and sandy deserts (AOU 1983, NatureServe 2010).
Black-necked Stilt	*Himantopus mexicanus*	S	M	M	M	M	M	M	Rare to common	BC, EPW, LU, NBP, NNAP, SPOS	Shallow salt or fresh water with soft muddy bottom; grassy marshes, wet savanna, mudflats, shallow ponds, flooded fields, borders of salt ponds and mangrove swamps (Tropical to Temperate zones) (AOU 1983, NatureServe 2010).
American Avocet	*Recurvirostra americana*	M	M	M	M	M	M	M	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Lowland marshes, mudflats, ponds, alkaline lakes, and estuaries (AOU 1983, NatureServe 2010).
Northern Jacana	*Jacana spinosa*	X				X			Very rare	BC, EPW, NBP	Found in marshes, flooded fields, and slow-moving waters (NatureServe 2010).
Lesser Yellowlegs	*Tringa flavipes*	M	M	M	M	M	M	M	Common	BC, EPW, LU, NBP, NNAP, SPOS	Nonbreeding: marshes, ponds, wet meadows, lakes and mudflats (AOU 1983), coastal Salinas (NatureServe 2010).
Greater Yellowlegs	*Tringa melanoleuca*	W	W	W	W	W	W	W	Rare to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Nonbreeding: marshes, ponds, lakes, stream margins and sand and gravel bars, lagoons, salinas, and coastal mudflats (AOU 1983, NatureServe 2010).
Willet	*Tringa semipalmata*	M	M	M	M	M	M	M	Rare to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Marshes, tidal mudflats, beaches, lake margins, mangroves, tidal channels, river mouths, coastal lagoons, sandy or rocky shores, and, less frequently, open grassland (AOU 1983, NatureServe 2010).
Solitary Sandpiper	*Tringa solitaria*	M	M	M	M	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Freshwater ponds, stream edges, temporary pools, flooded ditches and fields, more commonly in wooded regions, less frequently on mudflats and open marshes (AOU 1983); favors areas where vegetation extends to water's edge (NatureServe 2010).
Spotted Sandpiper	*Actitis macularius*	W	W	W	W	W	W	W	Common	BC, EPW, LU, NBP, NNAP, SPOS	Seacoasts and shores of lakes, ponds, and streams, sometimes in marshes; prefer shores with rocks, wood, or debris (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina			
Upland Sandpiper	*Bartramia longicauda*	M	M	M	M	M	M	M	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Restricted primarily to extensive, open tracts of short grassland habitat. Nest in native prairie, dry meadows, pastures, domestic hayfields, short-grass savanna, plowed fields, along highway rights-of-way and on airfields, and (in the north) peat lands and scattered woodlands near timberline. Very rarely in migration along shores and mudflats (AOU 1983, NatureServe 2010).
Eskimo Curlew	*Numenius borealis*						X		Rare	BC	Grasslands, pastures, plowed fields, and less frequently, marshes and mudflats (AOU 1983). Favored headlands and hills within a few kilometers of the sea. Burned over prairies and marshes particularly attractive during migration. Roosted on beaches along coast but rarely found near water in midwestern states (Gollop et al. 1986, NatureServe 2010).
Whimbrel	*Numenius phaeopus*	M							Uncommon to rare	NBP, SPOS	Beaches, tidal mudflats, marshes, estuaries, edges of tidal creeks, sandy or rocky shores, flooded fields and pastures (AOU 1983, NatureServe 2010).
Long-billed Curlew	*Numenius americanus*	W	M	M	M	M	M	M	Uncommon	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter occurring also on beaches and mudflats (AOU 1983, NatureServe 2010).
Hudsonian Godwit	*Limosa haemastica*	M							Uncommon to rare	NBP, SPOS	Marshes, beaches, flooded fields, and tidal mudflats (AOU 1983); lake and pond shores, inlets (NatureServe 2010).
Marbled Godwit	*Limosa fedoa*	M	M	M	M	M	M	M	Rare to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Marshes and flooded plains; in migration and when not breeding also on mudflats and beaches (AOU 1983) and open shallow water along shorelines (NatureServe 2010).
Ruddy Turnstone	*Arenaria interpres*	M							Rare to common	NBP, SPOS	Non-breeding: rocky, barren pebbly coasts, sandy beaches, mud flats, river mouths, tidal creeks, and shores of lakes (AOU 1983); fields (NatureServe 2010).
Sanderling	*Calidris alba*	M	M	M	M	M	M	M	Rare to locally uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: primarily sandy beaches, less frequently on mud flats and shores of lakes or rivers (AOU 1983, NatureServe 2010).
Semipalmated Sandpiper	*Calidris pusilla*	M	M	M	M	M	M	M	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: mudflats, sandy beaches, shores of lakes and ponds, and wet meadows (AOU 1983, NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Western Sandpiper	*Calidris mauri*	M	M	M	M	M	M	M	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: mudflats, beaches, shores of lakes and ponds, shallow lagoons, artificial salt ponds, and flooded fields; various coastal habitats with flat or gently sloping muddy, sandy, or gravelly shores; less often inland at pond edges, rain pools, wet fields (NatureServe 2010).
Least Sandpiper	*Calidris minutilla*	W	W	W	W	W	W	W	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: wet meadows, mudflats, flooded fields, shores of pools and lakes, narrow channels, edge of salt marsh, river sandbars, sometimes sandy beaches (NatureServe 2010).
White-rumped Sandpiper	*Calidris fuscicollis*	M	M	M	M	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: grassy marshes, mudflats, sandy beaches, flooded fields, and shores of ponds and lakes (AOU 1983, NatureServe 2010).
Baird's Sandpiper	*Calidris bairdii*	M	M	M	M	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: mudflats, estuaries, grassy marshes, and dry grassy areas near lakes and ponds, rarely dry pastures and prairies away from water (AOU 1983); prefers grassy margins of ponds, marshes, and wet pastures (NatureServe 2010).
Pectoral Sandpiper	*Calidris melanotos*	M	M	M	M	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: wet meadows, mudflats, flooded fields and golf courses, and shores of ponds and pools. Also found in grassy marshes and salt meadows, shores of lakes and rivers (NatureServe 2010).
Sharp-tailed Sandpiper	*Calidris acuminata*	X							Accidental	BC, NBP, SPOS	Non-breeding: wet grassy areas, marshes, flooded fields, freshwater and tidal mudflats, shores of lakes and ponds (AOU 1983, NatureServe 2010).
Dunlin	*Calidris alpina*	M	M	M	M	M	M	M	Rare to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: mudflats, estuaries, marshes, flooded fields, sandy or gravelly beaches, and shores of lakes, ponds, and sloughs (AOU 1983, NatureServe 2010).
Curlew Sandpiper	*Calidris ferruginea*	X							Rare	BC, NBP, SPOS	Non-breeding: mudflats, marshes, beaches (AOU 1983); prefers muddy, poorly vegetated wetland fringes both inland and coastal (NatureServe 2010).
Stilt Sandpiper	*Calidris himantopus*	M	M	M	M	M	M	M	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: mudflats, flooded fields, shallow ponds and pools, and marshes (AOU 1983, NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Buff-breasted Sandpiper	*Tryngites subruficollis*	M							Rare to uncommon	NBP, SPOS	Frequents short grass plains and dry uplands. Have been observed in man-altered habitats such as sod fields, airport runways, golf courses, cemeteries, burnt-over grasslands, cotton fields, recently ploughed fields, newly planted rice fields, flat, hard, sun-baked stubble, and barren recently inundated land (NatureServe 2010).
Ruff	*Philomachus pugnax*	X							Very rare	BC, NBP, SPOS	Grassy tundra, along shores of lakes and ponds, in swampy meadows and marshes, and rarely in hayfields. Nonbreeding: also mudflats and flooded fields (AOU 1983), salt ponds (NatureServe 2010).
Short-billed Dowitcher	*Limnodromus griseus*	M							Uncommon to rare	NBP, SPOS	Non-breeding: mudflats, estuaries, shallow marshes, pools, ponds, flooded fields and sandy beaches (AOU 1983). Prefers shallow salt water with soft muddy bottom, but visits various wetlands during migration (NatureServe 2010).
Long-billed Dowitcher	*Limnodromus scolopaceus*	M	M	M	M	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: marshes, shores of ponds and lakes, mudflats and flooded fields, primarily in freshwater situations (AOU 1983, NatureServe 2010).
Wilson's Snipe	*Gallinago delicata*	W	W	W	W	W	W	W	Common	BC, EPW, LU, NBP, NNAP, SPOS	Wet grassy or marshy areas from tundra to temperate lowlands and hilly regions. Non-breeding: wet meadows, flooded fields, bogs, swamps, moorlands, and marshy banks of rivers and lakes (NatureServe 2010).
American Woodcock	*Scolopax minor*		W		W				Rare to locally common	BC, EPW, LU	Winter habitats range from bottomland hardwoods to upland pine stands, young pine plantations, and mature pine-hardwoods, though in some pine habitats the birds tend to focus their activities in lowlands dominated by hardwoods (Roberts 1993); generally occupy moist thickets in daytime, and sometimes shift to more open habitats such as pastures, fields (including agricultural), and young clearcuts at night (NatureServe 2010).
Wilson's Phalarope	*Phalaropus tricolor*	M	M	M	M	M	M	M	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: on lake shores, mudflats, salt marshes, freshwater marshes, alkaline ponds; rarely along seacoasts; stages on salt lakes (Colwell and Jehl 1994, AOU 1998, NatureServe 2010).
Red Phalarope	*Phalaropus fulicarius*	X							Very rare; accidental	BC, NBP, SPOS	Occurring in migration on bays and estuaries, rarely on ponds, lakes and marshes; mainly in plankton-rich upwelling zones (NatureServe 2010).
Black-legged Kittiwake	*Rissa tridactyla*	W							Rare	BC, SPOS	Primarily pelagic, sometimes along seacoasts, bays and estuaries, casually on large inland bodies of water (AOU 1983, NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Sabine's Gull	*Xema sabini*	M	M	M	M	M	M	M	Rare	BC, EPW, LU, NBP, NNAP, SPOS	Primarily pelagic, casually along coasts or in inland waters (AOU 1983, NatureServe 2010).
Bonaparte's Gull	*Chroicocephalus philadelphia*	W	W	W	W	W	W	W	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Along seacoasts, bays and harbors, estuaries, mudflats, marshes, rivers, lakes, ponds, and flooded fields (NatureServe 2010).
Little Gull	*Hydrocoloeus minutus*	X							Very rare	BC, SPOS	Seacoasts, bays, estuaries, rivers, lakes, ponds, marshes, and flooded fields (AOU 1983, NatureServe 2010).
Franklin's Gull	*Leucophaeus pipixcan*	M	M	M	M	M	M	M	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Seacoasts, bays, estuaries, lakes, rivers, marshes, ponds and irrigated fields (AOU 1983); mudflats (NatureServe 2010).
Mew Gull	*Larus canus*	X							Very rare	BC, SPOS	Seacoasts, beaches, bays, and mudflats (AOU 1983, NatureServe 2010).
Ring-billed Gull	*Larus delawarensis*	W	M	M	W	M	M	M	Common	BC, EPW, LU, NBP, NNAP, SPOS	Seacoasts, bays, estuaries, rivers, lakes, ponds, irrigated fields and plowed lands, cities, dumps. Nests rocky, sandy, and grassy islets or isolated shores, occasionally on marshy lands, often with other water birds; mainly at inland lakes (NatureServe 2010).
Herring Gull	*Larus argentatus*	W	W	M	W	M	W	M	Common	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: Seacoasts, bays, estuaries, lakes, rivers, dumps. Breeding: along rocky and sandy coasts, on tundra, on islands in larger lakes and rivers, or on sea cliffs (NatureServe 2010).
Thayer's Gull	*Larus thayeri*	X							Rare to very rare	BC, NBP	Seacoasts, estuaries, bays, and dumps, less commonly on large inland lakes and rivers (AOU 1983, NatureServe 2010).
Least Tern	*Sternula antillarum*	M			M				Uncommon to rare	BC, NBP, SPOS	Seacoasts, beaches, bays, estuaries, lagoons, lakes, and rivers (AOU 1983, NatureServe 2010).
Caspian Tern	*Hydroprogne caspia*	M							Rare to uncommon	BC, NBP, SPOS	Seacoasts, bays, estuaries, lakes, marshes, and rivers (NatureServe 2010).
Black Tern	*Chlidonias niger*	M	M	M	M	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: pelagic waters as well as seacoasts, bays, estuaries, lagoons, lakes, reservoirs, and rivers (NatureServe 2010).
Common Tern	*Sterna hirundo*	M							Rare to casual	BC, NBP, SPOS	Seacoasts, estuaries, bays, lakes, rivers, and marshes (NatureServe 2010).

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Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina			
Forster's Tern	*Sterna forsteri*	W	W	W	W	W	W	W	Locally common	BC, EPW, LU, NBP, NNAP, SPOS	Freshwater and salt marshes, in migration and winter also seacoasts, bays, estuaries, rivers and lakes (AOU 1983, NatureServe 2010).
Pomarine Jaeger	*Stercorarius pomarinus*	M	M	M	M	M	M	M	Rare to very rare	BC, EPW, LU, NBP, NNAP, SPOS	Primarily pelagic, less often in bays and harbors, casually on large inland bodies of water (AOU 1983, NatureServe 2010).
Parasitic Jaeger	*Stercorarius parasiticus*	M	M	M	M	M	M	M	Very rare to casual	BC, EPW, LU, NBP, NNAP, SPOS	Mostly pelagic, less frequently along seacoasts, casually on large inland bodies of water (AOU 1983, NatureServe 2010).
Rock Pigeon*	*Columba livia*	Y	Y	Y	Y	Y	Y	Y	Common	BC, EPW, LU, NBP, NNAP, SPOS	In wild state along rocky seacoasts or inland in gorges, river valleys, caves, and desert oases. Feral birds occasionally in natural habitats, more abundantly near human settlement, especially in cities and around farms. Nests in cliff ledges, caves, building ledges, bridge structures, monuments, abandoned houses and barns, and in palm trees (e.g., West Indies) (NatureServe 2010).
Eurasian Collared-Dove*	*Streptopelia decaocto*	Y	Y	Y	Y	Y	Y	Y	Locally common	BC, EPW, LU, NBP, NNAP, SPOS	Open woodland to scrub and desert, and around human habitation (AOU 1989, NatureServe 2010).
White-winged Dove	*Zenaida asiatica*	Y	Y	Y	Y	Y	Y	Y	Common to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Generally arid regions with scrubby thickets or riverine forest, open cultivated lands with scattered trees, and mangroves (Tropical and Subtropical zones) (AOU 1983); mature citrus groves. Nests in tree, shrub, cactus, or vine (NatureServe 2010).
Mourning Dove	*Zenaida macroura*	Y	Y	Y	Y	Y	Y	Y	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Habitats include open woodland, forest edge, cultivated lands with scattered trees and bushes, parks and suburban areas, arid and desert country (generally near water), and second growth (Tropical to Temperate zones) (NatureServe 2010).
Inca Dove	*Columbina inca*	Y	Y	Y	Y	Y	Y	Y	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Open country with scattered trees or scrubby growth, most frequently in arid or semi-arid situations, and around cultivated areas, farmlands, parks and gardens (Tropical, less frequently Subtropical zones) (AOU 1983, NatureServe 2010).
Common Ground-Dove	*Columbina passerina*	Y	S	S	S	S	S	Y	Uncommon to locally common	BC, EPW, NBP, NNAP, SPOS	Prefers agricultural edges, orchards and sparse riparian vegetation. Ground-Doves are also found in orchards, brushy rangeland, and open woodlands. Also found in scrubby juniper-oak associations in the Trans-Pecos and on the Edwards Plateau (NatureServe 2010).

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		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Monk Parakeet *	*Myiopsitta monachus*	Y							Very locally common	BC, NBP, SPOS	Open woodland, savanna, arid scrubland, riverine forest, cultivated lands, and orchards, especially around human habitation (AOU 1983); palm groves (NatureServe 2010).
Yellow-billed Cuckoo	*Coccyzus americanus*	S	S	S	S	S	S	S	Common	BC, EPW, LU, NBP, NNAP, SPOS	Open woodland (especially where undergrowth is thick), parks, deciduous riparian woodland. Nests in deciduous woodlands, moist thickets, orchards, overgrown pastures; in tree, shrub, or vine, an average of 1-3 meters above ground (Harrison 1979, NatureServe 2010).
Black-billed Cuckoo	*Coccyzus erythrophthalmus*	M	M		M		M		Rare to very rare	BC, EPW, LU, NBP, SPOS	Forest edge and open woodland, both deciduous and coniferous, with dense deciduous thickets (AOU 1998, NatureServe 2010).
Greater Roadrunner	*Geococcyx californianus*	Y	Y	Y	Y	Y	Y	Y	Common to locally uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Desert scrub, chaparral, edges of cultivated lands, and arid open situations with scattered brush, locally in cedar glades and pine-oak woodland (Tropical and Subtropical zones) (AOU 1983, NatureServe 2010).
Groove-billed Ani	*Crotophaga sulcirostris*	S						S	Locally uncommon to rare	NBP, NNAP, SPOS	Open and partly open country, including scrub, thickets, cultivated lands, savanna, orchards, marshes, and second growth (NatureServe 2010).
Barn Owl	*Tyto alba*	Y	Y	Y	Y	Y	Y	Y	Rare to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Fields of dense grass. Open and partly open country (grassland, marsh, lightly grazed pasture, hayfields) in a wide variety of situations, often around human habitation (AOU 1983, NatureServe 2010).
Western Screech-Owl	*Megascops kennicottii*					Y			Common to uncommon	EPW	Woodland, especially broadleaf (e.g. oak) and riparian woodland, and scrub (Subtropical and Temperate zones) (AOU 1983, NatureServe 2010).
Eastern Screech-Owl	*Megascops asio*	Y	Y	Y	Y	Y	Y	Y	Common	BC, EPW, LU, NBP, NNAP, SPOS	Open woodland, deciduous forest, orchards, woodland/forest edge, swamps, parklands, residential areas in towns, scrub, and riparian woodland in drier regions (NatureServe 2010).
Great Horned Owl	*Bubo virginianus*	Y	Y	Y	Y	Y	Y	Y	Common	BC, EPW, LU, NBP, NNAP, SPOS	Various forested habitats, moist or arid, deciduous or evergreen lowland forest to open temperate woodland, including second-growth forest, swamps, orchards, riverine forest, brushy hillsides, and desert (NatureServe 2010).
Burrowing Owl	*Athene cunicularia*	W	W	W	W	W	W	W	Uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	Open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports (NatureServe 2010).

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		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Barred Owl	*Strix varia*	Y	Y		Y		Y	Y	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Dense woodland and forest (coniferous or hardwood), swamps, wooded river valleys, cabbage palm-live oak hammocks; often in areas bordering streams, marshes, and meadows (AOU 1983), but also commonly in upland areas (NatureServe 2010).
Short-eared Owl	*Asio flammeus*	W			W				Rare to locally uncommon	BC, NBP, SPOS	Broad expanses of open land with low vegetation for nesting and foraging are required. Habitat types frequently mentioned as suitable include fresh and saltwater marshes, bogs, dunes, prairies, grassy plains, old fields, tundra, moorlands, river valleys, meadows, savanna, open woodland, and heathland (NatureServe 2010).
Lesser Nighthawk	*Chordeiles acutipennis*	S						S	Common to uncommon	NBP, NNAP, SPOS	Open country, desert regions, scrub, savanna and cultivated areas, primarily in arid habitats (Tropical and Subtropical zones) (AOU 1983, NatureServe 2010).
Common Nighthawk	*Chordeiles minor*	S	S	S	S	S	S	S	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Habitats include mountains and plains in open and semi-open areas: open coniferous forests, savanna, grasslands, fields, vicinity of cities and towns. Nesting occurs on the ground on a bare site in an open area, also nests on flat gravel roofs of buildings, perhaps related to prey availability at artificial lights (NatureServe 2010).
Common Poorwill	*Phalaenoptilus nuttallii*	Y	Y	Y	Y	Y	Y	Y	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Scrubby and bushy areas, prairie, desert, rocky canyons, open woodland and broken forest, primarily in arid or semiarid habitats (AOU 1983). Found in valleys and foothills, mixed chaparral-grassland, and pinyon-juniper habitat. Nests in open areas on a bare site (NatureServe 2010).
Chuck-will's-widow	*Caprimulgus carolinensis*	S	S	S	S	S	S	S	Uncommon	BC, EPW, LU, NBP, NNAP	Breeding: Deciduous forest, pine-oak association, live-oak groves, and edges of clearings (AOU 1983, 1998). Dry or mesic woods and forests with either pine or hardwood, though favors mixed woods and a light to moderate understory (Hamel 1992, NatureServe 2010).
Eastern Whip-poor-will	*Caprimulgus vociferus*	M	M	M	M	M	M	M	Rare to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Breeding: Forest and open woodland, both arid and humid, from lowland moist and deciduous forest to montane forest and pine-oak association (AOU 1983). In open woodlands with well spaced trees and a low canopy (NatureServe 2010).

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		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Chimney Swift	*Chaetura pelagica*	S	S	S	S	S	S	S	Common	BC, EPW, LU, NBP, NNAP, SPOS	Cosmopolitan; inhabits rural and urban environments having both an abundance of flying arthropods and suitable roosting/nesting sites. Nests principally in chimneys, but also on the interior walls of a variety of other anthropogenic structures including silos, barns, outhouses, uninhabited houses, boathouses, wells, and cisterns (NatureServe 2010).
Green Violetear	*Colibri thalassinus*	X		X	X	X			Very rare	BC, EPW, NBP, NNAP, SPOS	Found in mountain forests, forest clearings, and forest edges (WhatBird 2008).
Broad-billed Hummingbird	*Cynanthus latirostris*	X							Rare to very rare	BC, LU, NBP, SPOS	Arid scrub, open deciduous forest, semi-desert and other open situations in arid habitats (Tropical and lower Sub-tropical zones) (AOU 1983). In U.S., mostly limited in summer to rocky canyons in desert-like mountain habitats. Foothills, canyons, arroyos, along streams, in or near desert habitat. Nests in a small tree, shrub or vine; usually about 1-2 m above ground, dry streambed, or water (NatureServe 2010).
Ruby-throated Hummingbird	*Archilochus colubris*	M	M	M	M	M	M	M	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Breeding habitat includes both heavily-wooded and open deciduous, mixed pine-hardwood, or pine forests, forest edge, savannas, wetlands, orchards, parks, wooded yards, and gardens. During migration, this hummingbird uses habitats similar in structure to those used for breeding (NatureServe 2010).
Black-chinned Hummingbird	*Archilochus alexandri*	S	S	S	S	S	S	S	Common to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes semiarid areas near water, canyons and slopes, chaparral, riparian woodlands, open woodlands, scrub, parks, orchards, and gardens. Nests are in trees or shrubs (e.g., alder, cottonwood, oak, sycamore, laurel, willow, apple, orange), often along canyons or streams or over small or dry creek beds (NatureServe 2010).
Rufous Hummingbird	*Selasphorus rufus*	M	M	M	M	M	M	M	Locally uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	Habitat in migration and winter includes open situations where flowers are present (AOU 1998). Nonbreeding habitat also includes oak forests interspersed with pine and juniper between 2,300-3,000 meters; higher oak-fir forests; shrubby secondary succession habitats; arid thorn forest; brush at farm and roadside edges with *Salvia* spp.; scrublands and disturbed oak woodland (Calder 1993, NatureServe 2010).
Allen's Hummingbird	*Selasphorus sasin*	X				X			Very rare	BC, EPW, NBP, SPOS	Chaparral, thickets, brushy hillsides, open coniferous woodlands, and gardens near coast, often in ravines and canyons (NatureServe 2010).

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Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina			
Ringed Kingfisher	*Megaceryle torquatus*	Y		Y	Y	Y	Y		Uncommon and local	BC, NBP, NNAP, SPOS	Lakes, rivers, streams, lagoons, and coastal regions (AOU 1983). Wide slow-flowing rivers, lowland lakes, marshes, estuaries, brackish coastal lagoons, mangroves, and sometimes open beaches; also sometimes ricefields, reservoirs, canals, water gardens in cities, and Chilean fiords (Fry and Fry 1992, NatureServe 2010).
Belted Kingfisher	*Megaceryle alcyon*	W	Y	W	Y	W	Y	W	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Primarily along water, both freshwater and marine, including lakes, streams, wooded creeks and rivers, seacoasts, bays, estuaries, and mangroves (NatureServe 2010).
Green Kingfisher	*Chloroceryle americana*	Y	Y	Y	Y	Y	Y	Y	Uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Almost all open freshwater and brackish habitats; shaded rivulets, muddy puddles in dried-out arroyos, deep turbid rivers, flooded scrub forest, dark pools in evergreen forest, coastal lagoons, coastal lagoons, mangroves, marshes, small rocky watercourses, and choked drainage canals. Streams, rivers, lakes, marshes, swamps, mangroves, and rarely rocky seacoasts (AOU 1983, NatureServe 2010).
Acorn Woodpecker	*Melanerpes formicivorus*			Y		Y			Very rare	BC, EPW	Oaks, either in unmixed open woodland or mixed with conifers (Subtropical to Temperate, locally also in Tropical zones) (AOU 1983, NatureServe 2010).
Golden-fronted Woodpecker	*Melanerpes aurifrons*	Y	Y	Y	Y	Y	Y	Y	Common	BC, EPW, LU, NBP, NNAP, SPOS	Open woodland (including pine), scrub, semidesert, second growth, mesquite brushlands, pecan groves, river bottomlands (NatureServe 2010).
Red-bellied Woodpecker	*Melanerpes carolinus*	Y	Y		Y				Rare	BC, EPW, NBP	Open woodland (primarily deciduous, less frequently coniferous), second growth, riverine forest, swamps, parks, orchards, shade trees of towns (NatureServe 2010).
Yellow-bellied Sapsucker	*Sphyrapicus varius*	W	W	W	W	W	W	W	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Deciduous or mixed deciduous-coniferous forest; in migration and winter also in a variety of forest and open woodland habitats, parks, orchards (AOU 1983, NatureServe 2010).
Ladder-backed Woodpecker	*Picoides scalaris*	Y	Y	Y	Y	Y	Y	Y	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Deserts, arid scrub, riparian woodland, mesquite, scrub oak, pinyon-juniper woodland, pine-oak association, pine savanna, thickets, shade trees in towns and rural areas (NatureServe 2010).
Downy Woodpecker	*Picoides pubescens*	Y	Y	Y	Y	Y	Y	Y	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Deciduous and mixed woodland, second growth, parks, orchards, swamps, and riparian woodland (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina			
Hairy Woodpecker	*Picoides villosus*	W	W		W		W		Rare	BC, EPW, LU, NBP	Forest, open woodland, swamps, well-wooded towns and parks, open situations with scattered trees. Most abundant in mature woods with large old trees suitable for cavity nesting; also common in medium-aged forests; prefers woods with a dense canopy (NatureServe 2010).
Northern Flicker	*Colaptes auratus*	W	W	W	W	W	W	W	Common to rare	BC, EPW, LU, NBP, NNAP, SPOS	Open forest, both deciduous and coniferous, open woodland, open situations with scattered trees and snags, riparian woodland, pine-oak association, parks (AOU 1983, NatureServe 2010).
Olive-sided Flycatcher	*Contopus cooperi*	M	M	M	M	M	M	M	Uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	Various forest and woodland habitats: taiga, subalpine coniferous forest, mixed coniferous-deciduous forest, burned-over forest, spruce or tamarack bogs and other forested wetlands, and along the forested edges of lakes, ponds, and streams (NatureServe 2010).
Greater Pewee	*Contopus pertinax*	X							Accidental	BC, NBP, SPOS	Highland pine, pine-oak association, riparian woodland and humid montane forest edge (AOU 1983, NatureServe 2010).
Eastern Wood-Pewee	*Contopus virens*	S	S	S	S	S	S	S	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits a wide variety of wooded upland and lowland habitats including deciduous, coniferous, or mixed forests. Occurs most frequently in forests with some degree of openness, whether it is the result of forest structure, natural disturbance, or human alteration (NatureServe 2010).
Yellow-bellied Flycatcher	*Empidonax flaviventris*	M	M		M				Uncommon to common	BC, EPW, LU, NBP, SPOS	Damp coniferous forest, swamps, bogs. In migration in various habitats from low scrub to forest; in winter prefers understory of primary or secondary forest, scrubby woodland, and shady clearings, commonly in humid lowland forest and open woodland (NatureServe 2010).
Acadian Flycatcher	*Empidonax virescens*	S	S	S	S	S	S	S	Common	BC, EPW, LU, NBP, SPOS	Moist deciduous forests with a moderate understory, generally near a stream (Hamel et al. 1982). Humid deciduous forest (primarily mature), woodland, shaded ravines, floodplain forest, river swamps, hammocks and cypress bays of south, thickets, second growth, plantations (NatureServe 2010).
Alder Flycatcher	*Empidonax alnorum*	M	M		M		M		Uncommon to common	BC, EPW, LU, NBP, SPOS	Brushy and scrubby growths, thickets, deciduous forest edge, open second growth, and swamps. Nonbreeding: also woodland, but migrants seldom enter tall shady second growth or woodland (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Willow Flycatcher	*Empidonax traillii*	M	M	M	M	M	M	M	Uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	Strongly tied to brushy areas of willow (*Salix* spp.) and similar shrubs. Found in thickets, open second growth with brush, swamps, wetlands, stream sides, and open woodland. Common in mountain meadows and along streams; also in brushy upland pastures (especially hawthorn) and orchards. The presence of water (running water, pools, or saturated soils) and willow, alder (*Alnus* spp), or other deciduous riparian shrubs are essential habitat elements (NatureServe 2010).
Least Flycatcher	*Empidonax minimus*	M	M	M	M	M	M	M	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Open woodland and brushy areas, forest borders, thinned woodland, tall second growth (NatureServe 2010).
Black Phoebe	*Sayornis nigricans*			Y		Y		Y	Locally uncommon to rare	BC, EPW, NNAP	Usually found near water; marshy ponds, open woodlands along streams, near farm ponds and irrigation ditches. Seen in towns and parks (NatureServe 2010).
Eastern Phoebe	*Sayornis phoebe*	Y	Y	Y	Y	Y	Y	Y	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Open woodland, situations with scattered trees, farmlands, and suburbs, usually near water. Nests on cliffs, banks, or in ravines in open and riparian woodland or farmland with scattered trees; under bridges and eaves; in culverts or wells; sometimes in buildings (NatureServe 2010).
Say's Phoebe	*Sayornis saya*	W	W	W	W	W	W	W	Uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, and cliffs, around ranches, rural homes (NatureServe 2010).
Vermilion Flycatcher	*Pyrocephalus rubinus*	S	S	S	S	S	S	S	Uncommon to common	BC, EPW, LU, NNAP, SPOS	Arid scrub, desert, savanna, cultivated lands, riparian woodland edge, small wooded ponds, washes, roadside shade trees (NatureServe 2010).
Ash-throated Flycatcher	*Myiarchus cinerascens*	S	S	S	S	S	S	S	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Desert scrub, pinyon-juniper and oak woodland, chaparral, thorn scrub and riparian woodland; in winter also in open deciduous woodland (AOU 1983, NatureServe 2010).
Great Crested Flycatcher	*Myiarchus crinitus*	S	S	S	S	S	S	S	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Breeding: deciduous (mainly), mixed, or pine woodland or somewhat open forest, parks, orchards, wooded residential areas, areas of scattered trees in cultivated regions, clearings and edges of wooded areas, and swamps (NatureServe 2010).
Brown-crested Flycatcher	*Myiarchus tyrannulus*							S	Uncommon to rare	NNAP, SPOS	Open woodland, situations with scattered trees, plantations, riparian woodland, second growth, scrub and mangroves, primarily in arid or semi-arid habitats (AOU 1983, NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Western Kingbird	*Tyrannus verticalis*	S	S	S	S	S	S	S	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Open and partly open country, especially savanna, agricultural lands, and areas with scattered trees (AOU 1983), also desert (NatureServe 2010).
Eastern Kingbird	*Tyrannus tyrannus*	M	M	M	M	M	M	M	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Forest edge, open situations with scattered trees and shrubs, cultivated lands with bushes and fencerows, and parks; in winter more closely associated with forest clearings and borders (AOU 1983, NatureServe 2010).
Scissor-tailed Flycatcher	*Tyrannus forficatus*	S	S	S	S	S	S	S	Common to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits open country (savannas, grasslands, croplands, pastures, gardens, parks, golf courses, and urban areas) with scattered trees and shrubs for perching and nesting. Natural plant associations inhabited during the breeding season include mesquite-acacia savanna, bluestem-grama prairie, blackland prairie, and bluestem-sacachuista prairie (NatureServe 2010).
Loggerhead Shrike	*Lanius ludovicianus*	Y	Y	Y	Y	Y	Y	Y	Rare to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Open country with scattered trees and shrubs, savanna, desert scrub (southwestern U.S.), and, occasionally, open woodland; often perches on poles, wires or fenceposts (Tropical to Temperate zones) (AOU 1983, NatureServe 2010).
White-eyed Vireo	*Vireo griseus*	Y	S	S	S	S	S	Y	Common to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits early-late successional, shrubby habitats such as deciduous scrub, old fields, abandoned pastures, regenerating clear cuts or other heavily logged areas, drainage and streamside thickets, forest edges, reclaimed strip mines, and mangrove swamps (NatureServe 2010).
Bell's Vireo	*Vireo bellii*	S	S	S	S	S	S	S	Locally common	BC, EPW, LU, NBP, NNAP, SPOS	Habitats vary widely among the four subspecies. Dense brush, willow thickets, mesquite, streamside thickets, and scrub oak, in arid regions often near water, also adjoining uplands (NatureServe 2010).
Black-capped Vireo	*Vireo atricapilla*	S	S	S	S	S	S	S	Rare to locally uncommon	BC, EPW, LU	Habitat consists of dense low thickets and oak scrub, mostly on rocky hillsides or steep ravine slopes in rugged terrain. Nesting occurs in areas with clumps of woody vegetation separated by bare ground, rocks, and/or herbaceous vegetation, often in areas with sparse *Juniperus* (NatureServe 2010).
Yellow-throated Vireo	*Vireo flavifrons*	S	S	S	S	S	S	S	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Primarily open deciduous forest and woodland, riparian woodland, tall floodplain forest, lowland swamp forest, and less frequently, mixed forest; also orchards, groves, roadside trees. Most abundant in mature woods but also occurs in medium-aged forests and some pioneer stands; requires a high, partially open canopy and prefers woods with an intermediate tree density or basal area (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Blue-headed Vireo	*Vireo solitarius*	W	W	W	W	W	W	W	Uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Mixed coniferous-deciduous woodland, humid montane forest; in migration and winter also in "a variety of wooded habitats, but favors tall woodland with live oaks and pines in the temperate zone (NatureServe 2010).
Hutton's Vireo	*Vireo huttoni*	Y	Y	Y	Y	Y	Y	Y	Very rare	BC, EPW, LU, NBP, NNAP, SPOS	Pine-oak association, oak woodland, and riparian woodland, primarily in low trees and scrub (Subtropical and Temperate zones) (AOU 1983, NatureServe 2010).
Warbling Vireo	*Vireo gilvus*	M	M	M	M	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Open deciduous and mixed deciduous-coniferous woodland, riparian forest and thickets, pine-oak association, orchards, and parks; in migration and winter in a wide variety of forest, woodland and scrub habitats (AOU 1983, NatureServe 2010).
Red-eyed Vireo	*Vireo olivaceus*	S	S	S	S	S	S	S	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Open deciduous forest (especially with sapling undergrowth), mixed forest with deciduous understory, second-growth woodland, scrub, thickets, gardens, mangroves. Most abundant in mature stands. In much of the range, prefers shady oak forests with a high, well-developed closed canopy and a fairly open understory with scanty ground cover (NatureServe 2010).
Blue Jay	*Cyanocitta cristata*	Y	Y	Y	Y	Y	Y	Y	Common	BC, EPW, LU, NBP, NNAP, SPOS	Primarily deciduous or mixed forest, open woodland, parks, residential areas with trees; less frequently in open situations with scattered trees (NatureServe 2010).
Western Scrub-Jay	*Aphelocoma californica*	Y	Y	Y	Y	Y	Y	Y	Common	BC, EPW, LU, NBP, NNAP	Scrub (especially oak, pinyon and juniper), brush, chaparral and pine-oak associations; also riparian woodland, gardens, orchards (NatureServe 2010).
American Crow	*Corvus brachyrhynchos*	Y	W	W	Y	W	W	W	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Open and partly open country: agricultural lands, suburban areas, orchards, tidal flats, primarily in humid situations, restricted mostly to riparian forest and adjacent areas in arid regions. Generally avoids dense coniferous forest and desert. (NatureServe 2010).
Chihuahuan Raven	*Corvus cryptoleucus*			M		M		M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Arid and semiarid grassland, scrub, desert, especially in yucca-mesquite association (AOU 1983, NatureServe 2010).
Common Raven	*Corvus corax*	Y	Y	Y	Y	Y	Y	Y	Uncommon to common	BC, EPW, LU	Various situations from lowlands to mountains, open country to forested regions, and humid regions to desert; most frequently in hilly or mountainous areas, especially in vicinity of cliffs (AOU 1983, NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Horned Lark	*Eremophila alpestris*	W	Y	W	W	W	W	W	Common to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Grassland, tundra, sandy regions, areas with scattered low shrubs, desert playas, grazed pastures, stubble fields, open cultivated areas, and rarely open areas in forest (AOU 1983, NatureServe 2010).
Purple Martin	*Progne subis*	S	S	S	S	S	S	S	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	A wide variety of open and partly open situations, frequently near water or around towns (Subtropical and Temperate zones, in winter also Tropical Zone) (AOU 1983, NatureServe 2010).
Tree Swallow	*Tachycineta bicolor*	W	M	M	W	M	M	W	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Open situations near water, including streams, lakes, ponds, marshes and coastal regions (AOU 1983); savanna, pastures, etc. (NatureServe 2010).
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	S	S	S	S	S	S	S	Rare to locally uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Open and partly open situations, especially along watercourses with steep banks, and roadside cuts. Nests in burrows in cliffs, riverbanks, roadside cuts, culverts, drain pipes, holes in walls, under bridges; locally in caves and old buildings (NatureServe 2010).
Bank Swallow	*Riparia riparia*	M	M	M	M	M	M	M	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes open and partly open situations, frequently near flowing water (AOU 1983, NatureServe 2010).
Cliff Swallow	*Petrochelidon pyrrhonota*	S	S	S	S	S	S	S	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Inhabit open to semi-wooded habitat, cliffs, canyons, and farm country, generally near meadows, marshes, and water. They build bottle-shaped mud nest in colonies on cliffs, under eaves of buildings, under bridges, and similar sites sheltered by an overhang (NatureServe 2010).
Cave Swallow	*Petrochelidon fulva*	S	S	S	S	S	S	S	Common to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Open country, less commonly partly open situations, frequently near water (AOU 1983). Typical of rocky ravines, coastal cliffs. Nests in limestone caves (twilight zone), sinkholes, culverts, on buildings, or under bridges (NatureServe 2010).
Barn Swallow	*Hirundo rustica*	S	S	S	S	S	S	S	Rare to common	BC, EPW, LU, NBP, NNAP, SPOS	Open situations, less frequently in partly open habitats, frequently near water (AOU 1983, NatureServe 2010).
Carolina Chickadee	*Poecile carolinensis*	Y	Y	Y	Y	Y	Y	Y	Common	BC, EPW, LU, NBP, NNAP, SPOS	Deciduous woodland, forest clearings and edge, swamps, thickets, second-growth woodland, parks, brushy areas, suburban areas. At night, especially in winter, roosts in cavities if available. Nests in cavity in tree or fence post, and in woodpecker holes and artificial cavities, including artificial snags (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Black-crested Titmouse	*Baeolophus atricristatus*	Y	Y	Y	Y	Y	Y	Y	Common	BC, EPW, LU, NBP, NNAP, SPOS	Riparian woodland, gallery forest, secondary forest, tropical deciduous forest (AOU 1998); arid to semi-humid oak and semi-deciduous woodland, open areas with hedges, scattered trees, scrubby woodland (NatureServe 2010).
Verdin	*Auriparus flaviceps*	Y	Y	Y	Y	Y	Y	Y	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Desert and arid brush, primarily in mesquite and creosotebush (AOU 1983). Breeding: Nests in a shrub, small tree, or cactus (NatureServe 2010).
Bushtit	*Psaltriparus minimus*	Y	Y	Y	Y	Y	Y	Y	Uncommon to common	BC, EPW, LU	Woodlands and scrub habitat with scattered trees and shrubs. Brushy streamsides, pinyon-juniper, chaparral and pine-oak associations. Found in trees and shrubs in residential areas (NatureServe 2010).
Red-breasted Nuthatch	*Sitta canadensis*	W	W	W	W	W	W	W	Rare	BC, EPW, LU, NBP, NNAP, SPOS	Coniferous and mixed forest, aspen woodland; in migration and winter also in deciduous forest, open woodland, parks, scrub, and riparian woodland (AOU 1983, NatureServe 2010).
White-breasted Nuthatch	*Sitta carolinensis*	W	W	W	W	W	W		Rare to locally uncommon	BC, EPW, LU, NBP, NNAP	Most frequent in open woodlands of mature trees (primarily oak or pine); pinyon-juniper, clearings, forest edge, parks, and partly open situations with scattered trees (AOU 1983, NatureServe 2010).
Brown Creeper	*Certhia americana*	W	W	W	W	W	W	W	Uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	Preferred habitat includes forest, woodlands, forested floodplains and swamps. Scrub and parks are also used in winter and during migration. Most often found in coniferous and mixed forests (NatureServe 2010).
Cactus Wren	*Campylorhynchus brunneicapillus*	Y	Y	Y	Y	Y	Y	Y	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Desert (especially with cholla cactus or yucca), mesquite, arid scrub, coastal sage scrub, and in trees in towns in arid regions (Tropical to Subtropical zones) (AOU 1983). Nests in *Opuntia* cactus, or in twiggy, thorny, trees and shrubs, sometimes in buildings (NatureServe 2010).
Rock Wren	*Salpinctes obsoletus*	W	Y	Y	W	Y	Y	Y	Common	BC, EPW, LU, NBP, NNAP	In arid or semi-arid habitat. In shrubby areas in rocky canyons and cliffs, rock slides, boulder-strewn slopes, arroyos with sparse vegetation. Seen around concrete and stone buildings. Nests in gopher burrows, rock crevices, cavities under rocks, adobe buildings, etc. (NatureServe 2010).
Canyon Wren	*Catherpes mexicanus*	Y	Y	Y	Y	Y	Y	Y	Uncommon to locally common	BC, EPW, LU, NBP	Cliffs, steep-sided canyons, rocky outcrops and boulder piles, usually in arid regions (Tropical and Subtropical zones) (AOU 1983). Also sometimes found in towns, around houses and barns, on old stone buildings. Nests on canyon walls; may also nest around human-built structures (NatureServe 2010).

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Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina			
Carolina Wren	*Thryothorus ludovicianus*	Y	Y	Y	Y	Y	Y	Y	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Open deciduous woodland, mostly in undergrowth and thickets; parks; also shrubbery of residential areas, hammocks, swamps, pine barrens; humid forest edge and clearings (NatureServe 2010).
Bewick's Wren	*Thryomanes bewickii*	Y	Y	Y	Y	Y	Y	Y	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Uses brushy areas, thickets and scrub in open country, open and riparian woodland, and chaparral. More commonly in arid regions but locally also in humid areas (subtropical and temperate zones) including country towns and farms (AOU 1983). In southwestern North America, primary habitats include chaparral, brushy slopes, pinyon-juniper, live-oak, and mesquite associations (NatureServe 2010).
House Wren	*Troglodytes aedon*	W	W	W	W	W	W	W	Common to rare	BC, EPW, LU, NBP, NNAP, SPOS	Inhabit thickets, shrubbery, and brushy areas in partly open situations, open woodland, farmlands, chaparral, and areas around human habitations. Occurs most often in human-disturbed habitats (NatureServe 2010).
Winter Wren	*Troglodytes hiemalis*	W	W	W	W	W	W	W	Uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Coniferous forest, primarily with dense understory and near water, and in open areas with low cover along rocky coasts, cliffs, islands, or high mtn. areas, logged areas with large amounts of slash; in winter and migration also in deciduous woods with understory, thickets, brushy fields (NatureServe 2010).
Sedge Wren	*Cistothorus platensis*	W	W		W		W		Common to uncommon	BC, EPW, LU, NBP, SPOS	Grasslands and savanna, especially where wet or boggy; sedge marshes; moist meadows with scattered low bushes; upland margins of ponds and marshes; coastal brackish marshes of cordgrass, herbs, and low shrubs; locally in dry cultivated grainfields (AOU 1983). Avoids cattail marshes (NatureServe 2010).
Marsh Wren	*Cistothorus palustris*	W	W	W	W	W	W	W	Common	BC, EPW, LU, NBP, NNAP, SPOS	Freshwater and brackish marshes in cattails, tule, bulrush, and reeds (AOU 1983, NatureServe 2010).
Blue-gray Gnatcatcher	*Polioptila caerulea*	Y	S	S	S	S	S	S	Rare to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Deciduous forest, open woodland, second growth, scrub, brushy areas and chaparral (Tropical to lower Temperate zones) (AOU 1983). Also in open pinyon-juniper woodland (NatureServe 2010).
Golden-crowned Kinglet	*Regulus satrapa*	W	W	W	W	W	W	W	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Coniferous forest and woodland (especially spruce), in migration and winter also deciduous woodland, scrub and brush (AOU 1983, NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Ruby-crowned Kinglet	*Regulus calendula*	W	W	W	W	W	W	W	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Nests in coniferous forests and woodlands. In migration and winter it also inhabits deciduous woodlands, shrubs and thickets and may be found in old fields, gardens, yards and parks (NatureServe 2010).
Eastern Bluebird	*Sialia sialis*	Y	Y	Y	Y	Y	Y	Y	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes forest edge, open woodland, and partly open situations with scattered trees, from coniferous or deciduous forest to riparian woodland, also pine woodland or savanna in the tropics. Nests are in natural cavities, old woodpecker holes, bird boxes, or similar sites (NatureServe 2010).
Veery	*Catharus fuscescens*	M	M		M		M		Uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	Nesting habitat includes swampy forest, especially in more open areas with shrubby understory, as well as second growth, willow or alder shrubbery near water; large tracts of forest are most suitable. In migration and winter this species occurs also in lowland forest, woodland, and scrub (NatureServe 2010).
Gray-cheeked Thrush	*Catharus minimus*	M	M		M				Uncommon to rare	BC, EPW, LU, NBP, SPOS	In migration and winter also in deciduous forest, forest borders, open woodland, second growth, and scrub (NatureServe 2010).
Swainson's Thrush	*Catharus ustulatus*	M	M	M	M	M	M	M	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	During migration, this species uses a wide range of wooded and shrubby habitats, generally with thick undergrowth (NatureServe 2010).
Hermit Thrush	*Catharus guttatus*	W	W	W	W	W	W	W	Common	BC, EPW, LU, NBP, NNAP, SPOS	Open humid coniferous and mixed forest and forest edge, dry sandy and sparse jackpine, less frequently in deciduous forest and thickets; in migration and winter also chaparral, riparian woodland, arid pine-oak, desert scrub (NatureServe 2010).
Wood Thrush	*Hylocichla mustelina*	M	M		M		M		Uncommon to common	BC, EPW, LU, NBP, SPOS	In migration and winter, habitats include forest and woodland of various types from humid lowland to arid or humid montane forest, also scrub and thickets; primarily undisturbed to moderately disturbed wet primary forest; may wander into riparian forest and various stages of second growth (NatureServe 2010).
American Robin	*Turdus migratorius*	Y	Y	Y	Y	Y	Y	Y	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	American robins use a wide range of habitats, including forest, woodland, scrub, parks, thickets, gardens, cultivated lands, savanna, swamps, and suburbs (NatureServe 2010).
Gray Catbird	*Dumetella carolinensis*	M	M	M	M	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Thickets, dense brushy and shrubby areas, undergrowth of forest edge, hedgerows, and gardens (AOU 1983), dense second growth (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Northern Mockingbird	*Mimus polyglottos*	Y	Y	Y	Y	Y	Y	Y	Abundant to common	BC, EPW, LU, NBP, NNAP, SPOS	Various open and partly open situations from areas of scattered brush or trees to forest edge and semi-desert (absent in forest interior), especially in scrub, thickets, gardens, towns, and around cultivated areas (AOU 1983, NatureServe 2010).
Brown Thrasher	*Toxostoma rufum*	W	W	W	W	W	W	W	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Thickets and bushy areas in deciduous forest clearings and forest edge, shrubby areas and gardens; in migration and winter also in scrub (AOU 1983, NatureServe 2010).
Long-billed Thrasher	*Toxostoma longirostre*	Y						Y	Common to uncommon	BC, NBP, NNAP, SPOS	Inhabits riparian woodlands of elm, hackberry, anacua, coma, Texas persimmon, willow, and colima. Also in chaparral and similar arid to semi-arid shrubby woodlands dominated by mesquite, colima, acacias, agarito, granjeno, cactus, and brasil (Oberholser 1974, Fischer 1980, 1981, NatureServe 2010).
Curve-billed Thrasher	*Toxostoma curvirostre*	Y	Y	Y	Y	Y	Y	Y	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits arid thornscrub, chaparral, cholla grasslands, and other brushy areas. Typical woody vegetation of occupied Texas chaparral includes mesquite, colima, acacia, agarito, brasil, and granjeno (Fischer 1980, 1981, NatureServe 2010).
European Starling *	*Sturnus vulgaris*	Y	Y	Y	Y	Y	Y	Y	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Found in a wide variety of habitats including open woodlands, agricultural and urban areas. Roosts in trees, shrubs, or buildings, forages in open areas (NatureServe 2010).
American Pipit	*Anthus rubescens*	W	W	W	W	W	W	W	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Non-breeding: seacoasts, beaches, mudflats, wet meadows, sandy areas and cultivated fields (AOU 1983, NatureServe 2010).
Sprague's Pipit	*Anthus spragueii*	M	M	M	M	M	M	M	Uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Habitat during migration and in winter consists of pastures and weedy fields (AOU 1983), including grasslands with dense herbaceous vegetation or grassy agricultural fields (NatureServe 2010).
Cedar Waxwing	*Bombycilla cedrorum*	W	W	W	W	W	W	W	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	A wide variety of open woodland types, either deciduous or coniferous, forest edge, second growth, parks, orchards and gardens; in migration and winter occurring wherever there are trees (AOU 1983, NatureServe 2010).
Chestnut-collared Longspur	*Calcarius ornatus*	W	W	W	W	W	W	W	Uncommon to rare	BC, EPW, LU, NBP	Grasslands and deserts with primarily grasses and forbs, vegetation less than 0.5 m. Also cultivated fields and near water sources (Hill and Gould 1997, NatureServe 2010).

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Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Tennessee Warbler	*Oreothlypis peregrina*	M	M		M		M	M	Uncommon to common	BC, EPW, LU, NBP, SPOS	Openings of northern woodland, edges of dense spruce forests, cleared balsam-tamarack bogs, grassy places of open aspen and pines, alder and willow thickets, open deciduous second growth. In migration and winter generally in single species flocks in tops of trees of various woodland types--not typically in continuous mature forest (NatureServe 2010).
Orange-crowned Warbler	*Oreothlypis celata*	W	W	W	W	W	W	W	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Habitats during migration and winter include various wooded habitat edges, especially those with dense undergrowth (AOU 1998, NatureServe 2010).
Nashville Warbler	*Oreothlypis ruficapilla*	M	M	M	M	M	M	M	Uncommon to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Forest-bordered bogs, second growth, open deciduous and coniferous woodland, forest edge and undergrowth, cutover or burned areas; in migration and winter in various woodland, scrub, and thicket habitats (NatureServe 2010).
Northern Parula	*Parula americana*	S	S	S	S	S	S	S	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Breeding habitat varies considerably throughout range, but primarily a riparian species associated with epiphytic growth. Found in open deciduous, coniferous, or mixed forest, woodland, floodplain and swamp forest (NatureServe 2010).
Yellow Warbler	*Dendroica petechia*	M	M	M	M	M	M	M	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes open scrub, second-growth woodland, thickets, farmlands, and gardens, especially near water; riparian woodlands, especially of willows, are typical habitat in the West. In migration and winter, often occur in open woodland, plantations, brushy areas, and forest edge (NatureServe 2010).
Magnolia Warbler	*Dendroica magnolia*	M	M	M	M	M	M	M	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter found in various open forest, woodland, scrub, and thicket habitats; usually secondary and disturbed woodland (NatureServe 2010).
Yellow-rumped Warbler	*Dendroica coronata*	W	W	W	W	W	W	W	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter found in open forests, woodlands, savanna, roadsides, pastures, and scrub habitat. May be seen in parks and gardens (NatureServe 2010).
Golden-cheeked Warbler	*Dendroica chrysoparia*	S	S	S	S	S	S	S	Uncommon to rare	BC, EPW, LU	Breeding habitat consists of old-growth and mature regrowth Ashe juniper-oak woodlands in limestone hills and canyons, including edges and open mosaics of Ashe juniper-scrub oak association in broken terrain in canyons and slopes, and closed canopy stands with plenty of old junipers and a sufficient proportion of deciduous oaks in the canopy (Sexton 1992); occupied sites contain junipers at least 40 years old (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Black-throated Green Warbler	*Dendroica virens*	M	M	M	M	M	M	M	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter, occurs in various open forest, woodland, scrub, second growth, and thicket habitats (AOU 1983); prefers forest canopy and edges, pasture trees, and semi-open, sometimes in low scrubby second growth (NatureServe 2010).
Blackburnian Warbler	*Dendroica fusca*	M	M		M		M		Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	In migration in various forest, woodland, scrub, and thicket habitats (AOU 1983, NatureServe 2010).
Yellow-throated Warbler	*Dendroica dominica*	S	M	S	S	S	S	S	Uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	Pine forest, sycamore-bald cypress swamp, riparian woodland, floodplain forest, live oak woodland. In migration and winter in various woodland, scrub, brush, and thicket situations, but most often in pine woodland if available (AOU 1983, NatureServe 2010).
Pine Warbler	*Dendroica pinus*	W							Uncommon to common	NBP, SPOS	Strongly associated with presence of pine and pine-hardwood forest during the breeding and winter seasons (NatureServe 2010).
Palm Warbler	*Dendroica palmarum*	M	M	M	M	M	M	M	Rare to locally uncommon	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter typically on ground in open areas in various woodland, second growth, and thicket habitats (NatureServe 2010).
Bay-breasted Warbler	*Dendroica castanea*	M	M		M				Uncommon to common	BC, EPW, LU, NBP, SPOS	Boreal coniferous forest, occasionally adjoining second growth or deciduous scrub. In migration and winter in various forest, woodland, scrub, and thicket habitats. (AOU 1983, NatureServe 2010).
Blackpoll Warbler	*Dendroica striata*	M	M		M				Uncommon to rare	BC, EPW, LU, NBP, SPOS	In migration in various forest, forest border, woodland, scrub, and brushy habitats (AOU 1983), clearings with scattered trees (NatureServe 2010).
Black-and-white Warbler	*Mniotilta varia*	S	S	S	S	S	S	S	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Inhabits young, medium-aged and mature deciduous and mixed forests (NatureServe 2010).
American Redstart	*Setophaga ruticilla*	M	M	M	M	M	M	M	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	In winter and migration, habitats include various kinds of forests, woodlands, scrublands, and thickets, including mangroves; uses a wide variety of agricultural habitats (NatureServe 2010).
Prothonotary Warbler	*Protonotaria citrea*	M	M		M				Uncommon to common	BC, EPW, LU, NBP, SPOS	In migration, habitat includes dry woodland, scrub, thickets, and mangroves (AOU 1983, NatureServe 2010).
Ovenbird	*Seiurus aurocapilla*	M	M	M	M	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Inhabited forest types include oak -hickory, oak-pine, maple-basswood, maple-birch, maple-birch-beech, hemlock-oak, Trembling Aspen, and spruce-fir (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Northern Waterthrush	*Parkesia noveboracensis*	M	M	M	M	M	M	M	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Prefers damp woodlands with standing water, thick cover along streams, in marshes, and by stagnant pools, but is also found on lawns and in hedgerows and thickets (Winkler et al. 1992, NatureServe 2010).
Louisiana Waterthrush	*Parkesia motacilla*	M	S	S	S	S	S	M	Uncommon	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter also in riparian woodland, scrub and thickets, generally near running water; avoids extensive openings and still water (NatureServe 2010).
Mourning Warbler	*Oporornis philadelphia*	M	M	M	M	M	M	M	Uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	Shrubbery and bushes of open deciduous woodland and second growth, and shrubby margins of bogs, swamps, and marshes. In migration and winter: thickets, weedy areas, scrub, and woodland undergrowth, mostly in humid regions (AOU 1983, NatureServe 2010).
MacGillivray's Warbler	*Oporornis tolmiei*	M	M	M	M	M	M	M	Uncommon to rare	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter, occurs in open woodland undergrowth, scrubby areas, and thickets (AOU 1998, NatureServe 2010).
Common Yellowthroat	*Geothlypis trichas*	S	S	S	S	S	S	S	Rare to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Marshes (especially cattail), thickets near water, bogs, brushy pastures, old fields, and, locally, undergrowth of humid forest. In migration and winter also in brushy and shrubby areas in both moist and arid regions (AOU 1983, NatureServe 2010).
Wilson's Warbler	*Wilsonia pusilla*	M	M	M	M	M	M	M	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes semi-open areas in moist woodlands, bogs with scattered trees, willow and alder thickets, and areas with similar vegatation structure (NatureServe 2010).
Canada Warbler	*Wilsonia canadensis*	M	M		M				Uncommon to rare	BC, EPW, LU, NBP, SPOS	In migration, this warbler uses various forest, woodland, scrub, and thicket habitats, mostly in humid areas (NatureServe 2010).
Red-faced Warbler	*Cardellina rubrifrons*				X				Accidental	BC	Montane fir, pine and pine-oak woodland. In migration and winter in humid montane forest, pine-oak association and riparian woodland, rarely in open woodland in lowland habitats (Subtropical and lower Temperate zones) (AOU 1983, NatureServe 2010).
Rufous-capped Warbler	*Basileuterus rufifrons*	X					X	X	Very rare	BC	Preferred habitats include foothills and brushlands (WhatBird 2008).
Yellow-breasted Chat	*Icteria virens*	S	S	S	S	S	S	S	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Second growth, shrubby old pastures, thickets, bushy areas, scrub, woodland undergrowth, and fence rows, including low wet places near streams, pond edges, or swamps; thickets with few tall trees; early successional stages of forest regeneration; commonly in sites close to human habitation (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina			
Olive Sparrow	*Arremonops rufivirgatus*			Y				Y	Common	NNAP, SPOS	Undergrowth of deciduous forest, thickets, thorn scrub, dense second growth, mesquite, riparian brush (AOU 1983, NatureServe 2010).
Green-tailed Towhee	*Pipilo chlorurus*			W		W		W	Common to uncommon	BC, EPW, NBP, NNAP, SPOS	Primarily in lowland habitats (AOU 1983, NatureServe 2010).
Spotted Towhee	*Pipilo maculatus*	W	W	W	W	W	W	W	Common	BC, EPW, LU, NBP, NNAP, SPOS	Uses a wide variety of shrubby habitats characterized by deep litter and humus on ground, and sheltering vegetation overhead. Undergrowth of open woodland, forest edge, second growth, brushy areas, chaparral, riparian thickets, woodland (AOU 1998, NatureServe 2010).
Eastern Towhee	*Pipilo erythrophthalmus*	W	W		W				Uncommon to rare	BC, EPW, NBP, SPOS	Inhabits forest and swamp edges, regenerating clearcuts, open-canopied forests (including deciduous, pine, pine-hardwood and spruce-fir; particularly those with a well-developed understory), reclaimed strip mines, mid-late successional fields, riparian thickets, overgrown fencerows, shrub/small-tree thickets, and other brushy habitats (NatureServe 2010).
Canyon Towhee	*Pipilo fuscus*	Y	Y	Y	Y	Y	Y	Y	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Dense brush, arid scrub, and riparian thickets, often in rocky areas (AOU 1989, NatureServe 2010).
Cassin's Sparrow	*Aimophila cassinii*	Y	Y	Y	Y	Y	Y	Y	Common to abundant	BC, EPW, LU	Open grassland and short-grass plains with scattered bushes or shrubs, sagebrush, mesquite or yucca (AOU 1983, NatureServe 2010).
Rufous-crowned Sparrow	*Aimophila ruficeps*	Y	Y	Y	Y	Y	Y	Y	Common to uncommon	BC, EPW, LU, NBP	Rocky hillsides, steep slopes of grass and brush. In Mexico, found in arid scrub and pine-oak habitat (NatureServe 2010).
Chipping Sparrow	*Spizella passerina*	Y	Y	Y	Y	Y	Y	Y	Common	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes open woodlands, forest and woodland edges, edges of lakes and streams, grassy fields, parks, farm yards, orchards, and areas with similar vegetation structure (NatureServe 2010).
Clay-colored Sparrow	*Spizella pallida*	M	M	M	M	M	M	W	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	In migration, found in mesquite and other desert shrublands, thickets, weed patches, open woodlands, and parks. In winter, in arid to semihumid grassland and fields with scattered shrubs. Also dry scrub and fencerows (NatureServe 2010).
Field Sparrow	*Spizella pusilla*	Y	Y	Y	Y	Y	Y	Y	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Old fields, brushy hillsides, overgrown pastures, thorn scrub, deciduous forest edge, sparse second growth, fencerows (AOU 1983, NatureServe 2010).

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Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina			
Vesper Sparrow	*Pooecetes gramineus*	W	W	W	W	W	W	W	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Habitats include plains, prairies, dry shrublands, savannas, weedy pastures, fields, sagebrush, arid scrub, and woodland clearings (AOU 1983, NatureServe 2010).
Lark Sparrow	*Chondestes grammacus*	Y	W	W	W	W	W	Y	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Breeding habitat includes various open situations with scattered bushes and trees: shortgrass, mixed-grass, and tallgrass prairie with a shrub component and sparse litter; parkland; sandhills; barrens; oldfields; cultivated fields; shrub thickets; shrubsteppe (native and altered); woodland edges; shelterbelts; orchards, parks; riparian areas; brushy pastures; overgrazed pastures; and savanna (NatureServe 2010).
Black-throated Sparrow	*Amphispiza bilineata*	Y	Y	Y	Y	Y	Y	Y	Common to abundant	BC, EPW, LU, NNAP, SPOS	Frequents the arid, hot deserts of the West. Not closely associated with particular plant species or communities, but favors sparsely vegetated desert scrub, including thorn brush, cacti, chaparral, mesquite and juniper. It is most often found on desert uplands, alluvial fans, and hillsides where thorny xeric brush dominates, and sometimes also in dry shrubby washes, but avoids desert valley floors (NatureServe 2010).
Lark Bunting	*Calamospiza melanocorys*	W	W	W	W	W	W	W	Abundant to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter found in cultivated lands, brushy areas and desert (AOU 1998, NatureServe 2010).
Savannah Sparrow	*Passerculus sandwichensis*	W	W	W	W	W	W	W	Abundant to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	In winter, cultivated fields, pastures, golf courses, roadsides, dunes, and salt marshes (Wheelwright and Rising 1993, NatureServe 2010).
Grasshopper Sparrow	*Ammodramus savannarum*	Y	Y	Y	Y	Y	Y	Y	Rare to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Prefer grasslands of intermediate height and are often associated with clumped vegetation interspersed with patches of bare ground (NatureServe 2010).
Baird's Sparrow	*Ammodramus bairdii*	X							Very rare	BC, EPW, LU, NBP, NNAP, SPOS	Nesting habitat includes ungrazed or lightly grazed mixed-grass prairie, prairie with scattered low bushes and matted vegetation (AOU 1983), local pockets of tallgrass prairie, wet meadows, and some types of disturbed habitats. This species most often occurs in tracts of native, mixed-grass prairie that is ungrazed or lightly grazed; it may use wet meadows and tallgrass prairie in dry years (NatureServe 2010).
Le Conte's Sparrow	*Ammodramus leconteii*	W	W	W	W	W	W	W	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Variety of old field and prairie habitats with dense cover of grass or sedge. Examples include: moist fields of broomsedge, rice stubble, airfield grasslands, and damp weedy or grassy fields (Lowther 1996, NatureServe 2010).

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Fox Sparrow	*Passerella iliaca*	W	W	W	W	W	W	W	Common to uncommon	BC, EPW, LU, NBP, SPOS	Dense thickets in coniferous or mixed woodlands, chaparral, parks, and gardens, wooded bottomlands along rivers and creeks. Requires dense brushy cover during the nesting season (NatureServe 2010).
Song Sparrow	*Melospiza melodia*	W	W	W	W	W	W	W	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Brushy, shrubby, and deep grassy areas along watercourses and seacoasts; marshes (cattail, bulrush, and salt); and, mostly in the northern and eastern portions of range, forest edge, bogs, brushy clearings, thickets, hedgerows, gardens (NatureServe 2010).
Lincoln's Sparrow	*Melospiza lincolnii*	W	W	W	W	W	W	W	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Bogs, wet meadows, riparian thickets, shrubby forest edge, marshes, brushy fields; mostly in northern and montane areas. Also jack pine plain barrens (NatureServe 2010).
Swamp Sparrow	*Melospiza georgiana*	W	W	W	W	W	W	W	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter also in weedy fields, brush, thickets, scrub, and forest edge (AOU 1998, NatureServe 2010).
White-throated Sparrow	*Zonotrichia albicollis*	W	W	W	W	W	W	W	Abundant to common	BC, EPW, LU, NBP, NNAP, SPOS	Coniferous and mixed forest, forest edge, clearings, bogs, brush, thickets, open woodland. In migration and winter also in deciduous forest and woodland, scrub, shrubbery, gardens, parks, cattail marshes (NatureServe 2010).
Harris's Sparrow	*Zonotrichia querula*	W	W	W	W	W	W	W	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Habitat descriptions from throughout the winter range include: thickets/brush bordering streams, edges of low woodlands, brush and brushy places, hedgerows, and willow thickets in ravines (NatureServe 2010).
White-crowned Sparrow	*Zonotrichia leucophrys*	W	W	W	W	W	W	W	Abundant to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Open woodlands, burnt over areas in forests, brushy areas, brushy subalpine meadows, willow thickets along streams or lakes, parks, farmland (NatureServe 2010).
Dark-eyed Junco	*Junco hyemalis*	W	W	W	W	W	W	W	Uncommon to abundant	BC, EPW, LU, NBP, NNAP	Habitats include various sorts of coniferous, mixed, and deciduous forest; forest edge; forest clearings; bogs; open woodland; brushy areas adjacent to forest; and burned-over lands. In migration and winter the species occurs in a wide range of openly wooded and brushy and grassy habitats (AOU 1998, NatureServe 2010).
Summer Tanager	*Piranga rubra*	S	S	S	S	S	S	S	Rare to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Deciduous woods (often near gaps and edges) in eastern U.S., stands of oaks, pines, and hickories in Southeast, and willows and cottonwoods at low elevations along streams and in canyons in Southwest (NatureServe 2010).

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		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Northern Cardinal	*Cardinalis cardinalis*	Y	Y	Y	Y	Y	Y	Y	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Thickets, brushy areas, fields, shrubbery, forest edge, clearings, around human habitation, and, in arid regions, in scrub, riparian thickets, woodland, and brush (NatureServe 2010).
Pyrrhuloxia	*Cardinalis sinuatus*	Y	W	Y	Y	Y	Y	Y	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Arid brush, thorn scrub, weedy fields, riparian thickets (AOU 1983). Breeding: Nests in mesquite, thorny bushes, 1.5-2.5 m above ground (NatureServe 2010).
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	M	M		M		M		Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Second-growth woods, mature forest edge, borders of swamps and wooded streams, dense growths of small trees, gardens and parks, old orchards. In migration and winter in various forest, woodland, and scrub habitats; avoids interior of closed forest (NatureServe 2010) .
Blue Grosbeak	*Passerina caerulea*	S	S	S	S	S	S	S	Locally common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Partly open situations with scattered trees, riparian woodland, scrub, thickets, cultivated lands, woodland edges, overgrown fields, hedgerows (NatureServe 2010).
Lazuli Bunting	*Passerina amoena*			M		M			Uncommon	BC, EPW, NNAP	Arid brushy areas in canyons, riparian thickets, chaparral and open woodland; in migration and winter also in open grassy and weedy areas (AOU 1983, NatureServe 2010).
Indigo Bunting	*Passerina cyanea*	S	S	S	S	S	S	S	Common to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Deciduous forest edge and clearings, open woodland, second growth, shrubby areas, scrub, cultivated lands, weedy fields, orchards, hedgerows, overgrown fencerows; avoids mature forests (NatureServe 2010).
Varied Bunting	*Passerina versicolor*			S		S			Locally uncommon to rare	BC, EPW	Arid thorn brush and thickets, dry washes and arid scrub (Tropical and Subtropical zones) (AOU 1983, NatureServe 2010). Often near water.
Painted Bunting	*Passerina ciris*	S	S	S	S	S	S	S	Uncommon to common	BC, EPW, LU, NBP, NNAP, SPOS	Partly open situations with scattered brush and trees, riparian thickets and brush, weedy and shrubby areas, woodland edges, yards and gardens in the southern U.S. (NatureServe 2010).
Dickcissel	*Spiza americana*	S	S	S	S	S	S	S	Uncommon to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Grassland, meadows, savanna, cultivated lands, brushy fields (AOU 1998, NatureServe 2010).
Red-winged Blackbird	*Agelaius phoeniceus*	Y	Y	Y	Y	Y	Y	Y	Abundant to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes freshwater and brackish marshes, bushes and small trees along watercourses, and upland cultivated fields. In migration and winter, this blackbird also occurs in open cultivated lands, plowed fields, pastures, and prairies (AOU 1998, NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Eastern Meadowlark	*Sturnella magna*	Y	Y	Y	Y	Y	Y	Y	Common to locally uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Grasslands, savanna, open fields, pastures, cultivated lands, sometimes marshes (NatureServe 2010).
Western Meadowlark	*Sturnella neglecta*	W	W	W	W	W	W	W	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes grasslands, savannas, cultivated fields, and pastures, in lowland and mountain valleys, foothills, and open mountains (Subtropical and Temperate zones) (AOU 1998, NatureServe 2010).
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	M	M	M	M	M	M	M	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	In migration and winter in open cultivated lands, pastures and fields (AOU 1983, NatureServe 2010).
Brewer's Blackbird	*Euphagus cyanocephalus*	W	W	W	W	W	W	W	Common to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Shrubby and bushy areas (especially near water), riparian woodland, aspen parklands, cultivated lands, marshes, and around human habitation; in migration and winter also in pastures and fields (AOU 1983, NatureServe 2010).
Common Grackle	*Quiscalus quiscula*	Y	Y	Y	Y	Y	Y	W	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Partly open situations with scattered trees, open woodland, forest edge, marsh edges, islands, swamp thickets, coniferous groves, cities, suburbs, farms (NatureServe 2010).
Great-tailed Grackle	*Quiscalus mexicanus*	Y	Y	Y	Y	Y	Y	Y	Abundant	BC, EPW, LU, NBP, NNAP, SPOS	Partly open situations with scattered trees, cultivated lands, pastures, shores of watercourses, swamps, wet thickets, around human habitation, sometimes in marshes (NatureServe 2010).
Bronzed Cowbird	*Molothrus aeneus*	Y	S	S	S	S	S	S	Abundant to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Open country, ranches, roadside thickets, open woods, parks, orchards, pastures, around human habitation, open areas and fields with scattered bushes and low trees (NatureServe 2010).
Brown-headed Cowbird	*Molothrus ater*	Y	Y	Y	Y	Y	Y	Y	Common to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Breeding habitat includes woodland, forest (primarily deciduous), forest edge, city parks, suburban gardens, farms, and ranches. Cowbirds often are associated with forest-field edge habitat and clearings in forests. Feedlots, pastures, and fields with livestock also attract cowbirds, especially in predominately forested areas (NatureServe 2010).
Orchard Oriole	*Icterus spurius*	S	S	S	S	S	S	S	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Farms, suburbs, shade trees along roads, orchards, open woodlands, scattered trees in cultivated areas, riparian woods in prairie regions; also scrub, second growth, brushy hillsides (AOU 1983, NatureServe 2010).
Hooded Oriole	*Icterus cucullatus*			S		S		S	Uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Riparian woodland, palm groves, mesquite, arid scrub, deciduous woodland, around human habitation, city parks, suburbs (NatureServe 2010).

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
Bullock's Oriole	*Icterus bullockii*	M	M	S	M	S	M	S	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Open woodland, deciduous forest edge, riparian woodland, partly open situations with scattered trees, orchards, shade trees. In migration and winter also in humid forest edge, second growth, and scrub (NatureServe 2010).
Baltimore Oriole	*Icterus galbula*	M	M	M	M	M	M	M	Common to uncommon	BC, EPW, LU, NBP, NNAP, SPOS	Habitat includes open woodland, deciduous forest edge, riparian woodland, partly open situations with scattered trees, orchards, and groves of shade trees. In migration and winter this oriole also occurs in humid forest edge, second growth, and scrub; treetop level in coffee and cacao plantations, and savanna groves (NatureServe 2010).
Scott's Oriole	*Icterus parisorum*	S	S	S	S	S	S	S	Common to uncommon	BC, EPW	Yucca, pinyon-juniper, arid oak scrub and palm oases (upper Tropical to lower Temperate zones) (AOU 1983). Foothills, desert slopes of mountains, and more elevated semi-arid plains (Bent 1958, NatureServe 2010).
House Finch	*Carpodacus mexicanus*	Y	Y	Y	Y	Y	Y	Y	Uncommon to locally common	BC, EPW, LU, NBP, NNAP, SPOS	Arid scrub and brush, thornbush, oak-juniper, pine-oak association, chaparral, open woodland, towns, cultivated lands, savanna (Subtropical and Temperate zones) (AOU 1983, NatureServe 2010).
Pine Siskin	*Spinus pinus*	W	W	W	W	W	W	W	Common to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Habitats include various forests and woodlands, parks, and gardens and yards in suburban areas. In migration and winter, this species occurs in a variety of woodland and forest habitats, partly open situations with scattered trees, open fields, pastures, and savanna (AOU 1983, NatureServe 2010).
Lesser Goldfinch	*Spinus psaltria*	S	S	S	S	S	S	S	Uncommon to locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	Partly open situations with scattered trees, woodland edge, second growth, open fields, pastures, and around human habitation (upper Tropical to lower Temperate zones) (AOU 1983). Found in areas where water available (NatureServe 2010).
American Goldfinch	*Spinus tristis*	W	W	W	W	W	W	W	Uncommon to abundant	BC, EPW, LU, NBP, NNAP, SPOS	Associated with weedy fields, cultivated lands, open deciduous and riparian woodland, forest edge, second growth, shrubbery, orchards, and farmlands (AOU 1998, NatureServe 2010).
House Sparrow *	*Passer domesticus*	Y	Y	Y	Y	Y	Y	Y	Locally abundant	BC, EPW, LU, NBP, NNAP, SPOS	North America: cities, villages, farms, parks. Nests in cavities and in crevices of structures (NatureServe 2010).

1 – Source: Lockwood, Mark W. and Brush Freeman. 2004. The Texas Ornithological Society Handbook of Texas Birds. Texas A&M University Press: College Station. 261 pp.
Distribution Categories:
Y: Year-round occurrence (permanent resident) - occurs regularly within the defined range throughout the year and implies a stable breeding population

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

Common Name	Scientific Name	Distribution within SEP-HCP Plan Area[1]							Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]
		Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina			

S: Summer occurrence (summer resident) - implies a breeding population, although in some cases this population may be small
W: Winter occurrence (winter resident) - occurs regularly within the described range generally between December and February
M: Migration route (migrant) - occurs as a transient passing through the state in spring and/or fall (certain species may be migrants some regions and residents in others)
X: Signifies a single occurrence

2 – Source: Lockwood, Mark W. and Brush Freeman. 2004. The Texas Ornithological Society Handbook of Texas Birds. Texas A&M University Press: College Station. 261 pp.
Status and Abundance
Local: May be found only in specific habitats or geographical area within any region, possibly in small numbers
Abundant: Always present and in such numbers and with such general distribution in proper habitat that many may be found in a given day
Common: Normally present and in such numbers that one may expect to find several in a day
Uncommon: Normally present in proper habitat, but one cannot be sure in finding one in a day
Rare: On the average, it occurs regularly, although not on an annual basis
Very rare: Not expected, occurs regularly, although not on an annual basis
Casual: Between 6 and 15 records accepted for the state by the TBRC; only one or a few records for any given area, but reasonably expected to occur again
Accidental: Average of one or two records every 10 years

3 - Ecoregions of Occurrence - BC: Balcones Canyonlands; EPW: Edwards Plateau Woodland; LU: Llano Uplift; NBP: Northern Blackland Prairie; NNAP: Northern Nueces Alluvial Plains; SPOS: Southern Post Oak Savanna

4 - Sources:
American Ornithologists' Union (AOU). 1983. Check-list of North American Birds, 6th edition. Allen Press, Inc., Lawrence, Kansas. 877 pp.
American Ornithologists' Union (AOU). 1989. Thirty-seventh supplement to the American Ornithologists' Union Checklist of North American birds. Auk 106:532-538.
American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, DC. 829 pp.
Bent, A.C. 1958. Life histories of North American blackbirds, orioles, tanagers, and their allies. U.S. National Museum Bulletin 211. Washington, DC.
Brennan, L.A. 1999. Northern Bobwhite (COLINUS VIRGINIANUS). In A. Poole and F. Gill, editors, The Birds of North America, No. 397. The Birds of North America, Inc., Philadelphia, PA. 28 pp.
Calder, W.A. 1993. Rufous Hummingbird (SELASPHORUS RUFUS). In A. Poole and F. Gill, editors, The Birds of North America, No. 53. Academy of Natural Sciences, Philadelphia, and American Ornithologists' Union, Washington, DC. 20 pp.
Colwell, M.A. and J.R. Jehl Jr. 1994. Wilson's Phalarope; The Birds of North America. Vol. 3, No. 83. American Orinithologists' Union. The Academy of Natural Sciences of Philadelphia.
Dugger, K. M., and L. H. Fredrickson. 1992. Life history and habitat needs of the wood duck. U.S. Fish Wildl. Serv., Fish and Wildlife Leaflet 13(1.6). 8 pp.
Fischer, D. H. 1980. Breeding biology of curve-billed thrashers and long-billed thrashers in southern Texas. Condor 82:392-397.
Fischer, D. H. 1981. Wintering ecology of thrashers in southern Texas. Condor 83:340-346.
Fry, C. H., and K. Fry. 1992. Kingfishers, bee-eaters & rollers: a handbook. Princeton Univ. Press, Princeton, New Jersey. 324 pp. [344 pp.?]
Gammonley, J. H., and L. H. Fredrickson. 1995. Life history and management of the blue-winged teal. USDI National Biological Service, Waterfowl Management Handbook 13.1.8. 7 pp.
Gollop, J. B., T. W. Barry, and E. H. Iversen. 1986. Eskimo curlew: a vanishing species? Saskatchewan Natural History Society, Special Publication No. 17. 159 pp.
Hamel, P. B. 1992. The land manager's guide to the birds of the south. The Nature Conservancy, Chapel Hill, NC. 367 pp + several appendices.
Harrison, H. H. 1979. A field guide to western birds' nests. Houghton Mifflin Company, Boston. 279 pp.
Hill, D.P., and L.K. Gould. 1997. Chestnut-collared Longspur (CALCARIUS ORNATUS). In A. Poole and F. Gill, editors, The Birds of North America, No. 288. Academy of Natural Sciences, Philadelphia, and American Ornithologists' Union, Washington, DC. 20 pp.
Kushlan, J. A. 1979. Feeding ecology and prey selection in the white ibis. Condor 81:376-389.
Lowther, P. E. 1996. Le Conte's Sparrow (AMMODRAMUS LECONTEII). In: A. Poole and F. Gill, (eds.), The Birds of North America, No. 224. Philadelphia: The Academy of Natural Sciences; Washington D.C.: The American Ornithologists Union. 16 pp.
National Geographic Society (NGS). 1983. Field guide to the birds of North America. National Geographic Society, Washington, DC.
NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed February 15, 2011.
Oberholser, H.C. 1974. The bird life of Texas. 2 vols. Univ. of Texas Press, Austin.
Page, G. W., M. A. Stern, and P. W. C. Paton. 1995. Differences in wintering areas of snowy plovers from inland breeding sites in western North America. Condor 97:258-262.
Roberts, T. H. 1993. The ecology and management of wintering woodcocks. Pages 87-97 in J. R. Longcore and G. F. Sepik, editors. Proceedings of the eighth American woodcock symposium. U.S. Fish and Wildlife Service Biological Report 16. vi + 139 pp.
Spendelow, J. A. and S. R. Patton. 1988. National Atlas of Coastal Waterbird Colonies in the Contiguous United States: 1976-1982. U.S. Fish and Wildlife Service, Biological Report 88(5). x + 326 pp.

Table 4. Avian Wildlife Species Within the SEP-HCP Plan Area.

		Distribution within SEP-HCP Plan Area[1]									
Common Name	Scientific Name	Bexar	Blanco	Bandera	Comal	Kerr	Kendall	Medina	Status and Abundance[2]	Ecoregions of Occurrence[3]	Habitat Description[4]

WhatBird. 2008. WhatBird The Ultimate Field Guide (on-line search engine). Mitch Waite Group. 2005 - 2008. Last Accessed February 11, 2011. http://www.whatbird.com/browse/objs/All/birds_na_147/38/Location/886/Texas/default.aspx.
Winkler, K., D. W. Warner, and A. R. Weisbrod. 1992. The Northern Waterthrush and Swainson's Thrush as transients at a temperate inland stopover site. Pp. 384-402 IN J. M. Hagen III and D. W. Johnston (editors), Ecology and conservation of neotropical migrant landbirds. Smithsonian Institution Press, Washington, D.C.

* Non-native/introduced/exotic species

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DRAFT PRELIMINARY ASSESSMENT OF RARE AMPHIBIAN SPECIES OF THE SOUTHERN EDWARDS LATEAU HABITAT CONSERVATION PLAN

Eurycea salamanders of central Texas caves and springs

Prepared for Loomis Partners, Inc.
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Introduction

The proposed Plan Area of the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP) encompasses the following seven counties in Texas: Bexar, Bandera, Comal, Kendall, Kerr, Blanco and Medina counties. The following assessment covers rare amphibian species distributed within the Plan Area. Distribution data were collected primarily from Bendik (2006), Chippendale et al. (2000) and the Texas Memorial Museum (TMM) biological database. Other sources as indicated below.

All of the amphibians of concern that occur in the seven counties covered by the SEP-HCP are aquatic salamanders in the genus *Eurycea*.

Species Descriptions and Distributions

There are a total of seven salamander species in the genus *Eurycea* that occur within the range of the SEP-HCP Plan Area. All of these species are neotenic (i.e., they retain external gills and other larval features associated with a strictly aquatic life history, even after reaching reproductive maturity). All of these salamanders belong to the Blepsimolge clade, a group of neotenic salamander endemic to central Texas spring outflows and caves containing permanent water.

Table 1. Distribution of amphibian species within the SEP-HCP Plan Area.

Species	**Geographic Range** [1]	**Status**
Eurycea latitans (Cascade Caverns Salamander)	Springs and caves in Medina River, Guadalupe River, and Cibolo Creek watersheds within Edwards Aquifer area[2] Bexar Northern portion of county including the northern quarter of Camp Bullis[3] Comal Honey Creek Cave[5] Kendall Cascade Caverns Cascade Sinkhole Knee Deep Cave[5] Pfeiffer's Water Cave Schneider Ranch Cave	State Threatened IUCN vulnerable
Eurycea neotenes	Bandera	No listing status

[1] Unless otherwise noted, all locations were derived from Texas Memorial Museum records

[2] TPWD 2010

[3] Zara Environmental 2009

Species	Geographic Range [1]	Status
(Texas Salamander)	Haby Salamander Cave Bexar Helotes Spring[4] Leon Springs[4] Mueller's Spring[4] Morales Spring[5] Lost Dog Spring[5] Zizelman (Culebra) Spring[5] Sharron Spring[5] Stealth Cave[5] Comal Comal Springs Gay Nineties Cave Kendall Indian Cave Little Water Cave Victor Phillips Water Cave Medina Pecan Springs[5]	at this time Petitioned for federal listing IUCN vulnerable
Eurycea pterophila (Blanco River Springs Salamander; Fern Bank Salamander)	Blanco Zercher Spring[4] Boardhouse Spring[4] T-Cave[4] White Spring[5] Comal Bender's Cave (aka: Bender's Water Cave, Bartel's Cave) Rebecca Creek Spring[5] Preserve Cave Plumley Cave (aka: Spring Branch Cave, Spring Branch Cave No. 2)[6] Hays Fern Bank Spring[4] Grapevine Cave[4] Otte's Spring[5] Jacob's Well[7] Kendall Peavey's Springs[4] Cave Without a Name[5] Sattler's Deep Pit[5] Alzafar Cave[6] Behr's Cave (unconfirmed) Golden Fawn Cave[6]	No listing status at this time
Eurycea troglodytes complex (Valdina Farms sinkhole	Medina Valdina Farms Sinkhole	No listing status at this time

[4] Chippindale et al. 2000
[5] Bendik 2006
[6] Andrew Gluesenkamp, pers. comm.
[7] Lucas et al. 2009

Species	Geographic Range [1]	Status
salamander)	Kerr[5] Bandera[5] Edwards[5] Gillespie [8] Real Tucker Hollow Cave[5] Uvalde Carson Cave[5] Val Verde Four-Mile Cave	
Eurycea tridentifera (Comal Blind Salamander)	Bexar Elm Springs Cave Jabba's Giant Sink Comal Bad Weather Pit Calmbach Cave Camp Bullis Cave No. 1* Camp Bullis Cave No. 3* Chrinoid Pit Ebert Cave Grosser's Sink* Honey Creek Cave Kappelman Salamander Cave	State Threatened Petitioned for federal listing
Eurycea spp. 7 (Edwards Plateau spring Salamanders)	Vague-from Comal to Val Verde Counties[9] (see notes below on E. spp. 7)	No listing status at this time
Eurycea sp. 8 (Comal Springs Salamander)	Comal County Comal Springs[10] Hueco Springs[5]	No listing status at this time

*This species was designated as *Eurycea latitans* in Zara Environmental 2009.

Eurycea latitans
A member of the Blepsimolge clade. The taxonomic history of *E. latitans* is complicated, and was once regarded as a hybrid swarm between *E. neotenes,* a species with epigean (surface-dwelling, typically found in springs) morphology, and *E. tridentifera,* which exhibited characteristics of subterranean species (Sweet 1984). Chippindale (2000) extended the range of *E. latitans* from the type locality at Cascade Caverns in Kendall County (Smith and Potter 1946) to include spring and cave systems in the Cibolo and Guadalupe drainage basins. Bendik (2006) used mtDNA sequencing data to show that *E. latitans* was conspecific with *E. tridentifera* and belonged in a paraphyletic group which may also include *E. pterophila*.

Eurycea neotenes
The Texas salamander, is a member of the Blepsimolge clade. *E. neotenes* was originally described from Culebra Creek in Bexar County (Bishop and Wright 1937). The range was extended numerous times as more spring and cave populations of

[8] Chippindale 2000
[9] TPWD 2006
[10] 60 FR 31137 http://www.epa.gov/EPA-SPECIES/1995/June/Day-13/pr-295.html

Eurycea in Central Texas were assigned to the species, which was thought to be widespread throughout central Texas (Sweet 1978), and include populations in Gillespie, Kerr (Brown 1942), Kendall (Bishop 1943), Travis and Hays Counties (Brown 1950) until molecular evidence led to a re-evaluation by Chippendale et al. (2000), who described the range as being restricted to springs in northwestern Bexar County. Later work re-extended the range of this species to include parts of Comal County (Bendik 2006).

Eurycea pterophila,
Originally described from Fern Bank Springs in Hays County (Burger et al. 1950) is a member of the Blepsimolge clade, a group of neotenic salamander endemic to central Texas spring outflows and caves containing permanent water. *E. pterophila* forms a weakly supported monophyletic group whose range extends beyond the springs and caves of the Blanco River Basin as far as Kendall and Gillespie counties (Bendik 2006; Krejca, unpublished data). Members of this group are not readily distinguishable from others in the southeastern Blepsimolge clade, based on cytochrome *b* sequencing (Chippindale and Hillis 1994), and the taxonomic status of this species remains less clear than that of more strongly supported monophyletic groups.

Eurycea troglodytes group
A large species complex that, along with numerous undescribed species, makes up the western group of the Blepsimolge clade (Chippindale 2000, Chippindale et al. 2000, Hillis et al. 2001), a group of neotenic salamander endemic to central Texas spring outflows and caves containing permanent water. Like most other central Texas *Eurycea,* this species retains external gills and other larval features associated with a strictly aquatic life history, even after it reaches reproductive maturity. The *E. troglodytes* complex has a complicated taxonomic history in which species boundaries are poorly understood (Chippindale et al. 2000). The original description of *E. troglodytes* limited the distribution to the Valdina Farms Sinkhole in Medina County (Baker 1957), and Sweet (1984) considered *E. troglodytes* a hybrid swarm that resulted from the occasional breeding of individuals of *E. tridentifera* with a population of *E. neotenes.* The taxonomy and range was revised in Chippindale (2000) as a complex of multiple distinct species that were unlikely to be of hybrid origin. The *E. troglodytes* complex includes populations from several discrete localities in north-western Medina, Real, Kerr, Bandera, Edwards, Uvalde and Gillespie counties; although Chippindale (2000) noted that the population from the type locality at Valdina Farms Sinkhole may have since become extirpated.

Eurycea tridentifera
A member of the Blepsimolge clade, a group of neotenic salamander endemic to central Texas caves containing permanent water. This species exhibits the most strongly cave adapted morphology (shovel-nose, lack of pigment, and long, slender appendages) in the Blepsimolge clade (Bendik 2006). Like most other central Texas *Eurycea,* this species retains external gills and other larval features associated with a strictly aquatic life history, even after it reaches reproductive maturity. This species was originally described from Honey Creek Cave in Comal County (Mitchell and Reddell 1965). The species range was extended to include several caves in the Cibolo Sinkhole Plain in Comal and Bexar counties (Sweet 1984, Chippindale et al. 2000). Recent genetic work suggests that this species be synonomized with *E. latitans* (Bendik 2006), and many taxonomists recognize *E. tridentifera* only as a cave adapted morph of *E. latitans* and not as a distinct species (Andrew Gluesenkamp, pers. comm.).

The Edwards Plateau spring salamander, Eurycea spp. 7
A catch-all designation that contains undescribed species of salamander in the *Eurycea* genus on the Edwards Plateau. The *Eurycea spp. 7* group ranges from Travis to Val Verde Counties (TPWD 2010); however, the only known population within the limits of the SEP-HCP Plan Area is a group of undescribed *Eurycea* located on Camp Bullis Military Reservation (referred to as "Area 9 Group" in Zara Environmental 2009).

The Comal Springs salamander, Eurycea sp. 8
A potentially undescribed species of salamander, however the morphology and genetics of this species is very similar to that of *E. neotenes*, and Bendik (2006) suggests that this "species" be synonomized with *E. neotenes* and the Comal and Hueco Springs collections be treated as a range extension.

Habitat Requirements

Central Texas neotenic salamanders live in the aquifer and have been collected from caves with perennial water, flowing springs, and wells. Spring-associated *Eurycea* have been collected from spring outflows, spring runs, and from gravel substrate downstream of spring outlets in rivers and streams. Cave dwelling *Eurycea* are observed within perennial underground pools, although they typically lack access to the same substrates as the spring species.

Threats

Threats to species inhabiting the karst environment include the direct destruction of habitat (by mechanical destruction, filling in, siltation), contamination from pollutants, and the alteration of the surrounding ecosystem, including the introduction of non-native species. Groundwater species are subject to additional threats, such as aquifer drawdown caused by increased rates of urbanization and drought and the destruction of spring habitats.

Rapid urbanization and agricultural development occurring around the springs and over the Edwards Aquifer threaten to degrade the salamanders' habitat through habitat loss and the increased siltation of the aquifer and springs (Hillis et al. 2001, Pennington 2002, Bendik 2006). Contamination to groundwater has a negative impact on both the spring dwelling and cave dwelling species of salamander, since both are aquatic. Habitat loss occurs both when springs are destroyed mechanically and when they cease to flow due to aquifer drawdown. Habitat loss in caves occurs when the cave is filled in or heavily silted, and when the water table drops low enough to cause caves with typically perennial water to become dry.

Other threats to the continued persistence of these species include human disturbances resulting in aquifer drawdown and decreased spring flow, and competition with or predation by non-native species (Bendik 2006). Many of these species are geographically restricted, making them especially vulnerable to disturbances, which could lead to a decrease in population size. Smaller populations are more susceptible to problems associated with reduced genetic variability (Storfer 1999) and heterozygosity (Coyne 1984).

Data Gaps

Very little is known of the life history of these species. Currently known distributions may not represent the true range of these species because of incomplete or a lack of survey data. The aquatic subterranean environment is notoriously difficult to sample, and salamanders can often only be captured at spring outflows or in caves. These salamanders are thought to "retreat" underground when springs and caves dry up, however their habits while underground are largely unknown.

Literature Cited

Baker, J. K. 1957. *Eurycea troglodytes:* A new blind cave salamander from Texas. Texas Journal of Science 9: 328-336

Bendik, N. F. 2006. Population genetics, systematics, biogeography, and evolution of the southeastern central Texas *Eurycea* clade Blepsimolge. (Plethodontidae). Master's thesis, The University of Texas at Arlington. 127 pp.

Bishop, S. C. 1943. A Handbook of Salamanders. The Salamanders of the United States, of Canada, and of Lower California. Comstock Publishing Company, Ithaca, New York.

Bishop, S. C., and M.R. Wright. 1937. A new neotenic salamander from Texas. Proceedings of the Biological Society of Washington, 50:141-143.

Brown, B. C. 1942. Notes on *Eurycea neotenes*. Copeia 3: 176.

Brown, B. C. 1950. An annotated check list of the reptiles and amphibians of Texas. Baylor University Press, Waco, Texas.

Burger, W. L., H. M. Smith, and F. E. Potter, Jr. 1950. Another neotenic *Eurycea* from the Edwards Plateau. Proceedings of the Biological Society of Washington 63: 51-58.

Chippindale, P. T. 2000. Species boundaries and species diversity in the central Texas hemidactyliine plethondontid salamanders, genus *Eurycea*. In Bruce, R.C., R.G. Jaeger and L.D. Houck, (eds.), The Biology of Plethondontid Salamanders, pp. 149-165. Kluwer Academic/Plenum Publishers, New York.

Chippindale, P. T., A. H. Price, J. J. Wiens, and D. M. Hillis. 2000. Phylogenetic relationships and systematic revision of central Texas hemidactyliine plethodontid salamanders. Herpetological Monograhps 14:1-80.

Chippindale, P. T., and D. M. Hillis. 1994. Relationships, status and distribution of central Texas hemidactyliine plethodontid salamanders (*Eurycea* and *Typhlomolge*). Final Section 6 Report prepared for Texas Parks and Wildlife Department, Austin, Texas.

Coyne, J. A. 1984. Correlation between heterozygosity and rate of chromosome evolution in animals. The American Naturalist 123: 725-729.

Hillis, D. M., D. A. Chamberlain, T. P. Wilcox and P. T. Chippindale. 2001. A new species of subterranean blind salamander from Austin, Texas, and a systematic revision of central Texas paodomorphic salamanders. Herpetologica 57: 266–280.

Longley, G. 1978. Status of *Typhlomolge* (= *Eurycea*) rathbuni, the Texas blind salamander. U.S. Fish and Wildlife Service Region 2, Endangered Species Report (2), Albuquerque, New Mexico.

Lucas, L. K., Z. Gompert, J. R. Ott, and C. C. Nice. 2009. Geographic and genetic isolation in spring-associated *Eurycea* salamanders endemic to the Edwards Plateau region of Texas. Conservation Genetics 10: 1309-1319.

Mitchell, R. W., and J. R. Reddell. 1965. *Eurycea tridentifera*, a new species of troglobitic salamander from Texas and a reclassification of *Typhlomolge rathbuni*. Texas Journal of Science 17:12–27.

Pennington, S. 2002. *Eurycea nana* (On-line), Animal Diversity Web. http://animaldiversity.ummz.umich.edu/site/accounts/information/Eurycea_nana.html, accessed March 26, 2010.

Smith, H. M., and F. E. Potter, Jr. 1946. A third neotenic salamander of the genus *Eurycea* from Texas. Herpetologica 3: 105-109.

Storfer, A. 1999. Gene flow and endangered species translocations: a topic revisited. Biological Conservation 87: 173-180.

Sweet, S. S. 1978. The evolutionary development of the Texas *Eurycea* (Amphibia: Plethodontidae). Ph.D. Dissertation, University of California, Berkeley, California, U.S.A.

Sweet, S. S. 1984. Secondary contact and hybridization in the Texas cave salamanders *Eurycea neotenes* and *E. tridentifera*. Copeia 1984: 428–441.

Texas Parks and Wildlife Department. 2006. Edwards Plateau Spring Salamanders, *Eurycea* sp. 7, IN: Rare, Threatened, and Endangered species of Texas. Revision date: 5/26/2006. http://gis.tpwd.state.tx.us/TpwEndangeredSpecies. Accessed May 20, 2010.

Texas Parks and Wildlife Department. 2010. Annotated County Lists of Rare Species, Comal County. Last revision March 12, 2010.

U.S. Fish and Wildlife Service (USFWS). 2008. Draft Bexar County Karst Invertebrate Recovery Plan. U. S. Fish and Wildlife Service, Albuquerque, New Mexico. 125 pp.

Zara Environmental LLC. 2009. Hydrogeological, biological, archeological, and paleontological karst investigations, Camp Bullis, Texas, 1993-2009). Report prepared for: Natural and Cultural Resources, Environmental Division, Bldg. 4196, 2202 15th Street, Fort Sam Houston, Texas, 78234. Submitted on 1 November 2009. 2775 pp.

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DRAFT PRELIMINARY ASSESSMENT OF RARE ARACHNID SPECIES OF THE SOUTHERN EDWARDS PLATEAU HABITAT CONSERVATION PLAN AREA

Cicurina madla, Government Canyon State Natural Area

Prepared for Loomis Partners, Inc.
3101 Bee Cave Road, Suite 100
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30 March 2011

Introduction

The proposed Plan Area of the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP) encompasses the following seven counties in Texas: Bexar, Bandera, Comal, Kendall, Kerr, Blanco and Medina counties. The following assessment covers rare arachnid species distributed within the Plan Area. Distribution data were collected using the Texas Memorial Museum (TMM) biological database, TEXBIO. Species were included in this assessment if they are known from five or fewer localities or they are endemic to the Plan Area. This criterion was chosen to match the NatureServe Global Conservation status ranking. These are species that are assigned a critical (G1) designation, as they only known to occur in five or fewer localities.

Species' Status

The species listed in Table 1 are not federally or state listed as endangered or threatened, although some are classified as globally imperiled in the NatureServe Explorer conservation database (2009) and by the World Conservation Union (IUCN). Two of the *Cicurina* species and one *Texella* species are included as "evaluation species" in the draft Comal County Regional Habitat Conservation Plan (SWCA et al. 2009).

Species Descriptions and Distributions

There are a total of 40 rare arachnid species that occur within the range of the SEP-HCP Plan Area. Many of these species are cave obligates, with morphological and physiological adaptations suited for the subterranean environment. These adaptations include elongated appendages, absent or reduced eyes, and lowered metabolic and reproductive rates (Culver 1982). Based on the most current data, all of these species' currently known distributions are highly restricted (TMM 2009).

Table 1. Distribution of rare arachnid species within the SEP-HCP Plan Area[1].

Species	County Range	# of Known Localities	NatureServe Global Status Conservation Rank[2]	Regulatory Protection Status
Cicurina bandera	Bandera	1	G1G2	None
Cicurina brunsi	Bexar	1		None
Cicurina bullis	Bexar	4		None
Cicurina gatita	Bexar	1		None
Cicurina loftini	Bexar	2		None
Cicurina mckenziei	Bandera	1	G1G2	None
Cicurina neovespera	Bexar	2		None
Cicurina obscura	Bandera	1	G1G2	None
Cicurina pampa	Bexar	9		None
Cicurina platypus	Bexar	3		None
Cicurina puentecilla[*]	Comal	1	G1G2	None
Cicurina reclusa[*]	Comal	2	G1G2	None
Cicurina sprousei	Bandera	1	G1G2	None
Cicurina stowersi	Kerr	1	G1G2	None
Eidmannella nasuta	Medina	1		None
Erigone n. sp.	Bexar	1		None
Leptoctenus byrrhus	Bexar	2		None
Neoantistea mulaiki	Bexar	2		None
Neoleptoneta bullis	Bexar	1		None
Neoleptoneta coeca	Comal	2		None
Neoleptoneta n. sp. 3	Comal	1		None
Neoleptoneta n. sp. 4	Comal	1		None
Neoleptoneta n. sp. 5	Bandera	2		None
Neoleptoneta n. sp. 6	Bexar	1		None
Neoleptoneta n. sp. 11	Bexar	1		None
Neoleptoneta n. sp. 12	Bexar	1		None
Neoleptoneta n. sp. 13	Medina	1		None
Neoleptoneta n. sp. 14	Bexar	1		None

Table 1, cont. Distribution of rare arachnid species within the SEP-HCP Plan Area[1].

Species	County Range	# of Known Localities	NatureServe Global Status Conservation Rank[2]	Regulatory Protection Status
Aphrastocthonius n. sp. 2	Bandera	1		None
Tartarocreagris amplyopa	Bexar	1		None
Tartarocreagris reyesi	Bexar	3		None
Texella brevidenta[*]	Comal	2	G1G2	None
Texella elliotti	Bexar	2		None
Texella hardeni	Bandera Kerr	4	G1G2	None
Texella hilgerensis	Bexar	2		None
Texella new species	Medina	1		None
Texella whitei	Bexar	2		None
Texella tuberculata	Bexar	2		None
Texella youngensis	Bexar	1		None

[1]All distribution data was taken from TMM (2009), Reddell and Cokendolpher (2004), Ubick and Briggs (2004) and Gertsch (1992).
[2] NatureServe Global Conservation Status Rank of G1/G2- Critically Imperiled to Imperiled.
[*] Species included as "evaluation species" in the draft Comal County Regional Habitat Conservation Plan.

Habitat Requirements

All of these rare arachnid species are found within the subterranean environment. Habitat requirements include subterranean spaces in karst, suitable substrates (for example, spaces between and underneath rocks suitable for foraging and sheltering), stable temperatures, and constant high humidity (Mitchell 1971, Culver 1982). Relative humidity for caves supporting troglobitic invertebrates is typically 100 percent (Elliott and Reddell 1989).

As with the listed karst invertebrates in Bexar County, these species rely heavily on the overall health of the surface community. The surface plant and animal communities contribute components for energy input such as leaf litter, cave crickets and other trogloxenes (i.e. animals that spend only a portion of their life cycle within the cave).

Threats

Threats to these species are the same as those for the nine federally listed Bexar County invertebrates and include the following (USFWS 2008):
Destruction of karst habitat by construction, filling in, and vandalism;
Contamination from sewer leaks, runoff, pesticides, and other sources;

Spread of non-native species; and
Alteration of surface vegetative and animal communities.

Data Gaps

Very little is known of the life history of these species. Most are top predators in their food web and depend highly on the health and maintenance of the lower trophic levels.

Currently known distributions may not represent the true range of these species because of incomplete or a lack of survey data. Therefore, the described range of one or more of these species may increase as other karst features across the Plan Area are investigated further.

Literature Cited

Culver, D. C. 1982. Cave Life. Evolution and Ecology. Harvard University Press, Cambridge, Massachusetts. 189 pp.

SWCA Environmental Consultants, Smith, Robertson, Elliott, Glen, Klein & Bell, L.L.P., Prime Strategies, Inc., Texas Perspectives, Inc., and Capitol Market Research, Inc. 2009. Final draft: Comal County Regional Habitat Conservation Plan. April 1, 2009. Prepared for Comal County, Texas. SWCA Proj. No. 12659-139-AUS. 126 pp.

Elliott, W. R. and J. R. Reddell. 1989. The status and range of five endangered arthropods from caves in the Austin, Texas, region. A report on a study supported by the Texas Parks and Wildlife Department and Texas Nature Conservancy for the Austin Regional Habitat Conservation Plan. 100 pp.

Gertsch, W. J. 1992. Distribution patterns and speciation in North American cave spiders with a list of the troglobites and revision of the cicurinas of the subgenus *Cicurella*. Texas Memorial Museum. Speleological Monographs 3: 75-122.

Mitchell, R. W. 1971. Preference responses and tolerance of the troglobitic carabid beetle *Rhadine subterranean*. Speleology. 3: 249-270.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. http://www.natureserve.org/explorer, Accessed May 06, 2010. 2010.

Reddell, J. R. and J. C. Cokendolpher. 2004. The cave spiders of Bexar and Comal counties, Texas. Texas Memorial Museum, Speleological Monographs 6: 75-94.

Texas Memorial Museum (TMM). 2009. *TEXBIO* database, The University of Texas at Austin. Accessed March 18, 2010.

Ubick, D. and T. S. Briggs. 2004. The harvestman family Phalangodidae. 5. New records and species of *Texella* Goodnight and Goodnight (Opiliones: Laniatores). Texas Memorial Museum, Speleological Monographs, 6: 101-141.

U.S. Fish and Wildlife Service (USFWS). 2008. Draft Bexar County Karst Invertebrate
Recovery Plan. U. S. Fish and Wildlife Service, Albuquerque, New Mexico. 125 pp.

OTHER BIRD SPECIES OF CONCERN

RESOURCE ASSESSMENT

FOR THE SOUTHERN EDWARDS PLATEAU HABITAT CONSERVATION PLAN

DRAFT SEPTEMBER 15, 2010

1.0 INTRODUCTION

This preliminary resource assessment describes the current status and habitat requirements of other bird species of concern that occur in the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP) Plan Area. The purpose of this assessment is to help develop the conceptual framework for the SEP-HCP and provide the basic background information for the Habitat Conservation Plan and associated Environmental Impact Statement.

This list of species was based on the Texas Parks and Wildlife Department (TPWD) county lists of rare species (obtained March 12, 2010) for Bandera, Bexar, Blanco, Comal, Kendall, Kerr, and Medina counties. These county lists of rare species identify vertebrates, invertebrates, and vascular plants of conservation concern within the state of Texas, and include information on the federal and state regulatory status, county occurrence, and brief life history and habitat descriptions.

Additional information for this review was obtained from the U.S. Fish and Wildlife Service's (USFWS) Federal Register and web-based species databases, TPWD wildlife fact sheets and books, journal articles, natural history books, the Birds of North America Online, and NatureServe's Online Encyclopedia of Life. NatureServe assesses the conservation status, taxonomy, distribution, and life history information of species and ecosystems throughout North America by utilizing databases maintained by natural heritage program scientists and other collaborators. They use this information to assign global, national, and state conservation status ranks to each species it tracks (see www.natureserve.org for more information).

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TABLE 1: OTHER BIRD SPECIES OF CONCERN REGULATORY STATUS, OCCURRENCE, AND HABITAT CHARACTERISTICS WITHIN THE SEP-HCP PLAN AREA.

Common Name	Scientific Name	Federal Regulatory Status[1]	State Regulatory Status[1]	Occurrence within the Plan Area[2]	Habitat Characteristics within the Plan Area
Baird's Sparrow	*Ammodramus bairdii*			C	May rarely occur during migration in the spring and fall in habitats that include grasslands, weedy fields, hay fields, and bare ground on the margins of water bodies.
Western Burrowing Owl	*Athene cunicularia hypugaea*			W/M	Open grasslands such as prairies and savannas where it is associated with mammal burrows (i.e., black-tailed prairie dog (*Cynomys ludovicianus*)), but it also can be associated with human development such as golf courses, cemeteries, airports, and vacant lots.
Zone-tailed Hawk	*Buteo albonotatus*		T	W/C	Little information available about migration and winter range habitat preferences.
Mountain Plover	*Charadrius montanus*			W/M	Very rarely associated with water and can be found in open, flat, short grasslands or fallow agricultural fields.
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T	M	Occupies wide range of habitats during migration, including urban areas.
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL		M	Occupies wide range of habitats during migration, including urban areas.
Whooping Crane	*Grus americana*	E	E	M	Utilize a variety of habitat types, including freshwater marshes, wet prairies, inland lakes, upland grain fields, and riverine systems.
Bald Eagle	*Haliaeetus leucocephalus*	DL	T	W/M	Found primarily near rivers, large lakes, and reservoirs.
Wood Stork	*Mycteria americana*		T	C	Utilizes prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water.
White-faced Ibis	*Plegadis chihi*		T	W/M	Prefers freshwater marshes, sloughs, and irrigated rice fields as well as other areas with ponded freshwater.
Sprague's pipit	*Anthus spragueii*	C		W/M	Utilizes grazed grasslands or pastures or weedy fields.

TABLE 1: OTHER BIRD SPECIES OF CONCERN REGULATORY STATUS, OCCURRENCE, AND HABITAT CHARACTERISTICS WITHIN THE SEP-HCP PLAN AREA.

Common Name	Scientific Name	Federal Regulatory Status[1]	State Regulatory Status[1]	Occurrence within the Plan Area[2]	Habitat Characteristics within the Plan Area
Interior Least Tern	*Sterna antillarum athalassos*	E	E	M/C	May be rarely found along open sand, shell, and gravel beaches, sandbars, and islands that have little to no vegetation associated with major riverine systems and reservoirs.

[1] E - ENDANGERED; T - THREATENED; DL - DELISTED; C - CANDIDATE
[2] B - BREEDING; W - WINTERING; M - MIGRATION; C - CASUAL

2.0 SPECIES DESCRIPTIONS, REGULATORY STATUS, AND HABITATS

2.1 BAIRD'S SPARROW

The Baird's sparrow (*Ammodramus bairdii*) is a small, brownish, streaked sparrow with an average length of 4.7 inches (Green et al. 2002). Its breeding range includes the northern Great Plains region and the species uses breeding habitats that are generally characterized as native grassland or prairie. Baird's sparrow winters in the Trans-Pecos region of southwest Texas in areas of open grasslands and overgrown fields (American Ornithologists' Union (AOU) 1983). Within the Plan Area, the Baird's sparrow may rarely occur during migration in the spring and fall in habitats that include grasslands, weedy fields, hay fields, and bare ground on the margins of water bodies (Green et al. 2002).

The Baird's sparrow is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. In 1997, the USFWS was petitioned to list this species as threatened with critical habitat; however, on May 13, 1999 USFWS found that the petition was not warranted (64 FR 27747). Currently, the Baird's sparrow is protected under the Migratory Bird Treaty Act, and the USFWS Migratory Bird Management Office lists it as a Species of Management Concern (USFWS 2008). NatureServe identifies the conservation status of Baird's sparrow in Texas as "imperiled" due to very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

Major threats to this species include conversion of native prairie to agricultural use, vegetation succession due to the lack of grazing and fire, and invasion of non-native species (Green et al. 2002, 64 FR 27747, NatureServe 2009).

2.2 WESTERN BURROWING OWL

The western burrowing owl (*Athene cunicularia hypugaea*) is a small, long-legged and ground-dwelling owl that occurs year-round in most of Texas (with the exception of the eastern portion of the state) (Lockwood and Freeman 2004). The species' breeding range encompasses the western portion of the state; however, the owl can be observed in the central and southern portion of the state during the winter (Lockwood and Freeman 2004). The western burrowing owl may be found less commonly during migration and as a winter visitor in the SEP-HCP Plan Area (Lockwood and Freeman 2004, Haug et al. 1993). The breeding and wintering habitats for the owl include open grasslands such as prairies and savannas where it is associated with mammal burrows (i.e., black-tailed prairie dog (*Cynomys*

ludovicianus)), but it also can be associated with human development such as golf courses, cemeteries, airports, and vacant lots (Haug et al. 1993, NatureServe 2009).

The western burrowing owl is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the conservation status of the breeding population of the species within Texas as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009). Others have identified this species as a "species of concern" due a lack of a comprehensive assessment of the species' state population status (McIntyre 2004).

Activities negatively impacting the population viability of the western burrowing owl include the conversion of grasslands to agriculture use, habitat fragmentation and degradation, and vehicular collisions (Haug et al. 1993, NatureServe 2009, Lockwood and Freeman 2004).

2.3 ZONE-TAILED HAWK

The zone-tailed hawk's (*Buteo albonotatus*) breeding range in Texas includes the Big Bend region, north to the Davis Mountains, and east to Real and Kerr Counties (Johnson et al. 2000, Oberholser 1974). Also, the species is very rarely found to be a visitor as far east as Bexar and Travis counties (Lockwood 2001), with records of occurrence outside of the typical breeding range in Bell, Bastrop, Bexar, Colorado, and Victoria counties (Lockwood and Freeman 2004). This species utilizes a variety of habitat types for nesting and hunting that include arid open areas, riparian forests, and mixed-conifer forests (Johnson et al. 2000, NatureServe 2009). Little information is available about migration and winter range habitat preferences (Johnson et al. 2000).

The zone-tailed hawk is listed as threatened by the State of Texas, but is not a federally listed species or a candidate for federal listing. NatureServe identifies the conservation status of the breeding population of the species in Texas as "vulnerable" due to a restricted range, relatively few populations, recent and widespread declines or other factors that make it vulnerable to extirpation (NatureServe 2009).

Information regarding the threats to the zone-tailed hawk is limited, except that disturbances at nest sites increase the likelihood of mortality, and habitat degradation from water development projects and rural and agricultural development has decreased habitat suitability (Johnson et al. 2000). Pesticide accumulation in prey items may also be a threat (NatureServe 2009).

2.4 MOUNTAIN PLOVER

The mountain plover (*Charadrius montanus*) is a shorebird that is very rarely associated with water and can be found in open, flat, short grasslands or fallow agricultural fields (Knopf and Wunder 2006, NatureServe 2009, Lockwood and Freeman 2004). The bird breeds in the northwestern portion of Texas, as well as at an isolated location in the Davis Mountains (Lockwood and Freeman 2004). It can also be rarely observed during migration and in the winter across much of Texas (with the exception of the eastern portion of the state) particularly to the southeast and northwest of the SEP-HCP Plan Area (Lockwood and Freeman 2004, Knopf and Wunder 2006, NatureServe 2009). Recently, Fennell (2002) documented the mountain plover in Williamson County near Granger, Texas using fallow agricultural fields in the winter.

The mountain plover is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. The USFWS had previously indentified the mountain plover as a candidate for listing in 1982, and the species was formally proposed for listing in 1999. However, the proposed listing was withdrawn in 2003 because new information indicated that threats to the species were not as significant as earlier believed (68 FR 53083). NatureServe identifies the conservation status of the species within Texas as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

Threats to this species include degradation of habitat, conversion of prairie to agriculture, and agriculture activities such as tilling and pesticide application (Knopf and Wunder 2006, NatureServe 2009). However, USFWS reviewed threats and recent information and concluded that nesting habitat for the species does not appear to be limiting and that distribution of plovers across the wintering range appears to depend more on annual farming practices and weather conditions, rather than on permanent habitat destruction (68 FR 53083).

2.5 PEREGRINE FALCON

Nineteen subspecies are recognized for the peregrine falcon (*Falco peregrinus*) and three of them (*F. p. anatum*, *F. p. pealei*, and *F. p. tundrius*) occur in North America (White et al. 2002). The following two subspecies of the peregrine falcon may occur within the State of Texas, and they may also rarely occur within the SEP-HCP Plan Area during migration. Major threats to the peregrine falcon include insecticide accumulation in prey items, habitat loss, human disturbance, illegal collection and indiscriminate shooting (Campbell 2003).

2.5.1 AMERICAN PEREGRINE FALCON

The American peregrine falcon (*Falco peregrinus anatum*) nests on mountain cliffs and river gorges which generally exceed 200 feet in height (Campbell 2003). The species is an uncommon to rare migrant throughout the state, and is a rare to very rare winter resident occupying primarily urban areas from the coast inland to north-central Texas (Lockwood and Freeman 2004). The American peregrine falcon is a year-round resident in the Trans-Pecos with breeding populations confined to the Guadalupe and Chisos Mountains and the cliffs that line the Rio Grande, but may appear in the SEP-HCP Plan Area as a migrant (Campbell 2003). Fall migrants are noted around the state as early as mid-July, and spring birds may linger as late as early May (Lockwood and Freeman 2004).

The American peregrine falcon was listed by the USFWS as federally endangered in 1970 due to population declines linked to the use of organochlorine pesticides. By the late 1990's, recovery goals for the subspecies were substantially exceeded in some areas and the species was removed from the Federal List of Endangered and Threatened Wildlife in 1999 (64 FR 46541). The American peregrine falcon is currently identified as threatened by the State of Texas (TPWD 2010). NatureServe identifies the conservation status of the breeding population of the species within Texas as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

2.5.2 ARCTIC PEREGRINE FALCON

The Arctic peregrine falcon (*Falco peregrinus tundrius*) is slightly smaller in size and lighter in color than the American peregrine falcon (Campbell 2003). It is an uncommon to rare migrant

throughout the state and is a locally uncommon winter resident on the Coastal Prairies, but can be common at times along the intermediate coast, particularly near bays and estuaries (Lockwood and Freeman 2004). Like the American peregrine falcon, the arctic peregrine falcon may appear in the SEP-HCP Plan Area as a migrant (Campbell 2003). Fall migrants are noted as early as mid-July, and spring birds may linger as late as early May (Lockwood and Freeman 2004).

This species is no longer listed as threatened or endangered by the State of Texas (TPWD 2010). The falcon was removed from the Federal list of endangered and threatened wildlife in October 1994 (59 FR 50796). NatureServe identifies the conservation status of the nonbreeding population of the species within Texas as "vulnerable" due to a restricted range, relatively few populations, recent and widespread declines or other factors that make it vulnerable to extirpation (NatureServe 2009).

2.6 WHOOPING CRANE

The whooping crane (*Grus americana*) is a migratory bird that winters along the Texas coast. The coastal wintering grounds are dominated by salt grass (*Distichlis spicata*), saltwort (*Batis maritima*), smooth cordgrass (*Spartina alterniflora*), glasswort (*Salicornia* sp.), sea ox-eye (*Borrichia frutescens*), and Gulf cordgrass (*Spartina spartinae*) (Campbell 2003, Lewis 1995). During migration, whooping cranes are known to utilize a variety of habitat types, including freshwater marshes, wet prairies, inland lakes, upland grain fields, and riverine systems (Campbell 2003, Lewis 1995). Migration occurs across the central portion of the state to or from the central coast during October-November and again in April (Lockwood and Freeman 2004). The narrow migration corridor utilized by this species occurs in a northwesterly direction from Aransas County on the coast across central Texas (Travis, Williamson, and Burnet Counties) towards north-central Texas and the eastern portion of the Panhandle. Most of the SEP-HCP Plan Area falls to the west of this corridor, however documentation of whooping cranes just to the east and west of the migration corridor has occurred (Lockwood and Freeman 2004).

The whooping crane was federally listed as endangered in June 1970 (35 FR 8491). Critical habitat for the species was designated in May 1978 (43 FR 20938) and includes the species' wintering range in the Aransas National Wildlife Refuge and vicinity of the Texas Gulf coast. The State of Texas also lists the whooping crane as endangered. NatureServe identifies the conservation status of the species in Texas as "critically imperiled" due to extreme rarity or because of some factor(s) such as very steep declines that make it especially vulnerable to extirpation (NatureServe 2009).

Major threats for the whooping crane include habitat loss, human disturbance (particularly on the breeding grounds at Wood Buffalo National Park, Alberta), and collisions with stationary objects like power lines and poles (Lewis 1995). On March 11, 2010 The Aransas Project filed a federal lawsuit against Texas Commission on Environmental Quality (TCEQ) for illegal harm and harassment of the species at the Aransas National Wildlife Refuge leading to take in violation of Section 9 of the Endangered Species Act (The Aransas Project 2010).

2.7 BALD EAGLE

The bald eagle (*Haliaeetus leucocephalus*) is found year-round in Texas, and the Texas population includes both breeding populations and winter residents. Breeding populations are typically found in the eastern half of the state and along the Texas Gulf Coast. However, the species has been known to breed at some localized sites in central Texas. Most wintering populations have been observed in the Texas Panhandle and the central and eastern portions of the state. Spring and fall migrants can be found throughout the state (Campbell 2003). Bald eagle breeding and wintering habitat

must include bodies of open water like reservoirs and rivers. Tall trees are essential for nesting sites during the breeding season, while abundant waterfowl and fish are needed as prey items during the winter (Campbell 2003). The SEP-HCP Plan Area includes Canyon Lake (Comal County) and Medina Lake (Medina and Bandera Counties), which may provide suitable habitat for the eagle; however, breeding or wintering populations are not known from either of these locations (Campbell 2003, TPWD 2010). Campbell (2003) indicates that the species is known to winter in Kerr and Kendall counties (presumably associated with the Guadalupe River).

The bald eagle is a Texas threatened species, but it was removed from the Federal list of endangered and threatened wildlife in July 2007 (72 FR 37346). The species will be monitored by the USFWS, in cooperation with the Texas and other states for a minimum of five years after delisting. The species is still protected by the Bald and Golden Eagle Protection Act (16 USC 668-668d), which prohibits "take" of bald and golden eagles and provides a statutory definition of "take" that includes "disturb". NatureServe identifies the conservation status of the nonbreeding and breeding population of the species within Texas as "vulnerable" due to a restricted range, relatively few populations, recent and widespread declines or other factors that make it vulnerable to extirpation (NatureServe 2009).

Some of the threats that this species face are pesticide accumulation in the environment, ingestion of plastics and lead, human disturbance at nest and roost sites, and degradation of habitat (Buehler 2000).

2.8 WOOD STORK

The wood stork (*Mycteria americana*) is the only stork that breeds in the United States, and this species is strongly associated with shallow salt- and freshwater wetlands in the Southeast where it feeds in groups (Coulter et al. 1999). The current breeding range in the U.S. for this species is Florida, Georgia, and South Carolina; however postbreeding dispersal, from Mexican breeding colonies, occurs along the Gulf Coast with rare sightings in the eastern third of Texas (Coulter et al. 1999, Lockwood and Freeman 2004). Utilization of the SEP-HCP Plan Area by wood stork is likely to be rare due to the lack of suitable wetland habitat in this region. However, the species is rarely known to be a postbreeding wanderer to the eastern Edwards Plateau region (Lockwood 2001) and Oberholser (1974) lists a number of historical sightings of the species in Bexar, Medina, Bandera, and Kerr counties.

The breeding population of the wood stork was listed as endangered on February 28, 1984 in Alabama, Florida, Georgia, North Carolina, and South Carolina (49 FR 7332), but the species is not federally listed as threatened or endangered in Texas. The wood stork is listed as threatened by the State of Texas. Within Texas, NatureServe identifies the conservation status of the nonbreeding population as "imperiled" (due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation) and the breeding population of the species as "possibly extirpated" (a species or community that occurred historically in the state and there is some possibility that it may be rediscovered) (NatureServe 2009).

The wood stork faces challenges within its breeding range from habitat loss and degradation, disturbance at nest, roost, and foraging sites, and bioaccumulated toxic materials like mercury (Coulter et al. 1999).

2.9 WHITE-FACED IBIS

The white-faced ibis (*Plegadis chihi*) is an inland, freshwater wading bird that inhabits cattail and bulrush marshes, flooded hay meadows, agricultural fields, and estuarine wetlands (Ryder and Manry 1994). The largest resident coastal breeding colonies for this species are found in Texas and Louisiana, while migratory breeding populations occur in the Great Basin (Ryder and Manry 1994, NatureServe 2009). Postbreeding dispersal can be far-ranging, and the white-faced ibis may be uncommon to common in many regions of Texas during the fall and winter (Lockwood and Freeman 2004, Ryder and Manry 1994). Within the SEP-HCP Plan Area, white-faced ibis is an occasional spring migrant and uncommon fall migrant (Lockwood 2001) associated with reservoirs and other areas of ponded freshwater.

The white-faced ibis is listed as threatened by the State of Texas, and the Great Basin population has been designated as a candidate for listing as threatened or endangered by USFWS (Ryder and Manry 1994, 56 FR 58812). However, the white-faced ibis population in Texas is not currently a candidate for federal listing. NatureServe identifies the conservation status of the breeding population of the species within Texas as “apparently secure”, which means the species is uncommon but not rare and there is some cause for long-term concern due to declines or other factors (NatureServe 2009).

Major threats to this species include weather-related fluctuations in water levels, diversion of water supplies from wetlands, loss of habitat due to waterfowl management and agriculture, and bioaccumulation of toxic materials (Ryder and Manry 1994, NatureServe 2009).

2.10 SPRAGUE’S PIPIT

The Sprague’s pipit (*Anthus spragueii*) is a small, endemic North American grassland bird. Its breeding range includes the northern Great Plains region and the species uses breeding habitats that are generally characterized as native short-grass prairie (Robbins and Dale 1999, NatureServe 2009). During migration and on its wintering grounds, the species will utilize grazed grasslands and pastures that resemble short-grass prairie (Robbins and Dale 1999, Lockwood 2001, NatureServe 2009). The Sprague’s pipit is an uncommon migrant through the center of the Texas, including the SEP-HCP Plan Area, but generally is considered a locally common winter resident east of the Balcones Escarpment or in agricultural areas in north-central Texas and northwestern Edwards Plateau (Lockwood and Freeman 2004). However, Oberholser (1974) lists historical records for both spring and winter for Bexar and Kendall counties.

On September 15, 2010, the USFWS found the listing of the Sprague’s pipit as warranted but precluded due to higher priority actions (75 FR 56028). The species is not listed as threatened or endangered by the State of Texas. NatureServe identifies the conservation status of the nonbreeding population of the species within Texas as “vulnerable” due to a restricted range, relatively few populations, recent and widespread declines or other factors that make it vulnerable to extirpation (NatureServe 2009).

Major threats to the Sprague’s pipit include habitat loss mainly due to conversion of prairie to agriculture, overgrazing, habitat fragmentation, and introduction of non-native invasive vegetation (Robbins and Dale 1999, NatureServe 2009).

2.11 INTERIOR LEAST TERN

The interior least tern (*Sterna antillarum athalassos*), a subspecies of the least tern (*Sterna antillarum*), is the smallest of the North American terns. This waterbird nests on open sand, shell, and gravel beaches, sandbars, and islands that have little to no vegetation and that are typically associated with coastal areas, major riverine systems, and reservoirs (Thompson et al. 1997, NatureServe 2009, Campbell 2003). In Texas, interior least terns are found at three reservoirs along the Rio Grande River, on the Canadian River in the northern Panhandle, on the Prairie Dog Town Fork of the Red River in the eastern Panhandle, and along the Red River (Texas/Oklahoma boundary) into Arkansas (Campbell 2003). Campbell (2003) does not indicate that the species breeds or winters in any of the counties included in the SEP-HCP Plan Area. However, the migration corridor for the interior least tern may cross eastern Bexar and Comal counties of the Plan Area (Lockwood and Freeman 2004).

The USFWS listed the interior least tern as endangered on June 27, 1985. Within Texas, the USFWS considers the interior least tern as endangered everywhere except along the coast line and a 50-mile zone inland from the coast (50 FR 21792). The species is also listed as endangered by the State of Texas. NatureServe identifies the conservation status of the breeding population of the species in Texas as “critically imperiled” due to extreme rarity or because of some factor(s) such as very steep declines that make it especially vulnerable to extirpation (NatureServe 2009).

The interior least tern faces threats from channelization, water diversions, impoundments, recreational activities on land and water, irrigation and water consumption (Thompson et al. 1997, Campbell 2003, NatureServe 2009, 50 FR 21792). However, the interior least tern may also benefit from some of the water modification projects by creating habitat and additional foraging areas (Thompson et al. 1997, Campbell 2003).

3.0 SIGNATURES

This report was prepared by professional wildlife biologists at the consulting firm of Loomis Partners, Inc. in conformance with the methods and limitations described herein.

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4.0 REFERENCES

American Ornithologists' Union (AOU). 1983. Check-list of North American Birds, 6th edition. Allen Press, Inc., Lawrence, Kansas. 877 pp.

Buehler, D. A. 2000. Bald Eagle (*Haliaeetus leucocphalus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/506; April 23, 2010.

Campbell, L. 2003. Endangered and threatened animals of Texas – Their life history and management. Texas Parks and Wildlife Department, Wildlife Division. Austin, Texas. 127 pp.

Coulter, M. C., J. A. Rodgers, J. C. Ogden and F. C. Depkin. 1999. Wood Stork (*Mycteria americana*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/409; April 26, 2010.

Fennell, T. 2002. Mountain Plover: A Central Texas perspective. Texas Birds 4: 27-33.

Green, M. T., P. E. Lowther, S. L. Jones, S. K. Davis, and B. C. Dale. 2002. Baird's Sparrow (*Ammodramus bairdii*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/638; April 8, 2010.

Haug, E. A., B. A. Millsap, and M. S. Martell. 1993. Burrowing owl (*Athene cunicularia*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/061; April 15, 2010.

Johnson, R. R., R. L. Glinski, and W. W. Matteson. 2000. Zone-tailed Hawk (*Buteo albonotatus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/529; April 26, 2010.

Knopf, F. L. and M. B. Wunder. 2006. Mountain Plover (*Charadrius montanus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/211; April 16, 2010.

Lewis, J. C. 1995. Whooping Crane (*Grus americana*), The Birds of North America Online (A. Poole,Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/153; April 23, 2010.

Lockwood, M. W. 2001. Birds of the Texas Hill Country. University of Texas Press, Austin. 228 pp.

Lockwood, M. W. and B. Freeman. 2004. The Texas Ornithological Society Handbook of Texas Birds. Texas A&M University Press, College Station. 261 p.

McIntyre, N.E. 2004. Historical and current status of breeding and wintering Western burrowing owls (*Athene cunicularia hypugaea*) in Texas. Journal of Raptor Research 38:91-95.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed April 26, 2010.

Oberholser, H. C. 1974. The bird life of Texas. Volumes 1 and 2. University of Texas Press, Austin.

Robbins, M. B. and B. C. Dale. 1999. Sprague's Pipit (*Anthus spragueii*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/439; September 15, 2010.

Ryder, R. A. and D. E. Manry. 1994. White-faced Ibis (*Plegadis chihi*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/130; April 26, 2010.

Texas Parks and Wildlife Department (TPWD). 2010. Annotated County Lists of Rare Species: Bandera, Bexar, Blanco, Comal, Kendall, Kerr, and Medina counties. Updated March 12, 2010.

Texas Parks and Wildlife Department (TPWD). 2009. Wildlife fact sheets [on-line]. Accessed May 14, 2010 at http://www.tpwd.state.tx.us/huntwild/wild/species/.

The Aransas Project. 2010. Press release: The Aransas Project files federal lawsuit against Texas Commission on Environmental Quality Officials for illegally harming endangered whooping cranes. March 11, 2010.

Thompson, B. C., J. A. Jackson, J. Burger, L. A. Hill, E. M. Kirsch, and J. L. Atwood. 1997. Least Tern (*Sterna antillarum*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/290; April 23, 2010.

U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp.

White, C. M., N. J. Clum, T. J. Cade, and W. G. Hunt. 2002. Peregrine Falcon (*Falco peregrinus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/660; April 19, 2010.

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DRAFT PRELIMINARY ASSESSMENT OF RARE CRUSTACEAN SPECIES OF THE SOUTHERN EDWARDS PLATEAU HABITAT CONSERVATION PLAN

Image is of a selection of aquifer crustaceans, by R. Gibson and J. Krejca

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30 March 2011

Introduction

The proposed Plan Area of the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP) encompasses the following seven counties in Texas: Bexar, Bandera, Comal, Kendall, Kerr, Blanco and Medina counties. The following assessment covers rare aquifer crustacean species distributed within the Plan Area. Distribution data were collected using the Texas Memorial Museum (TMM) biological database, *TEXBIO,* and other literature sources.

Aquifer species are notoriously difficult to sample due to the inaccessibility of their habitat. Assessing their status, range and microhabitat requirements has been a subject of ongoing research for several decades, and even very recent studies are leading to the discovery of new aquifer species and assisting in defining the range of others (Zara Environmental 2009). While only one species of crustacean in the Plan Area is federally listed, other potentially rare species also occur in similar habitats and may warrant review in the SEP-HCP documents. Species included in this brief assessment include those species that are endemic to the plan area, those that are not endemic to the plan area but occur in a total of five or fewer localities, and those species on state or federal watch lists.

Species Descriptions and Distributions

There are twenty two rare crustacean species that occur within the range of the SEP-HCP Plan Area and are being recommended for inclusion in the plan. All of these species are aquifer dwelling, with morphological and physiological adaptations suited for the subterranean environment. These adaptations include elongated appendages, absent or reduced eyes, and lowered metabolic and reproductive rates (Culver 1982).

Table 1. Distribution of crustacean species within the SEP-HCP Plan Area.

Taxa	**Species**	**County Range**	**Status**
Thermosbaenacean 	*Tethysbaena (=Monodella) texana*	Bexar Comal Hays Uvalde	No listing status at this time; Nature Serve Global Rank: G2
Bathynellacean	*Texanobathynella bowmani*	Comal Dickens San Saba	
Amphipod Amphipods are small shrimp like crustaceans	*Stygobromus dejectus* (Cascade Cave Amphipod)	Kendall Bexar	IUCN vulnerable; Nature Serve Global Rank: G1

Taxa	Species	County Range	Status
with different forms of appendages including club shaped gnathopods (a modified appendage used for food handling). Amphipod can be loosely translated to mean "different-footed," in Greek *amphi* means "two" and *pod* means "foot," referring to the two main forms the appendages take. 	*Stygobromus flagellatus* (Ezell's Cave Amphipod)	Comal Hays Travis Bexar	No listing status at this time; Nature Serve Global Rank: G2
	Stygobromus longipes (Long-legged Cave Amphipod)	Comal Hays Kendall	No listing status at this time; Nature Serve Global Rank: G2
	Stygobromus pecki (Peck's Cave Amphipod)	Comal	Federally Endangered
	Allotexiweckelia hirsuta	Hays Bexar	No listing status at this time; Nature Serve Global Rank: G2
	Parabogidiella americana	Hays Bexar	No listing status at this time; Nature Serve Global Rank: G2
	Artesia subterranea	Comal Hays Terrell Val Verde	Nature Serve Global Rank: G1
	Mexiwekellia hardeni	Bexar Comal Medina	
	Seborgia relicta	Comal Hays Medina	Nature Serve Global Rank: G2
	Texiweckeliopsis insolita	Bexar Hays	
Isopods Isopods are a large order (approximately 10,000 species) of relatively small crustaceans that includes woodlice and pillbugs (roly-polys). They have seven pairs of legs of similar size and shape, in fact "isopod" translates from the Greek term *iso*, which means "same," and *pod*, which means "foot."	*Mexistenasellus coahuila* (Coahuila isopod)	Bexar Medina	No listing status at this time IUCN endangered
	Cirolanides texensis	Bexar Comal Kerr Kendall Medina Hays Edwards Real Burnet Crockett Jeff Davis	Widely distributed, but possible indicators of healthy cave ecosystems (Krejca 2009)

Taxa	Species	County Range	Status
	*Lirceolus hardeni*	Comal Kendall Blanco Hays Travis Williamson	
	Lirceolus pilus	Comal Medina Bandera Hays	Nature Serve Global Rank: G2
	Mexistenasellus coahuila	Bexar Medina Val Verde	IUCN endangered; Nature Serve Global Status: G2
	Speocirolana hardeni	Bexar Val Verde	Nature Serve Global Rank: G2
Shrimp	*Palaemonetes antrorum*	Bexar Hays	Nature Serve Global Rank: G2
Copepod	*Nitocrellopsis texana*	Comal	Single locality endemic

Tethysbaena (=Monodella) texana
The only thermosbaenacean (a rare order of crustaceans) known from the continental United States. This species is 3 mm long, and transparent to white in color. It was originally described as *Monodella texana* by Maguire (1964, 1965) and placed in the new genus by Wagner (1994). The genus name means 'walkers of the Tethys Sea.' The Tethys Sea was a Mesozoic era ocean between Laurasia and Gondwana, and fauna that inhabit the current Mediterranean Sea, Caribbean Ocean, Gulf of Mexico, and adjacent landmasses are said to have a Tethyan distribution (reflecting the migration of landmasses since the Mesozoic era). This species description was very interesting to biogeographers because at the time it was the only locality for that order outside of the Mediterranean Sea. Since then, researchers have found thermosbaenaceans elsewhere, including other parts of Europe, the Caribbean, and Africa. Nevertheless, this is considered an old crustacean group with a Tethys Sea relict distribution of interest to biogeography (Juame 2008). This interest inspired a redescription of the species in order to verify taxonomic relationships (Stock and Longley 1981).

Texanobathynella bowmani
A state endemic bathynellacean known from only one Edwards Aquifer locality, a well in Comal County. According to Texas Memorial Museum records, this Texas endemic was previously known from only two localities: Dickens County: Roaring Spring; San Saba County: Gorman Cave. Bathynellaceans are known from every continent except Antarctica, and have been collected from a variety of aquatic environments

including wells, caves, hot springs, rivers and marine beaches.

Stygobromus dejectus
The Cascade Cave amphipod, described by Holsinger (1967), is on the International Union for the Conservation of Nature (IUCN) list of threatened species (classified as "vulnerable") (Inland Water Crustacean Specialist Group 1996a). This species is endemic to the SEP-HCP plan area, currently known from Kendall and Bexar counties (John Holsinger, pers. comm.).

Stygobromus flagellatus
The first subterranean amphipod species to be reported in Texas, from the type locality at the artesian well at Texas State University (Benedict 1896). This species is also known from Ezell's Cave, Rattlesnake Cave, and San Marcos Springs in San Marcos (Holsinger and Longley 1980); Barton Springs in Austin; and Comal Springs in New Braunfels (Gibson et al. 2008). This species is most closely related to *S. longipes*, but Gibson et al. (2008) found no evidence of hybridization between the species. At San Marcos Springs, *S. flagellatus* was collected with *S. longipes* and *S. russelli*.

Stygobromus longipes
An amphipod known from Cave Without-A-Name (Kendall County), Honey Creek Cave (Comal County), and San Marcos Springs (Hays County) (Holsinger 1966, 1967; Reddell 1985; Gibson et al. 2008). A very closely related but undescribed species (*Stygobromus* near *longipes*) has been collected from Jacob's Well (Hays County) (Krejca and McDermid, unpublished data). This species of amphipod has been collected from drifts also containing specimens of *S. flagellates* and *S. russelli*, though the composition of the samples indicates that they occupy different niche spaces (Gibson et al. 2008).

Stygobromus pecki
A federally listed amphipod (United States Fish and Wildlife Service 1997) originally described from the type locality at Comal Springs (Holsinger 1967), where they are still fairly abundant (Gibson et al. 2008). This amphipod can be white or bright orange, depending probably on the availability of food sources at the collection locality. *S. pecki* have been collected from the organic and inorganic debris near springs and seeps at Comal Springs, Landa Lake, Panther Canyon Well, and Hueco Springs (Gibson et al. 2008; Krejca 2005).

Allotexiweckelia hirsute
In the family Hadziidae, is the only current member of this genus. The amphipod family Hadziidae consists mostly of marine or brackish species, with the only freshwater species in the family being cave or aquifer adapted. The family is considered of marine origin, and the distribution is tied to the old Tethys Sea region (Holsinger and Longley 1980). Holsinger and Longley (1980) describe it as a medium-sized (8-10 mm), fragile-bodied subterranean species. The sexes are generally similar, except mature females are larger than mature males in the samples examined. Holsinger and Longley (1980) showed that during a year and a half of continuous sampling of the Artesian Well in the mid-seventies, this species represented 0.66 percent of the total number of amphipods collected. Beyond this ratio, and the morphological description and species range, almost nothing is known about this species.

Parabogidiella americana
The first species of the bogidiellid amphipod discovered in North America north of Mexico. It is the type species of the new genus Parabogidiella described by Holsinger and Longley (1980). It is eyeless and lacking pigment, with a slender body morphologically similar to the related Bogidiella. Parabodigidiella can be distinguished from Bogidiella by the presence of five pairs of gills at the base of its legs as well as its slightly reduced mouthparts. The largest collected specimen of Parabodigidiela americana is 3.5 mm in length.

Artesia subterranea
A medium-sized (6-7 mm), relatively slender-bodied subterranean species described from a single locality, the Artesian Well (Holsinger and Longley, 1980). Recent work by Gibson et al. (2008) identified this species from two other sites, Ezell's Cave (Hays County) and Comal Springs (Comal County), and since then the species was found at San Felipe and Caroline springs (Val Verde and Terrell counties respectively, R. Gibson pers. comm.). Based on the nature of all of these localities, Gibson et al. (2008) suggest this species primarily inhabits deeper areas of the aquifer. Holsinger and Longley (1980) report the sexes are similar, but present in a slightly skewed ratio in favor of males (1.3: 1.0). Also during a year and a half of continuous sampling of the Artesian Well in the mid seventies, this species represented 1.07 percent of the total number of amphipods collected. Beyond this ratio, and the morphological description and species range, almost nothing is known from this species.

Mexiweckelia hardeni
A hyporheic species first described from specimens collected from interstitial alluvial groundwater in the gravel banks of Hondo Creek in Medina County (Holsinger 1992). Since then it has been collected in the alluvium of the San Antonio River and Comal Springs (Gibson et al. 2008), but is still endemic to the SEP-HCP plan area.

Seborgia relicta
Described by Holsinger as very small (1-2 mm) and subterranean, noting the remarkable similarities to *S. minima* and also slightly expanding the characteristics of the genus to accommodate the new species (Holsinger and Longley 1980). The sexes are generally similar, with males slightly smaller than females. During a year and a half of continuous sampling of the Artesian Well in the mid seventies, this species represented 1.11 percent of the total number of amphipods collected. The sex ratio in that sample was 4.6 to 1 in favor of females. Ovigerous females, each with 1-3 eggs, were present in samples taken year round, indicating it is likely they breed throughout the year (Holsinger and Longley 1980). The species is known from five sites including the type locality of the Artesian Well in Hays County (Holsinger and Longley 1980), Ezell's Cave in Hays County, Comal and Hueco Springs in Comal County (all from Gibson et al. 2008), and the Hondo Creek alluvium in Medina County.

Texiweckeliopsis insolita
The genus name for the hadziid amphipod *Texiweckeliopsis insolita* is derived from 'opsis' to indicate likeness to *Texiweckelia*, and this species is the type for the genus. This species is a relatively small (4 mm), fragile bodied subterranean species with a rather slender body and distinguishable from congeners by the structure of the mouthparts (Holsinger and Longley 1980). Males have different gnathopod structure than females. During a year and a half of continuous sampling of the Artesian Well in the mid seventies, this species represented the majority (61.01 percent) of the total

number of amphipods collected. The sex ratio in that sample was 1.6 to 1 in favor of females. Adults outnumbered juveniles 8.45 to 1, and juveniles were present in samples taken year round, though they were in greater numbers during late summer and fall (Holsinger and Longley 1980). The species is known from three sites including the type locality in Hays County (Artesian Well), San Marcos Springs, and Verstraeten Well No. 1 in Bexar County.

CIrolanides texensis
Marine relicts, having colonized subterranean waters most likely via the littoral interstitial zone during periods of marine regression (Boutin and Coineau, 2000). They are not known from surface fresh waters. Benedict (1896) described the stygobitic isopod *Cirolanides texensis* from the Artesian Well at San Marcos, Hays County. The species occurs throughout central and west Texas karst aquifers to the Mexico border and in adjacent groundwater basins of north Mexico, and is the only member of this genus. Studies of the species include its description and redescription (Benedict 1896, Bowman 1964), designation of a subspecies in Mexico (Botosaneanu and Iliffe 2002), documentation of its distribution (Reddell 1965 and 1970, Bowman 1972), and quantification of number of individuals in well samples and associated water chemistry parameters (Karnei 1978). Elliott and Mitchell (1973) determined they preferred temperatures between 20-30 Celsius, somewhat warmer than those recorded from their actual habitats. Krejca (2005) examined the phylogeography of many populations in Texas and Mexico and found correlations with hydrogeologic history. Researchers have recorded the possible extirpation of the species at two sites, Valdina Farms Sinkhole (Veni and Associates 1987) and Wonder Cave (Elliott 1994).

Lirceolus
A genus of isopod with six described species in Texas (Lewis 2001, Lewis and Bowman 1996). Phylogeographic work on the genus *Lirceolus* showed patterns of relatedness that follow surface river drainage basins (Krejca 2005). There are collections of unidentified material from across the state, and at least one locality, Barton Springs in Travis County, has sympatric species. Members of this genus are not commonly collected, they are extremely small compared to the widespread Texas asellid, *Caecidotea reddelli*. While no *Lirceolus* have formal protection, several of the species are endemic to small areas and a regional Habitat Conservation Plan in Hays County recognizes *Lirceolus smithii* as one that could become listed as threatened or endangered in the future (Loomis Partners, Inc. and Zara Environmental, LLC 2008).

Mexistenasellus coahuila
In 1972, Cole and Minckley described the *Mexistenasellus*, a new genus in the sowbug family *Stenasellus*. Usually an Old World family found widely throughout Europe and Africa, the *Mexistenasellus* genus was identified from specimens in the New World collected at the thermal springs of the Cuatro Ciénegas in northern Mexico. This genus was described as being bright red in life and eyeless, with a sharp spike enclosed by the endopod (the inner branch of a two branched crustacean leg). The *M. coahuila* is an elongated, slender species with a body length about five times its width. It is similar to its Old World relatives in most morphological characteristics, with small deviations in its antennae, pleopod, and endopodite structures (Cole and Minckley 1972). This species is on the IUCN list of threatened species (classified as “endangered”) (Inland Water Crustacean Specialist Group 1996b).

Speocirolana hardeni
The only species of the genus *Speocirolana* that is known outside of Mexico. It is between three and four times longer than wide, with the largest described male 22.4 mm long. It is widest at the sixth segment of the thorax and has a slight median concavity (dip) at the front of its head (anterior margin). Antenna 1 reaches only to the midline of the first peduncle; antenna 2 reaches to the sixth. The head is incapable of lateral rotation. In addition to its Texas type locality in Val Verde County at Emerald Sink, 2 miles N of Langtry, the *Speocirolana hardeni* has been found in six sites in Texas. In Bexar County, it was documented in Artesian Well No. 4, CPS Leon Creek Well No. 1, Aldridge 209 Well, and Verstraeten Well. In Val Verde it was documented in Four-mile Cave and Slaughter Bend Springs.

Texas cave shrimp, Palaemonetes antrorum
Large (10-20 mm), white to transparent, and with eye-stalks with very degenerate eyes. The mouthparts closely resemble surface species in this genus, adapted to micropredatory or scavenging feeding methods (Bruce and Short 1993). The species has been recorded from eight sites, including four wells in Bexar County (Artesia Pump Station Well, O.R. Mitchell Well, Verstraeten Well No. 1m Verstraeten Well No. 2), and four sites in Hays County (Artesian Well, Ezell's Cave, Frank Johnson's Well, Wonder Cave). However one of the Hays County sites, Wonder Cave, is severely impacted by habitat modification and commercialization and all recent attempts to find any aquatic fauna there have been unsuccessful. Furthemore there are two localities where blind shrimp have been reported but not verified, Jacob's Well in Hays County and Carson Cave in Uvalde County.

Nitocrellopsis texana
A stygobitic harpacticoid copepod known only from Honey Creek Cave, Comal County, Texas described by Fiers and Iliffe (2000). This is the only stygobitic harpacticoid copepod in the United States, and the current knowledge of the distribution of the genus indicates it is likely a Tethyan sea relict, with ancestors across the atlantic (e.g. Africa).

Habitat Requirements

All of these rare crustacean species are found in groundwater and have been collected from springs, caves, or wells. Habitat requirements include water filled spaces in karst with suitable substrates (for example, spaces between and underneath rocks suitable for foraging and sheltering) (Culver 1982). All of these aquatic species rely heavily on the overall health of the aquifer and springs.

Threats

Threats to these aquatic karst species include the following (USFWS 2008):

1. Destruction of karst habitat by construction, filling in, and vandalism;
2. Contamination from sewer leaks, runoff, pesticides, and other sources;
3. Spread of non-native species; and
4. Alteration of surface vegetative and animal communities.

Groundwater species are subject to additional threats, such as aquifer drawdown caused by increased rates of urbanization and drought and the destruction of spring habitats.

Data Gaps

Very little is known of the life history of these species. Currently known distributions may not represent the true range of these species because of incomplete or a lack of survey data. The aquatic subterranean environment is notoriously difficult to sample, and live fauna are often unavailable for observation. Current research is working to expand the state of knowledge of these subterranean aquatic species, including studies into the range, habitat requirements, and trophic ecology of the Edwards Aquifer (Zara Environmental 2009).

Literature Cited

Benedict, J. E. 1896. Preliminary descriptions of a new genus and three new species of crustaceans from an artesian well at San Marcos, Texas. Proceedings of the United States National Museum 18: 615-617.

Cole, G. A., and W. L. Minckley. 1972. *Stenasellid* Isopod Crustaceans in the Western Hemisphere – a New Genus and Species from Mexico – with a Review of Other North American Freshwater Isopod Genera. Proceedings of the Biological Society of Washington, Vol. 84, No. 39: 313-326.

Culver, D. C. 1982. Cave Life. Evolution and Ecology. Harvard University Press, Cambridge, Massachusetts. 189 pp.

Fiers, F. and T.M. Iliffe (2000). *Nitocrellopsis texana* n. sp. from central TX (U.S.A.) and *N. ahaggarensis* n. sp. from the central Algerian Sahara (Copepoda, Harpacticoida). Hydrobiologia, 418 (1):81-97

Gibson, J. R., S. J. Harden, and J. N. Fries. 2008. Survey and distribution of invertebrates from selected springs of the Edwards Aquifer in Comal and Hays Counties, Texas. The southwestern Naturalist 53: 74-84.

Holsinger, J. R. 1967. Systematics, speciation and distribution of the subterranean amphipod genus *Stygonectes* (Gammaridae). Bulletin United States National Museum 259: 1-176.

Holsinger, J. R. and Longley, G. 1980. The subterranean amphipod crustacean fauna of an artesian well in Texas.--*Smithsonian Contriutions to Zoology. 308*: 1-62.

Holsinger, J. R. 1966. Subterranean amphipods of the genus *Stygonectes* (Gammaridae). United States National Museum Bulletin 259: 1-176.

Inland Water Crustacean Specialist Group. 1996b. *Mexistenasellus coahuila* In: IUCN 2009. *IUCN Red List of Threatened Species*. Version 2009.2. www.iucnredlist.org . Retrieved on April 12, 2010.

Inland Water Crustacean Specialist Group. 1996a. *Stygobromus dejectus*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.1. <www.iucnredlist.org>. Downloaded on 02 April 2010.

Juame, D. 2008. Global diversity of spelaeogriphaceans & thermosbaenaceans (Crustacea: Spelaeogriphacea & Thermosbaenacea) in freshwater. Hydrobiologia, 595: 219-224.

Krejca, J. K. 2005. Stygobite phylogenetics as a tool for determining aquifer evolution. Dissertation. 115 pp.

Lewis, J. J. 2001. Three new species of subterranean asellids from western North America, with a synopsis of the species of the region (Crustacea: Isopoda: Asellidae). Pages 1-15 *in* J. R. Reddell and J. C. Cokendolpher, eds. Texas Memorial Museum, Speleological Monographs, 5. The University of Texas, Austin, Texas.

Lewis, J. J. and T. E. Bowman. 1996. The subterranean asellids of Texas (Crustacea: Isopoda: Asellidae). Proceedings of the Biological Society of Washington 109:482-500.

Maguire, B., Jr. 1964. Crustacea: A primitive Mediterranean group also occurs in North American Science 146: 931-932.

Maguire, B., Jr. 1965. *Monodella texana* n. sp., an extension of the range of the crustacean order Thermosbaenacea to the Western Hemisphere. Crustaceana 9: 149-154, pl. III.

Reddell, J. R. 1985. Cave biology of Honey Creek. Texas Caver 30: 133-134.

Stock, J. H., and G. Longley. 1981. The generic status and distribution of *Monodella texana* Maguire, the only known North American thermosbaenacean. Proceedings of the Biological Society of Washington 94: 569-578.

U.S. Fish and Wildlife Service (USFWS). 2008. Draft Bexar County Karst Invertebrate Recovery Plan. U. S. Fish and Wildlife Service, Albuquerque, New Mexico. 125 pp.

United States Fish and Wildlife Service. 1997. Endangered and threatened wildlife and plants; final rule to list three aquatic invertebrates in Comal and Hays counties, TX, as endangered. Federal Register 62: 66295-66304.

Wagner, H. P. 1994. A monographic review of the Thermosbaenacea (Crustacea: Peracarida). Zoologische Verhandelingen 291. 338 pp.

Zara Environmental. 2009. 2008 Annual Report: Well and cave sampling for aquifer biota. Report prepared for the Edwards Aquifer Authority, San Antonio, Texas. 41 pp.

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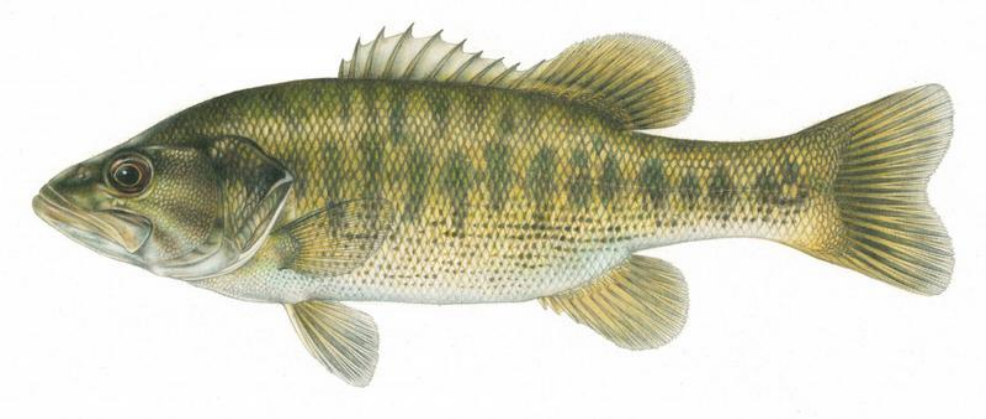
DRAFT PRELIMINARY ASSESSMENT OF RARE FISH SPECIES OF THE SOUTHERN EDWARDS PLATEAU HABITAT CONSERVATION PLAN AREA



Micropterus treculii
Credit: Joseph R. Tomelleri

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Introduction

Fishes included in this resource assessment are those species tracked by the Texas Parks and Wildlife Department (TPWD) on their County Lists of Rare Species for those counties included in the Plan Area of the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP) (TPWD 2010). Other resources reviewed to identify rare species in the Plan Area were The Texas Journal of Science- An Annotated Checklist of the Freshwater Fishes of Texas, with Keys to Identification of Species (Hubbs et al. 1991) and The Texas Natural History Collection database, accessed at www.fishesoftexas.org (2010).

The SEP-HCP Plan Area includes Bexar, Medina, Bandera, Kerr, Kendall, Blanco, and Comal counties. Species and habitat information was obtained from a variety of Internet sources and published reports. Credit for originally collecting and presenting much of this information goes to Hassan-Williams and Bonner (2010), who have studied fishes in Texas extensively.

Edwards Plateau Shiner

The Edwards Plateau shiner (*Cyprinella lepida*) is a small fish endemic to streams in the Nueces River basin of the Edwards Plateau, where it inhabits clear and cool spring fed waters with gravel or limestone bottoms. There is some evidence that it may also inhabit the upper reaches of the Guadalupe River Basin (Mayden 1989, Hubbs et al. 1991, Page and Burr 1991). Some taxonomic uncertainty exists for this species, as investigations by Richardson and Gold (1995) found that the Frio and Sabinal River populations were a different species than populations previous believed to be *C. lepida* from the Nueces River. TPWD lists this species as known from or potentially inhabiting Medina, Uvalde, Real, and Bandera counties. It has no formal state or federal listing status, but was described as vulnerable by Warren et al. (2000) and as critically imperiled/imperiled by (Scharpf 2005). The NatureServe Explorer database gives this species a conservation status ranking of G1/G2 (critically imperiled/imperiled) (NatureServe 2009).

Populations in the Frio and Sabinal Rivers have declined significantly over the past several decades (Richardson and Gold 1995, Edwards et al. 2004). Declines were most severe in the Sabinal River where *C. lepida* was found only in Lost Maples State Park at the headwaters of the river (Richardson and Gold 1995). Additional information on the population status, taxonomy, and ecology is needed.

Fountain Darter

The fountain darter (*Etheostoma fonticola*) is a small, reddish brown predatory fish found in Hays and Comal counties. Usually less than 1 inch long, it is the smallest of the darters and is known only from the San Marcos and Comal Rivers, where it prefers vegetated stream floor habitats and is often associated with mats of filamentous algae. It requires a constant flow of clear, clean water with stable temperatures, vegetation for cover, and undisturbed stream floors (U.S. Fish and Wildlife Service (USFWS) 1996). Live specimens are also kept at the San Marcos National Fish Hatchery and Technology Center. The Comal River population was extirpated in the mid 1950's when Comal Springs ran dry; however, individuals from the San Marcos population were re-introduced to the Comal River on several occasions starting in 1975 (Schenck and Whiteside 1976). It is now found throughout the Comal River to its confluence with the Guadalupe River (USFWS 1996) and the

reintroduced upper Comal River population was estimated to contain 168,078 individuals (Linam et al. 1993).

Fountain darters breed year round, with peak spawning periods in August and in late winter/early spring, and require vegetation on which to attach their adhesive eggs. *E. fonticiola* often remain stationary on the stream bottom or concealed in vegetation and dart out to eat insect larva and micro-crustaceans.

E. fonticola is a federal and state listed endangered species. Critical habitat has been designated for the species at Spring Lake and the San Marcos River in Hays County (USFWS 1996). A primary threat to this species is the loss of spring flow that is directly related to pumping water from the Edwards Aquifer, and extraction of water is expected to increase with human populations along the I-35 corridor, especially in San Antonio (USFWS 1996). The USFWS Recovery Plan (1996) predicts take in the Comal River if flow drops below 200 cfs (cubic feet per second) and 100 cfs in the San Marcos River. Declines in water quality are another threat. Contamination with pesticides, fertilizers, and other chemicals could threaten entire ecosystems and because of the limited range of *E. fonticola* a single catastrophic event could severely damage the overall population. Cumulative effects of non-point source pollutants also degrade the habitat and are cause for concern (USFWS 1996). Water temperature is an important factor of water quality, and reduced spring flows or introduction of water or wastewater can alter the temperature of in-stream waters. During periods with reduced aquifer levels introduced contaminants can be become concentrated since there is less water available to dilute them. Modifications to stream channels and banks, and vegetation removal also threaten *E. fonticola*, as do introduced species. Aquatic ramshorn snails have denuded protective vegetation in some areas, and introduced fish may prey on or competitively exclude *E. fonticola*.

Nueces Roundnose Minnow

The Nueces roundnose minnow (*Dionda serena*) is a small fish that inhabits clean, clear, flowing waters with aquatic macrophytes and sand or gravel substrates for spawning. TPWD lists this species as known from or potentially occurring in Bandera, Medina, Real, and Uvalde counties. Relatively little is known of its life history, though Edwards et al. (2004) claim it is probably a close relative and ecological equivalent of the Devils River minnow (*D. diaboli*). It is endemic to the upper reaches of the Nueces River drainage basin (Warren et al. 2000, Edwards et al. 2004) where spring-fed water with little temperature variation is consistently available. *D. serena* is abundant at unimpacted sites within this narrow range and does not appear to be in immediate jeopardy, though reductions in water quantity or quality could easily threaten this status (Edwards et al. 2004). Scharpf (2005) listed it as imperiled, though Warren et al. (2000) listed it as secure just five years prior. It has no formal federal or state listing status, although NatureServe Explorer database gives it a conservation status ranking of G2 (imperiled) (NatureServe 2009). Information relating aquifer levels and pumping to habitat for *D. serena* would be useful in predicting spring flow levels that could threaten the species.

Headwater Catfish

The headwater catfish (*Ictalurus lupus*) has olive colored sides with small spots and a silvery underside. It appears similar to the common channel catfish (*I. punctatus*), is omnivorous, and can grow up to 19 inches long. It inhabits sandy and rocky riffles, runs, and pools with clear water within the Rio Grande and Pecos river basins of

Texas, New Mexico, and Mexico, as well as gulf slope streams in northeast Mexico. In Texas, it was also known from the upper Nueces, San Antonio, Guadalupe, and Colorado River basins, though is now extirpated from these areas (Kelsch and Hendricks 1990). Though uncommon, a small population persists in Independence Creek in Texas (Bonner et al. 2005, Edwards et al. 2002). Some specimens were collected in Hinds Creek on the upper San Felipe Creek near Del Rio and Edwards et al. (2002) found them in the Rio Grande below the Rio Conchos and through the Big Bend Region in low abundance. Hubbs et al. (1991) suggests that the Colorado River populations were introduced. The current range in Texas and New Mexico is now greatly reduced (Sublette et al. 1990, Hubbs et al. 1991). Habitat alteration and possible competition with the channel catfish likely extirpated *L. lupus* from Gulf slope streams in Texas (Kelsh and Hendricks 1990). In west Texas and Coahuila it appears adversely affected by reduced spring flows, as well as reservoir construction (Hubbs and Garrett 1990). The headwater catfish is not currently listed as threatened or endangered at the federal or state levels, nor is it identified as a formal candidate for such listing. Hubbs et al. (1991) considers the headwater catfish a species of concern and the NatureServe Explorer gives the species a conservation status ranking of G3 (vulnerable) (NatureServe 2009).

Guadalupe Bass

The Guadalupe bass (*Micropterus treculii*) is the state fish of Texas and a popular sport fish. They have a greenish tinge with dark, interrupted bars on each side. Large adults reach 9.8 inches long and the state record, from Lake Travis in Travis County, is 15 inches (Edwards 1997). *M. treculii* inhabits clear streams of the northern and eastern Edwards Plateau, with smaller populations in the lower Colorado River and San Antonio Bay system. Two introduced populations persist in the Nueces River system (Hubbs et al. 1991). It commonly inhabits clear waters of streams draining from the Edwards Plateau, as well as reservoirs, and prefers relatively constant water temperatures. Though its native streams are often spring fed, it is generally absent in the most upper reaches of streams (Tomelleri and Eberle 1990). Typical streams are 6.5 to 33 feet wide and contain cover from rocks, roots, or stumps. *M. treculii* overwinters in deep pools with some current and spawn in quieter, shallow areas near current (Edwards 1980). Aquatic invertebrates make up most of the diet, though fish will also be taken when available (Edwards 1980).

The species is not listed as threatened or endangered by the USFWS or the State of Texas. However, Warren et al. (2000) listed it as vulnerable in the southern drainages and Hubbs et al. (1991) considered it a species of special concern that has declined in recent years. NatureServe Explorer database gives it a conservation status ranking of G3 (vulnerable) (NatureServe 2009).
Hurst et al. (1975) noted competition between *M. treculii* and the introduced *M. dolomieu* (smallmouth bass), although these two species rarely co-occur. Preservation of high quality, clear water and stream habitat is important to the preservation of *M. treculii* (Hurst et al. 1975) and Edwards (1980) and Littrell et al. (2007) note that genetic introgression from other species, like *M. dolomieu,* poses a significant threat. Continued reduced stream flows and habitat degradation are likely to occur as human populations increase and pump additional water from aquifers (Edwards et al. 2004).

Guadalupe Darter

The Guadalupe darter (*Percina sciera apristis*) is sometimes considered a subspecies of the dusky darter (*Percina sciera*), though Robins and Page (2007) show that it is genetically isolated from *P. sciera* and is its own species. A formal name change to *P. apristis* is under review and little information specific to *P. sciera apristis* is available.

This fish has black, rectangular blotches on an olive-green body and reaches 5.2 inches long. In the Plan Area, the Guadalupe darter may occur in the Guadalupe River drainage within Comal, Kendall, and Kerr counties (TPWD 2010). *P. sciera* feeds chiefly on invertebrates and inhabits medium to large streams with moderate to low gradients that are not especially turbid (Edwards 1997). It is most common in mid-water over gravel or sand, and commonly amidst branches and leaves (Page 1983). Young individuals appear to enter tributaries and shallow edges of pools, where adults are uncommon.

It is assumed that *P. sciera apristis* has similar habits and preferences as *P. sciera* and is restricted to the Guadalupe River drainage. This species is not listed as threatened or endangered by the USFWS or the State of Texas, nor is it a candidate for federal listing.

Widemouth Blindcat

The widemouth blindcat, *Satan eurystomus*, is one of the most rare and poorly understood catfishes in the country. It is eyeless, white or pinkinsh tinged, adapted to subterranean waters, and the maximum known size is 5.4 inches (Longley and Karnei 1979). It is known only from a handful of wells that penetrate the San Antonio pool of the Edwards Aquifer in the area around San Antonio at depths from 1,000 to 1,909 feet (Cooper and Longley 1980, Warren et al. 2000). It appears to be an opportunistic predator and gut contents contained exoskeletons of crustaceans. Langecker and Longley (1993) considered it a top predator in the Edwards Aquifer that likely feeds on lower vertebrates and invertebrates. Hubbs et al. (1991) considered this species endangered in its entire range and it is a State of Texas threatened species. The NatureServe Explorer database gives this species a conservation status ranking of G1/G2 (critically imperiled/imperiled (NatureServe 2009). This species is not federally listed, nor is it a candidate for listing. More information on the range, population status, and natural history of this species is needed.

Toothless Blindcat

The toothless blindcat, *Trogloglanis pattersoni*, is another rare and poorly understood catfish of the region. This eyeless, white or pinkish, cave adapted fish reaches approximately 4 inches long and its mouth is ventrally oriented, toothless, and sucker-like. It is known only from a handful of wells that penetrate the San Antonio pool of the Edwards Aquifer in the area around San Antonio (Cooper and Longley 1980, Warren et al. 2000). It was found at depths from 1,000 to 1,909 feet (Cooper and Longley 1980) and lacks an air bladder, allowing it to live under great pressure (Hubbs and Bailey 1947). It is assumed that *T. pattersoni* is a detritovore that will eat any organic matter it encounters (Langecker and Longley 1993). The State of Texas lists this species as threatened and it receives a NatureServe Explorer conservation status ranking of G1/G2 (critically imperiled/imperiled (NatureServe 2009). The species is not federally listed, nor is it a candidate for listing. More

information on the range, population status, and natural history of this species is needed.

Literature Cited

Cooper, J. E., and G. Longley. 1980. *Satan eurystomus* (Hubbs and Bailey), Widemouth blindcat. pp 474 *in:* D. S. Lee et al. Atlas of North American Freshwater fishes. N.C. State Mus. Nat. Hist., Raleigh, i-r + 854 pp.

Edwards, R. J. 1980. The ecology and geographic variation of the Guadalupe bass, *Micropterus treculi*. Unpubl. Ph.D. Dissertation, University of Texas at Austin. 224 pp.
Edwards, R. J. 1997. Ecological profiles for selected stream-dwelling Texas freshwater fishes. Report to the Texas Water Development Board. 89 pp.

Edwards, R. J., G. P. Garrett, and N. L. Allan. 2004. Aquifer-dependent fishes of the Edwards Plateau region. Chapter 13, pp. 253-268 *in*: Mace, R. E., E. S. Angle, and W. F. Mullican, III (eds.). Aquifers of the Edwards Plateau. Texas Water Development Board. 360 pp.

Hassan-Williams, C., and T. H. Bonner. 2010. Texas Freshwater Fishes. Texas State University, San Marcos, Texas. www.bio.txstate.edu/~tbonner/txfishes/index.htm. Last accessed May 29, 2010.

Henderson, G. G., Jr. 1960. Stomach contents of central Texas specimens of *Percina caprodes*. M. A. Thesis, The University of Texas. 44 pp.

Hubbs, C., and R. M. Bailey. 1947. Blind catfishes from artesian waters of Texas. Occas. Pap. Mus. Zool. Univ. Mich. 499: 1-17.

Hurst, H., G. Bass, and C. Hubbs. 1975. The biology of the Guadalupe, Suwanee, and Redeye Basses. pp. 47-53 *in* R. Stroud and H. Clepper, eds. Black Bass Biology and Management. Sport Fishing Institute, Washington, DC, 534 pp.

Hubbs, C., R. 1985. Darter reproductive seasons. Copeia 1985 (1): 56-68.

Hubbs, C., and G.P. Garrett. 1990. Reestablishment of *Cyprinodon eximius* (Cyprinodontidae) and status of *Dionda diaboli* (Cyprinidae) in the vicinity of Dolan Creek, Val Verde Co., Texas. The Southwestern Naturalist 35(4): 446-448.

Hubbs, C., R. J. Edwards, and G. P. Garrett. 1991. An annotated checklist of the freshwater fishes of Texas, with keys to identification of species. Texas Journal of Science, Supplement, 43 (4): 1-56.

Kelsch, S. W., and F. S. Hendricks. 1990. Distribution of the headwater catfish *Ictalurus lupus* (Osteichthyes: Ictaluridae). Southwestern Naturalist 35: 292-297.

Langecker, T. G., and G. Longley. 1993. Morphological Adaptations of the Texas Blind Catfishes *Trogloglanis pattersoni* and *Satan eurystomus* (Siluriformes: Ictaluridae) to Their Underground Environment. Copeia 1993(4): 976-986.

Linam, G. W., K. B. Mayes, and K. S. Saunders. 1993. Habitat utilization and population size estimate of fountain darters, *Etheostoma fonticola*, in the Comal River, Texas. Tex. J. Sci 45: 341-348.

Littrell, B. M., D. J. Lutz-Carrillo, T. H. Bonner, and L. T. Fries. 2007. Status of an introgressed Guadalupe bass population in a central Texas stream. North American Journal of Fisheries Management 27: 785-791.

Longley, G., and H. Karnei. 1979. Status of *Trogloglanis pattersoni* Eigenmann, the toothless blindcat, and status of *Satan eurystomus* Hubbs and Bailey, the widemouth blindcat. Endangered Species Report, U.S. Fish and Wildlife Service, Albuquerque, NM.

Mayden, R. L. 1989. Phylogenetic studies of North American minnows, with emphasis on the genus *Cyprinella* (Teleostei: Cypriniformes). Mis. Publ. Mus. Nat. Hist., Univ. Kansas 80: 1-189.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. http://www.natureserve.org/explorer. (Accessed: August 5, 2010).

Page, L. M. 1983. Handbook of Darters. T.F.H. Publications, Neptune City, N.J. 271 pp.

Page, L. M., and B. M. Burr. 1991. A field guide to freshwater fishes of North America north of Mexico. Houghton Mifflin Company, Boston, Massachusetts. 432 pp.

Richardson, L. R., and J. R. Gold. 1995. Evolution of the *Cyprinella lutrensis* species-complex. II. Systematics and biogeography of the Edwards Plateau shiner, *Cyprinella lepida*. Copeia 1995(1): 28-37.

Robins, R. H., and L. M. Page. 2007. Taxonomic status of the Guadalupe darter, *Percina apristis* (Teleostei: Percidae). Zootaxa 1618: 51-60.

Scharpf, C. 2005. Annotated checklist of North American freshwater fishes, including subspecies and undescribed forms, Part 1: Petromyzontidae through Cyprinidae. American Currents, Special Publication 31(4): 1-44.

Schenck, J. R., and B. G. Whiteside. 1976. Distribution, habitat preference and population size estimate of Etheostoma fonticola. Copeia 1976(4): 697-703.

Texas Natural History Collection Database. 2010. http://www.fishesoftexas.org/ University of Texas at Austin. Accessed August 5, 2010.

Texas Parks and Wildlife Department (TPWD). 2010. Annotated county lists of rare species: Bandera, Bexar, Blanco, Comal, Kendall, Kerr, and Medina Counties. Last updated March 12, 2010.

Thompson, B. A. 1980. *Percina Caprodes* (Rafinesque), Logperch. pp. 719 *in* D.S. Lee et al. Atlas of North American Freshwater Fishes. N. C. State Museum of Natural History. Raleigh, North Carolina. 854 pp.

Tomelleri, J. R., and M. E. Eberle. 1990. Fishes of the Central United States. University of Kansas Press, Lawrence. 226 pp.

U.S. Fish and Wildlife Service (USFWS). 1996. San Marcos/Comal (revised) recovery plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

Warren, M. L., Jr., B. M. Burr, S. J. Walsh, H. L. Bart, Jr., R. C. Cashner, D. A. Etnier, B. J. Freeman, B. R. Kuhajda, R. L. Mayden, H. W. Robison, S. T. Ross, and W. C. Starnes. 2000. Diversity, distribution, and conservation status of the native freshwater fishes of the southern United States. Fisheries 25(10): 7-29.

Winn, H. E. 1985. Observations of the reproductive traits of darters (Pisces: Percidae). American Midland Naturalist. 59 (1): 190-212.

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Draft Preliminary Assessment of Rare Insect Species of the Southern Edwards Plateau Habitat Conservation Plan
May 20, 2010

Rawson's Metalmark (*Calephelis rawsoni)* Bob Barber 2003

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The proposed Plan Area of the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP) encompasses the following seven counties in Texas: Bexar, Bandera, Comal, Kendall, Kerr, Blanco and Medina counties. The following assessment covers rare insect species distributed within the Plan Area. The rare species list in this assessment was derived by accessing the Texas Parks and Wildlife's "Rare, Threatened and Endangered Species of Texas database (Texas Parks and Wildlife Department 2009). Those species were then cross checked with the NatureServe Explorer conservation database (NatureServe 2009) for global status rankings. Two species that were petitioned to the U.S. Fish and Wildlife Service for listing as federally threatened or endangered are also included (USFWS 2009).

Table 1. Distribution and status of 15 rare insect species within the SEP-HCP Plan Area.

Common Name	Species	County Range	Regulatory Status	TPWD Rare Species List (2009)	Conservation Status Rank (NatureServe 2009) [1]
Comal Springs riffle beetle	*Heterelmis comalensis*	Comal; Hays	Federally Endangered	X	G1
Comal Springs dryopid beetle	*Stygoparnus comalensis*	Comal; Hays	Federally Endangered	X	G1G2
Edwards Aquifer diving beetle**	*Haideoporus texanus*	Comal; Hays		X	G1G2
Comal Springs diving beetle	*Comaldessus stygius*	Comal		X	G1
Disjunct crawling water beetle	*Haliplus nitens*	Blanco		X	GH
A mayfly	*Allenhyphes michaeli*	Kendall; Bandera; Blanco; Uvalde		X	
A mayfly	*Baetodes alleni*	Kendall		X	G1G2
A mayfly	*Pseudocentroptiloides morihari*	Comal		X	G2G3
A mayfly	*Plauditus futilis*	Bandera		X	
Leonora's dancer damselfly	*Argia leonorae*	Medina; Bandera; Kerr; Uvalde; Kinney; Kimble; Hays		X	G3

Sage Sphinx	*Sphinx eremitoides*	Kerr; Uvalde	X	G1G2
A notodontid moth**	*Ursia furtiva*	Bexar		G1G2
Manfreda giant skipper	*Stallingsia maculosus*	Bexar, Kendall	X	G1G2
Texas austrotinodes caddisfly	*Austrotinodes texensis*	Bandera; Hays	X	G2
Rawson's metalmark	*Calephelis rawsoni*	Bexar; Bandera; Kerr; Kendall;		G4
		Comal; Real; Hays	X	

**species petitioned for listing as federally threatened or endangered, by which listing was determined to be warranted by USFWS (USFWS 2009).
1 = NatureServe globally imperiled rankings: G1 = critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres); G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres); G3 = Either very rare and local throughout its range or found locally in a restricted range; G4 = Apparently secure throughout it's range; GH = Of historical occurrence throughout its range, i.e., formerly part of the established biota, with the expectation that it may be rediscovered.

Species Descriptions, Distribution, Status and Threats

Comal Springs riffle beetle (*Heterelmis comalensis*) - The Comal Springs riffle beetle is a small aquatic, surface-dwelling species in the family *Elmidae*. Adult Comal Springs riffle beetles are about 1/8 inch long, with females slightly larger than males. Larvae are up to 10 mm long, with an elongate tubular body. The specific name is for the type locality, Comal Springs. This species is known from two localities: San Marcos Springs in Hays County and Comal Springs in Comal County. It occurs in the gravel substrate and shallow riffles in spring runs. Biologists have found adults and larvae primarily in drift nets or cotton cloth traps at spring upwellings (Gibson et al. 2008).

Comal Springs dryopid beetle (*Sygobromus comalensis*) - The Comal Springs dryopid beetle is the only known subterranean member of the beetle family Dryopidae. These long, slender dryopid beetles are about 1/8 inch long as adults, with a thin outer covering and reddish-brown color (Spangler and Barr 1992). Larvae are elongate, cylindrical and yellowish-brown. They have vestigial (non-functional) eyes, are weakly pigmented, translucent, and thin-skinned. The species has been found in two spring systems (Comal Springs and Fern Bank Springs) that are located in Comal and Hays counties, respectively (Barr 1993). Dryopid beetles live primarily in flowing, uncontaminated waters. Biologists find adults and larvae of this aquifer species primarily in drift nets or cotton cloth traps at spring upwellings (Gibson et al. 2008).

Species' Status

The USFWS listed both the Comal Springs riffle beetle and the Comal Springs dryopid beetle as endangered on December 18, 1997 (USFWS 1997). Final rule regarding critical habitat for both these species was issued on July 17, 2007. Three spring systems (Comal, Fern Bank, and San Marcos) were designated as critical habitat units for the two species and are produced by discharge of aquifer spring water along the Balcones fault zone at the edge of the Edwards Plateau in central Texas. The source of water flows for Comal Springs and San Marcos Springs is the San Antonio segment of the Edwards Aquifer. These spring systems designated for critical habitat are characterized by high water quality and relatively constant water flows, with temperatures that range from 68 to 75 degrees Fahrenheit and 20 to 24 degrees Celsius (USFWS 2007).

Threats

The primary threat for both these species is the potential failure of spring flow and a decrease in water quality due to development, drought, or excessive groundwater pumping which could result in loss of aquatic habitat for these species (USFWS 2009).

Although both the Comal Springs riffle beetle and the Comal Springs dryopid beetle persisted at Comal Springs in the 1950s despite extreme drought conditions, both species are aquatic and require water to complete their individual life cycles (USFWS 2007).

Edwards Aquifer diving beetle *(Haideporus texanus*) - This aquifer dwelling beetle is a small (less than half an inch), elongate, oval-shaped, and somewhat flattened member of the family Dytiscidae (subfamily Hydroporinae, tribe Hydroporini). Unique at the time of description, it was the only North American aquatic beetle with reduced, apparently nonfunctional eyes and reduced body pigmentation (Young and Longley 1976). Another likely subterranean adaptation of this species is a greater development of fine sensory hairs on the back of the wing covers. It is known from the Artesian Well in Hays County and Comal Springs in Comal County (Gibson et al. 2008).

Species' Status

Haideporus texanus was petitioned for federal listing as threatened or endangered and is currently under a status review to determine if such listing is warranted (USFWS 2009). It is also listed as rare in the Texas Parks and Wildlife "Rare, Threatened and Endangered Species List" (TPWD 2009).

Threats

Threats to this species include aquifer drawdown and loss of water quality due to increasing human population growth in large cities using the water supply (NatureServe 2009).

Comal Springs diving beetle (*Comaldessus stygius*) - Spangler and Barr (1995) described *C. stygius* as having an elongate, nearly parallel-sided and somewhat flattened body shape, rudimentary eyes, and a pale reddish-brown, thin, and nearly transparent outer layer. Other subterranean adaptations include well-developed sensory hairs on various parts of the body. This aquatic insect is primarily restricted to surface water associated with Comal Springs in Comal County and with San Marcos Springs in Hays County (Gibson et al. 2008).

Species Status

This species is listed as rare in the Texas Parks and Wildlife "Rare, Threatened and Endangered Species List" (TPWD 2009).

Threats

The primary threat for this species is the potential failure of spring flow and a decrease in water quality due to development, drought, or excessive groundwater pumping which could result in loss of aquatic habitat for these species.

Disjunct crawling water beetle (*Haliplus nitens*) – This is a medium-sized beetle, yellow in color with brownish-tinged markings (Brigham 1983). The specimen used to describe this species was collected in 1848 and appears to be from Isle St. Ignace, Ontario, on the north shore of Lake Superior (Brigham 1983). The only other known specimens of *Haliplus nitens* are labeled as being from Shovel Mt., Texas and could potentially refer to two different localities- the Town of Shovel Mountain in Burnet County or the actual Shovel Mountain, located in Blanco County (Brigham 1983). The Texas Parks and Wildlife Department states that both Blanco and Burnett Counties are localities for this species (TPWD 2009). Brigham, however, believes the Texas locality record may be erroneous (1983).

Information on this species is sparse. It is thought to inhabit shallow waters (TPWD 2009).

Species Status

This species is listed as rare in the Texas Parks and Wildlife "Rare, Threatened and Endangered Species List" (TPWD 2009).

Threats

Currently, threats to this species have not been assessed.

Various mayflies (*Allenhyphes michaeli, Baetodes alleni, Pseudocentroptiloides morihari, Plauditus futilis*) - Mayflies are aquatic insects that occur in a wide variety of

standing and running water habitats, with the greatest diversity found in rocky-bottomed headwater streams. The adults are short-lived, from a few minutes to a few days depending on the species, and are generally found along shoreline vegetation. Mayflies have an aquatic larval stage and length of larval life varies with temperature, but is usually three to six months, although some have a larval stage as short as 10 to 14 days (Merritt and Cummins 1996). The rate of mayfly dispersal is limited in the larval stage by drainage systems and in adult stages by relatively short life spans and weak flying ability of gravid females (McCafferty and Provonsha 1993).

Species Status

These mayfly species' are listed as rare in the Texas Parks and Wildlife "Rare, Threatened and Endangered Species List" (TPWD 2009).

Threats

Threats to this species are in need of assessment. Many of these mayflies have been only recently described and data on distributions and abundance are currently lacking (NatureServe 2009).

Leonora's dancing damselfly (*Argia leonore*) – This brilliant blue damselfly of the Odonata family is found in south central and western Texas and is known from small streams and seepages. Damselflies can be found near almost any body of fresh water and occupy a great diversity of aquatic habitats, although they are most commonly found in lowland streams and ponds (Merritt and Cummins 1996). The aquatic mayfly larvae serve as in important component of aquatic food webs involving invertebrates, fish and other aquatic invertebrates (Merritt and Cummins 1996).

The flight season of most species of Odonata in Texas extends from the spring through the summer months and occasionally persists into the fall. Damselflies generally emerge as soon as temperatures begin to rise in the spring and continue throughout much of the summer (Abbott 2001).

Species Status

This species is listed as rare in the Texas Parks and Wildlife "Rare, Threatened and Endangered Species List" (TPWD 2009).

Threats

Major threats are overgrazing, water use of streams in arid areas, and drawdown of the water table. Additionally, populations may be quite isolated (NatureServe 2009).

Sage Sphinx (*Sphinx eremitoides*) – The sage sphinx is a moth with an approximately 3 to 3.5-inch wingspan. The species is generally pale gray with some yellowish tints and black and white markings (Opler et al. 2010). This moth is known to inhabit desert grassland, sandy prairies, or desert with sage habitats. In its larval stage, caterpillars feed on leaves of sage plants (*Salvia* spp.). The larvae pupate in soil chambers underground overwinter and adults emerge late spring or summer. Adults are nocturnal, but their nectar sources are unknown (NatureServe 2009). The range of this species includes the Great Plains region of Kansas south to Texas, west to Colorado and New Mexico. In the vicinity of the Southern Edwards Plateau, the sage sphinx has been recorded from Kimble, Kerr, and Uvalde counties (Opler et al. 2010). Little information is known on the population status and ecological requirements of this species (Opler et al. 2010)

Species Status

This species is listed as rare in the Texas Parks and Wildlife "Rare, Threatened and Endangered Species List" (TPWD 2009).

Threats

Threats include conversion of native habitats to cultivated agriculture or heavily grazed lands (NatureServe 2009).

Rawson's Metalmark (*Calephelis rawsoni*)- Found in moist areas in shaded limestone outcrops in central Texas, desert scrub or oak woodland in foothills, or along riparian corridors. Males perch in gulches to find females. Eggs are laid singly on host plant leaves, which caterpillars eat. Caterpillars can be found on shrubby boneset (*Eupatorium havanense*) and palmleaf eupatorium (*E. greggii*) of the sunflower family (Asteraceae). The range of this species includes southern Arizona and New Mexico, south and west Texas south to central Mexico (Opler et al. 2010).

Species Status

This species is listed as rare in the Texas Parks and Wildlife "Rare, Threatened and Endangered Species List" (TPWD 2009).

Threats

Threats to this species have not been assessed (NatureServe 2009).

A notodontid moth (*Ursia furtiva*) – This moth of the family Notodontidae is known only from Bexar, Brewster, and Angelina counties in Texas (Opler et al. 2010), although NatureServe (2009) reports Bexar and Brewster as the only county localities for this species. The two known localities in Bexar and Brewster counties are widely separated

locations in San Antonio, Bexar County, and Pine Canyon in the Chisos Mountains, Big Bend National Park, Texas. The San Antonio habitat is on private property, while Big Bend National Park is part of the National Park Service system (NatureServe 2009). Habitat includes mixed, hardwood woodlands (NatureServe 2009).

Species Status

Ursia furtiva was petitioned for federal listing as threatened or endangered and is currently under a status review to determine if such listing is warranted (USFWS 2009).

Threats

Threats to this species include it's limited range. A few events, such as an extensive fire or housing development, could eliminate significant portions of this moth's limited occurrences (NatureServe 2009).

Manfreda giant skipper (*Stallingsia maculosus*) - This giant skipper is dark brown in color with small, oval cream-colored spots on the forewing. This cream color is also found on the fringes of the forewings. Wing span is approximately 1.75 to 2-inches (Opler et al. 2010). Females glue eggs singly to leaves and flowers of the host. Young caterpillars bore directly into the root or first bore through the leaves or flowers. Caterpillars make silk chimneys or tents which project from the plant, in which they feed, overwinter, and pupate (Opler et al. 2010). Caterpillar host is the Texas tuberose (*Manfreda maculosa*) in the agave family. Adults do not feed, but males sip moisture from mud. Range includes south Texas and Mexico (Opler et al. 2010). It is known from three counties in Texas: Kinney, Bexar, and San Patricio (NatureServe 2009).

Species Status

This species is listed as rare in the Texas Parks and Wildlife "Rare, Threatened and Endangered Species List" (TPWD 2009).

Threats

Primary threat is habitat destruction (NatureServe 2009). Also, this species has a limited range, with full extent of range and number of occurrences in Mexico unknown but apparently very limited. Available information suggests this species has far fewer than 20 viable metapopulations (NatureServe 2009).

Texas austrotinodes caddisfly (*Austrotinodes texensis*) – The austrotinodes caddisfly was first described in 1995 and is known only from Val Verde, Bandera, and Hays counties (Bowles 1995). It is a small, moth-like species with tan-brownish wings measuring less than half an inch (Bowles 1995). Caddisflies have aquatic larvae and are

found in a wide variety of habitats such as streams, rivers, lakes, ponds, spring seeps, and vernal pools (Merritt and Cummins 1996). They tend to occupy cool running waters and sometimes in transient streams (NatureServe 2009). It appears to be endemic to the karst springs and spring runs of the Edwards Plateau region and are generally found in coarse substrates that range from cobble and gravel to limestone bedrock. (TPWD 2009). Species is known from three localities: Medina River in Bandera County, San Felipe Springs in Val Verde County, and Fern Bank Springs in Hays County (Bowles 1995).

Species Status

This species is listed as rare in the Texas Parks and Wildlife "Rare, Threatened and Endangered Species List" (TPWD 2009).

Threats

The primary threat for this species is the potential failure of spring flow and a decrease in water quality due to development, drought, or excessive groundwater pumping which could result in loss of aquatic habitat.

Data Gaps

Much information is lacking on the biology, current distribution and abundance of many of the described species, particularly those listed as rare under the Texas Parks and Wildlife Department (2009). Threats to many of these are also in need of assessment.

Literature Cited

Abbott, J. C. 2001. Distribution of Dragonflies and Damselflies (Odonata) in Texas. Transactions of the American Entomological Society (1890-). 127 (2): 189-228.

Barr, C. B. 1993. Survey for two Edwards Aquifer Invertebrates: Comal Springs Dryopid Beetle *Stygoparnus comalensis* Barr and Spangler (Coleoptera: Dryopidae) and Peck's Cave Amphipod *Stygobromus pecki* Holsinger (Amphipoda: Crangonyctidae). Report prepared for U.S. Fish and Wildlife Service, Austin, TX. 71 pp.

Bowles, D. E. 1995. Journal of the New York Entomological Society. 103 (2): 155-161.

Brigham, W. U. 1983. Neatrctic Halpidae (Coleoptera) VI. Haliplus nitens LeConte: Desiganation of a Lectotype, Redescription and Distribution. The Coleopterists Bulletin 37 (4): 353-361.

Culver, D. C. 1982. Cave Life. Evolution and Ecology. Harvard University Press, Campbridge, Massachusetts. 189 pp.

Elliott, W. R. and J. R. Reddell. 1989. The status and range of five endangered arthropods from caves in the Austin, Texas, region. A report on a study supported by the Texas Parks and Wildlife Department and Texas Nature Conservancy for the Austin Regional Habitat Conservation Plan. 100 pp.

Gibson, J.R., S.J. Harden, and J.N. Fries. 2008. Survey and distribution of invertebrates from selected springs of the Edwards Aquifer in Comal and Hays counties, Texas. The Southwestern Naturalist 53(1):74-84.

McCafferty, W. P. and A. V. Provonsha. 1993. New species, subspecies, and stage description of Texas Baetidae (Ephemeroptera). Proc. Entomol. Soc. Wash. 59: 59-69.

Merritt, R. W. and K. W. Cummins, eds. 1996. An Introduction to the Aquatic Insects of North America, Third Edition. Kendall/Hunt Publishing Company, Dubuque, Iowa. 862 pp.

Mitchell, R. W. 1971. Preference responses and tolerance of the troglobitic carabid beetle Rhadine subterranean. Speleology. 3: 249-270.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. http://www.natureserve.org/explorer. Accessed May 8, 2010.

Opler, P. A., K. Lotts, and T. Naberhaus, coordinators. 2010. Butterflies and Moths of North America. Bozeman, MT: Big Sky Institute. http://www.butterfliesandmoths.org. Accessed May 12 and 17, 2010.

Spangler, P.J. and C.B. Barr. 1995. A new genus and species of stygobiontic dytiscid beetle, Comaldessus stygius (Coleoptera: Dytiscidae: Bidessini) from Comal Springs, Texas. Insecta Mundi 9:301–308.

Texas Memorial Museum (TMM). 2009. TEXBIO database. The University of Texas at Austin. Accessed March 18, 2010.

Texas Parks and Wildlife Department (TPWD). 2009. County lists of rare, threatened, and endangered species. Austin, Texas. http://beta-www.tpwd.state.tx.us/land-water/land/maps/gis/ris/endangered_species/rare-threatened-and endangered-species-of-texas-by-county. Accessed December 30, 2009.

U.S. Fish and Wildlife Service (USFWS). 1997. Endangered and threatened wildlife and plants; final rule to list three aquatic invertebrates in Comal and Hays counties, TX, as endangered. Federal Register 62: 66295- 66304.

U.S. Fish and Wildlife Service (USFWS). 2007. Designation of critical habitat for the Peck's Cave amphipod, the Comal Springs riffle beetle and the Comal Springs dryopid beetle, final rule. Federal Register 73: 14995- 14997.

U.S. Fish and Wildlife Service (USFWS). 2009. Endangered and threatened wildlife and plants; partial 90-day finding on a petition to list 475 species in the southwestern United States as threatened or endangered with critical habitat, proposed rule. Federal Register 74: 66366- 66905.

Young, F.N., and G. Longley. 1976. A new subterranean aquatic beetle from Texas (Coleoptera: Dytiscidae-Hydroporinae). Annals of the Entomological Society of America, 69: 787-792.

MAMMAL SPECIES OF CONCERN

RESOURCE ASSESSMENT

FOR THE SOUTHERN EDWARDS PLATEAU

HABITAT CONSERVATION PLAN

DRAFT MARCH 30, 2011

1.0 INTRODUCTION

This preliminary resource assessment describes the current status and habitat requirements of mammal species of concern that occur in the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP) Plan Area. The purpose of this assessment is to help develop the conceptual framework for the SEP-HCP and provide the basic background information for the Habitat Conservation Plan and associated Environmental Impact Statement.

The list of mammal species of concern was generated by the Texas Parks and Wildlife Department (TPWD) annotated county lists of rare species for Bandera, Bexar, Blanco, Comal, Kendall, Kerr, and Medina counties of the SEP-HCP Plan Area on March 12, 2010. Information provided by the TPWD county lists of rare species includes federal and state regulatory status, county occurrence, and brief life history and habitat descriptions.

Other sources of information regarding species descriptions, regulatory status, and habitat descriptions for the mammal species of concern included the U.S. Fish and Wildlife Service's (USFWS) Federal Register and web-based species databases, TPWD wildlife fact sheets and books, journal articles, natural history books, and NatureServe's Online Encyclopedia of Life. NatureServe assesses the conservation status, taxonomy, distribution, and life history information of species and ecosystems throughout North America by utilizing databases maintained by natural heritage program scientists and other collaborators. They use this information to assign global, national, and state conservation status ranks to each species it tracks (see www.natureserve.org for more information).

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TABLE 1: MAMMAL SPECIES OF CONCERN REGULATORY STATUS, OCCURRENCE, AND HABITAT CHARACTERISTICS WITHIN THE SEP-HCP PLAN AREA

Common Name	Scientific Name	Federal Regulatory Status[1]	State Regulatory Status[1]	Counties of Potential Occurrence[2]	Habitat Characteristics within the Plan Area
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*			Kerr	Roosts in caves and mine tunnels and occurs in desert scrub to pinyon-juniper woodlands that have canyons or cliff.
Frio pocket gopher	*Geomys texensis bakeri*			Medina	Restricted to well drained sandy and loamy soils along Seco and Parker creeks, both tributaries of the Frio River.
Llano pocket gopher	*Geomys texensis texensis*			Kerr	Burrows in deep, brown loamy sands or gravelly sandy loams in valley areas, fluvial soils at the margins of rivers and streams, as well as city parks, lawns, and roadside drainage ditches.
Jaguarundi	*Herpailurus yaguarondi*	E	E	Comal[3]	This species is limited to the lower Rio Grande Valley in dense thorny shrublands and is highly unlikely to regularly occur within the Plan Area.
Ghost-faced bat	*Mormoops megalophylla*			Bandera Bexar Medina	Inhabits a variety of habitats including riparian areas with mature cottonwood, sycamore, and willow in oak-woodland habitat. Roosts in caves, rock crevices, abandoned mines, and old buildings.
Cave myotis bat	*Myotis velifer*			all 7 counties of the SEP-HCP Plan Area	This species will use deserts, grasslands, and watercourses when foraging and hibernate in central Texas caves in the winter.
White-nosed coati	*Nasua narica*		T	Kerr	Habitat preferences include oak-sycamore-walnut, oak-pine, and shrub-grass canyons usually near water.
Plains spotted skunk	*Spilogale putorius interrupta*			all 7 counties of the SEP-HCP Plan Area	Occurs in wooded areas, as well as tall-grass prairies, particularly where rocky canyons and outcrops are available.
Black bear	*Ursus americanus*	T/SA	T	all 7 counties of the SEP-HCP Plan Area	Habitat includes woodland and forested areas across large, contiguous, remote blocks of land.

[1] E - ENDANGERED; T - THREATENED; T/SA - THREATENED/SIMILAR APPEARANCE
[2] TPWD (2010)
[3] While a natural heritage record exists for the jaguarundi in Comal County, the species is highly unlikely to regularly occur within the Plan Area.

2.0 SPECIES DESCRIPTION, REGULATORY STATUS, AND HABITATS

2.1 PALE TOWNSEND'S BIG-EARED BAT

The pale Townsend's big-eared bat, or pale lump-nosed bat, (*Corynorhinus townsendii pallescens*) is a subspecies of the Townsend's big-eared bat (*Corynorhinus townsendii*) and may occur in the western portion of Kerr County and northwest corner of Bandera County. The pale Townsend's big-eared bat has very large ears and fleshy lumps on either side of snout (Schmidly 1991, Schmidely 2004, NatureServe 2009). This is the most widespread subspecies of *C. townsendii* and occurs in desert scrub to pinyon-juniper woodlands that have canyons or cliffs (NatureServe 2009). Roost and maternity colonies are typically located in caves or mine tunnels (NatureServe 2009, Schmidly 2004).

The pale Townsend's big-eared bat is not listed as threatened or endangered by the U.S. Fish and Wildlife Service (USFWS) or the State of Texas; nor is the species currently a candidate for such listing. This species was listed as a Category 2 candidate by USFWS prior to 1996 (59 FR 58982). NatureServe lists the conservation status of this species in Texas as "vulnerable" due to a restricted range, relatively few populations, recent and widespread declines or other factors that make it vulnerable to extirpation (NatureServe 2009).

The main threats to this species include loss of habitat, such as blasting of mine entrances, vandalism, and disturbance at roost and maternity sites (Schmidly 2004, NatureServe 2009).

2.2 FRIO POCKET GOPHER

The Frio pocket gopher (*Geomys texensis bakeri*) is a fossorial rodent (i.e., one that is adapted to digging underground) with fur-lined cheek pouches or pockets used for food storage and transport. The species only occurs in Texas within the drainages of the Frio River (Schmidly 2004, NatureServe 2009). A portion of the Frio River and associated drainages occurs in the southwest corner of Medina County of the SEP-HCP Plan Area. The population in Medina County is restricted to soils along Seco and Parker creeks, both tributaries of the Frio River, and there may be additional populations in the intervening area (Smolen et al. 1993, NatureServe 2009). This subspecies of the Texas pocket gopher (*Geomys texensis*) uses well drained sandy and loamy soils within its restricted range (Smolen et al. 1993, NatureServe 2009).

The Frio pocket gopher is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe lists the conservation status of this species in Texas as "imperiled" due to a very restricted range, very few populations, steep declines or other factors that make it very vulnerable to extirpation (NatureServe 2009).

Very little information exists regarding the threats to this species except that its restricted range and small population make it vulnerable to habitat loss or alteration (NatureServe 2009).

2.3 LLANO POCKET GOPHER

The Llano pocket gopher (*Geomys texensis texensis*) is a fossorial rodent with fur-lined cheek pouches or pockets that are used for food storage and transport. The species occurs in the Texas Hill Country, including southwest Medina, northeast Kerr, and northwest Blanco counties of the SEP-HCP Plan Area (Schmidly 2004). This subspecies, as well as the Texas pocket gopher (*G. texensis*) and the Frio pocket gopher (*G. t. bakeri*), occurs only in Texas. The Llano pocket gopher burrows in deep,

brown loamy sands or gravelly sandy loams in valley areas, fluvial soils at the margins of rivers and streams, as well as city parks, lawns, and roadside drainage ditches (Schmidly 2004). This particular species is isolated from other *Geomys* species by shallow stony to gravelly clayey soils (Block and Zimmerman 1991, NatureServe 2009).

The Llano pocket gopher is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe lists the conservation status of this species in Texas as "imperiled" due to a very restricted range, very few populations, steep declines or other factors that make it very vulnerable to extirpation (NatureServe 2009). Schmidly (2004) lists this species as locally abundant, and indicates that it does not appear to be threatened.

Very little information exists regarding the threats to this species except that its restricted range and small population make it vulnerable to habitat loss or alteration (NatureServe 2009).

2.4 JAGUARUNDI

The jaguarundi (*Herpailurus yaguarondi*) is a small, slender-bodied, weasel-like cat that weighs between 7 and 22 pounds and has an average height at the shoulder of 11 inches (Schmidly 2004, Campbell 2003). This cat is considered the rarest of all the native cat species in North America (Schmidly 2004, Campbell 2003). This species is limited to the lower Rio Grande Valley in dense thorny shrublands (Schmidly 2004, Campbell 2003). Little information exists about the optimal habitat conditions for the jaguarundi in Texas (Campbell 2003). The jaguarundi is highly unlikely to occur within the SEP-HCP Plan Area; however a natural heritage record exists for Comal County (TPWD 2009, NatureServe 2009).

The jaguarundi was federally listed as endangered in June 1976 (41 FR 24062). Recently, the USFWS has begun a five-year review of the best scientific and commercial data available for the jaguarundi, as well as 22 other southwestern species (74 FR 6917). The State of Texas also lists the jaguarundi as endangered. NatureServe lists the conservation status of this species in Texas as "critically imperiled" due to extreme rarity or because of some factor(s) such as very steep declines that make it especially vulnerable to extirpation (NatureServe 2009).

Major threats affecting the jaguarundi in Texas are conversion of thorny brushlands to agriculture and urban development and human persecution (Campbell 2003, Schmidly 2004, NatureServe 2009).

2.5 GHOST-FACED BAT

The ghost-faced bat, or Peter's ghost-faced bat, (*Mormoops megalophylla*) is the only member of the family Mormoopidae to occur in the United States, with records in Texas and Arizona (Schmidly 1991, Schmidly 2004). The ghost-faced bat is a medium-sized bat with reddish brown to dark brown fur with the typical distinctive facial ornamentations for this family. The ghost-faced bat inhabits a variety of habitats including desert scrub, mixed boreal-tropical forest, tropical rain forests and riparian areas with mature cottonwood, sycamore, and willow in oak-woodland habitat (TPWD 2009). They often roost in large colonies in caves, rock crevices, abandoned mines, and old buildings (Schmidly 2004, Schmidly 1991). In Texas, this species is known from the Trans-Pecos, Edwards Plateau, and South Texas Plains regions of the state (Schmidly 1991). Museum and literature records exist for Bexar and Medina counties of the SEP-HCP Plan Area (Schmidly 1991). The range distribution for this bat may also include Bandera County and parts of Kerr, Kendall, and Comal counties (Schmidly 2004). Schmidly

(1991) notes that ghost-faced bats have been collected from Haby Cave in Bexar County and Valdina Farms Sinkhole in Medina County.

The ghost-faced bat is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe lists the conservation status of this species in Texas as "imperiled" due to a very restricted range, very few populations, steep declines or other factors that make it very vulnerable to extirpation (NatureServe 2009). Schmidly (2004) notes that this species may not be as rare within its geographic range as previously thought.

Very little information exists pertaining to the threats faced by the ghost-faced bat; however, Schmidly (2004) wrote that any cave-dwelling bat species, like the ghost-faced bat, that roosts in large numbers at one site is vulnerable to disruption, disturbance, and extirpation.

2.6 CAVE MYOTIS BAT

The cave myotis bat (*Myotis velifer*) is a member of the Vespertilionidae family, which is the largest family of bats worldwide (Schmidly 2004). This species is the largest *Myotis* in Texas and is chiefly insectivorous. They average 3.5 inches in length and range between 0.4 to 0.5 ounces in weight. The cave myotis bat occurs over most of the Trans-Pecos, south Texas, eastern portions of the Panhandle, north-central Texas, and the Edwards Plateau (Schmidly 2004). This species is a colonial, cave-dwelling bat and will use deserts, grasslands, and watercourses when foraging (NatureServe 2009, Schmidly 1991, Schmidly 2004). The cave myotis bat is second in abundance only to the Brazilian, or Mexican, free-tailed bat (*Tadarida brasiliensis*) on the Edwards Plateau, and it hibernates in central Texas caves in the winter (Schmidly 1991, Schmidly 2004). County and literature records, as well as museum specimens, distribute this species throughout the SEP-HCP Plan Area with the exception of Bandera County (Schmidly 1991, Schmidly 2004).

The cave myotis bat is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe lists the conservation status of this species in Texas as "apparently secure", which means the species is uncommon but not rare and there is some cause for long-term concern due to declines or other factors (NatureServe 2009). Schmidly (2004) notes that there is little concern about the long-term status of this bat in Texas.

Potential threats to the cave myotis bat include habitat loss due to development, pesticides, and roost disturbances particularly at nurseries (Schmidly 2004, NatureServe 2009).

2.7 WHITE-NOSED COATI

The white-nosed coati (*Nasua narica*) is a raccoonlike carnivore, but more slender and with a longer banded tail, that occurs in woodlands in south Texas from the Big Bend region and east to Kerr and Victoria counties (Schmidly 2004). NatureServe (2009) lists their current distribution and breeding status as uncertain in Texas. Their habitat preferences include oak-sycamore-walnut, oak-pine, and shrub-grass canyons usually near water (NatureServe 2009). They are mostly active during the day, sociable (particularly the females), and omnivorous (Schmidly 2004, NatureServe 2009). In the SEP-HCP Plan Area, county records for this species only exist for Kerr County, but its distribution may include other SEP-HCP Plan Area counties (Schmidly 2004).

The State of Texas lists this species as threatened; however the USFWS has not listed it due to the relatively good populations found elsewhere in its range (Schmidly 2004, TPWD 2009).

NatureServe lists the conservation status of this species in Texas as "imperiled" due to a very restricted range, very few populations, steep declines or other factors that make it very vulnerable to extirpation (NatureServe 2009).

Very limited information exists pertaining to threats for this species; however, Schmidly (2004) notes that degradation and loss of riparian woodland habitat in south and west Texas may impact the white-nosed coati since it needs a sizeable area of habitat to maintain population viability.

2.8 PLAINS SPOTTED SKUNK

The plains spotted skunk (*Spilogale putorius interrupta*) is a subspecies of the eastern spotted skunk (*Spilogale putorius*). Very limited information is available about this subspecies; however, the descriptions about the eastern spotted skunk may provide some insight into the habitat requirements and range for the plains spotted skunk. The eastern spotted skunk occurs in wooded areas, as well as tall-grass prairies, particularly where rocky canyons and outcrops are available (Schmidly 2004). The range of the eastern spotted skunk includes the eastern half of the state, westward onto the Edwards Plateau, and through north-central Texas to the Panhandle (Schmidly 2004). County records for the eastern spotted skunk exist for Bexar, Kendall, Kerr, and Medina counties of the SEP-HCP Plan Area (Schmidly 2004).

The plains spotted skunk is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. According to Schmidly (2004), the current status of the species is unknown in the state. The plains spotted skunk was listed as a Category 2 candidate by the USFWS prior to 1996 (56 FR 58804, 59 FR 58982). NatureServe lists the conservation status of this species in Texas as "vulnerable" due to a restricted range, relatively few populations, recent and widespread declines or other factors that make it vulnerable to extirpation (NatureServe 2009).

One threat to *S. putorius*, and possibly *S. p. interrupta*, includes the widespread use of chlorinated hydrocarbon insecticides, which may accumulate in the invertebrate prey base that is a substantial portion of their omnivorous diet (Schmidly 2004).

2.9 AMERICAN BLACK BEAR

The American black bear (*Ursus americanus*) is a medium-sized bear either black or brown in color that was formerly found throughout the state of Texas. The species is now restricted to the mountains of the Trans-Pecos region (Schmidly 2004). The black bear population in Texas appears to be recolonizing from populations in northern Mexico (Schmidly 2004). Black bear habitat includes woodland and forested areas across large, contiguous, remote blocks of land (Campbell 2003, Schmidly 2004). According to TPWD (2009), the chance of an established population of black bear in the Hill Country, which includes the SEP-HCP Plan Area, is remote.

The State of Texas currently lists the black bear as threatened in Texas. Since January 1992, USFWS lists the subspecies, Louisiana black bear (*Ursus americanus luteolus*), as threatened. Due to similarities in appearance between the Louisiana black bear and the American black bear, the listing designation has been applied to the species as a whole within the subspecies' historic range (southern Mississippi, Louisiana, and east Texas) (Campbell 2003, Schmidly 2004, 57 FR 588)). NatureServe lists the conservation status of this species in Texas as "vulnerable" due to a restricted range, relatively few

populations, recent and widespread declines or other factors that make it vulnerable to extirpation (NatureServe 2009).

Decline of this species can be attributed mainly to overharvest by humans, conversion, alteration, and fragmentation of habitat, and human population density (Campbell 2003).

3.0 SIGNATURES

This report was prepared by professional wildlife biologists at the consulting firm of Loomis Partners, Inc. in conformance with the methods and limitations described herein.

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4.0 REFERENCES

Block, S. B., and E. G. Zimmerman. 1991. Allozymic variation and systematics of plains pocket gophers (*Geomys*) of south-central Texas. Southwestern Naturalist 36: 29-36.

Campbell, L. 2003. Endangered and threatened animals of Texas – Their life history and management. Texas Parks and Wildlife Department, Wildlife Division. Austin, Texas. 129 pp.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed May 13, 2010.

Schmidly, D. J. 1991. The Bats of Texas. Texas A & M University Press, College Station. 188 pp.

Schmidly, D. J. 2004. The Mammals of Texas. University of Texas Press, Austin. 501 pp.

Smolen, M. J., R. M. Pitts, and J. W. Bickham. 1993. A new subspecies of pocket gopher (GEOMYS) from Texas (Mammalia: Rodentia: *Geomyidae*). Proceedings Biological Society Washington, 106: 5-23.

Texas Parks and Wildlife Department (TPWD). 2009. Wildlife fact sheets [on-line]. Accessed May 2010 at http://www.tpwd.state.tx.us/huntwild/wild/species/.

Texas Parks and Wildlife Department (TPWD). 2010. Annotated county lists of rare species: Bandera, Bexar, Blanco, Comal, Kendall, Kerr, and Medina Counties. Last updated March 12, 2010.

REPTILE SPECIES OF CONCERN

RESOURCE ASSESSMENT

FOR THE SOUTHERN EDWARDS PLATEAU HABITAT CONSERVATION PLAN

DRAFT MARCH 30, 2011

1.0 INTRODUCTION

This resource assessment briefly describes the current status and habitat requirements of rare reptile species that occur in the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP) Plan Area. The purpose of this assessment is to provide basic background information for the Habitat Conservation Plan and associated Environmental Impact Statement.

The list of rare reptile species addressed in this assessment was generated from the Texas Natural Diversity Database (TXNDD) for the counties of Bandera, Bexar, Blanco, Comal, Kendall, Kerr, and Medina of the SEP-HCP Plan Area on March 12, 2010. The TXNDD, maintained by the Texas Parks and Wildlife Department (TPWD), identifies vertebrates, invertebrates, and vascular plants of conservation concern within the state of Texas. Information provided by TXNDD county rare species query includes federal and state regulatory status, county occurrence, and brief life history and habitat descriptions.

Additional sources of information regarding species descriptions, regulatory status, and habitat descriptions included the U. S. Fish and Wildlife Service's (USFWS) Federal Register and web-based species databases, TPWD wildlife fact sheets and books, journal articles, natural history books, and NatureServe's Online Encyclopedia of Life. NatureServe assesses the conservation status, taxonomy, distribution, and life history information of species and ecosystems throughout North America by utilizing databases maintained by natural heritage program scientists and other collaborators. They use this information to assign global, national, and state conservation status ranks to each species it tracks (see www.natureserve.org for more information).

Table 1 includes the regulatory status, occurrence, and habitat characteristics for rare reptile species within the SEP-HCP Plan Area (TPWD 2010).

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TABLE 1: REGULATORY STATUS, OCCURRENCE, AND HABITAT CHARACTERISTICS FOR RARE REPTILES FROM THE SEP-HCP PLAN AREA.

Common Name	Scientific Name	Federal Regulatory Status[1]	State Regulatory Status[1]	SEP-HCP Counties of Potential Occurrence[2]	General Habitat Characteristics
Timber/ Canebrake rattlesnake	*Crotalus horridus*	none	T	Bexar	swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto
Texas indigo snake	*Drymarchon corais*	none	T	Bexar Medina	Texas south of the Guadalupe River and Balcones Escarpment; thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors; can do well in suburban and irrigated croplands if not molested or indirectly poisoned; requires moist microhabitats, such as rodent burrows, for shelter
Texas tortoise	*Gopherus berlandieri*	none	T	Bexar Medina	open brush with a grass understory is preferred; open grass and bare ground are avoided; when inactive occupies shallow depressions at base of bush or cactus, sometimes in underground burrows or under objects; longevity greater than 50 years; active March-November; breeds April-November
Cagle's map turtle	*Graptemys caglei*	none	T	Comal Kendall Kerr	endemic; Guadalupe River System; short stretches of shallow water with swift to moderate flow and gravel or cobble bottom, connected by deeper pools with a slower flow rate and a silt or mud bottom; gravel bar riffles and transition areas between riffles and pools especially important in providing insect prey items; nest on gently sloping sand banks within ca. 30 feet of water's edge
Spot-tailed earless lizard	*Holbrookia lacerata*	none		all 7 counties of the SEP-HCP Plan Area	central and southern Texas and adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground

TABLE 1: REGULATORY STATUS, OCCURRENCE, AND HABITAT CHARACTERISTICS FOR RARE REPTILES FROM THE SEP-HCP PLAN AREA.

Common Name	Scientific Name	Federal Regulatory Status[1]	State Regulatory Status[1]	SEP-HCP Counties of Potential Occurrence[2]	General Habitat Characteristics
Texas horned lizard	*Phrynosoma cornutum*	none	T	all 7 counties of the SEP-HCP Plan Area	open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September
Texas garter snake	*Thamnophis sirtalis annectens*	none		Bexar Blanco Comal Kendall	wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August

[1] E - ENDANGERED; T – THREATENED
[2] TPWD (2010)

2.0 SPECIES DESCRIPTIONS, REGULATORY STATUS, AND HABITATS

2.1 TIMBER/CANEBRAKE RATTLESNAKE

The timber/canebrake rattlesnake (*Crotalus horridus atricaudatus*) is a venomous snake that occurs in heavily wooded areas, typically second growth where rodents abound in the Northeast; lowlands, favoring cane thickets and swamplands in the South; and wooded stream valleys that extend out into the prairies in the West (Conant and Collins 1991). In Texas, this species primarily occurs within the eastern third of the state and occupies moist lowland forests and hilly woodlands or thickets near permanent water sources such as rivers, lakes, ponds, streams and swamps where tree stumps, logs and branches provide refuge (Dixon 2000, Werler and Dixon 2007, and TPWD 2009). In the SEP-HCP Plan Area, county records for this species only exist for Bexar County. The distribution of this species is not likely to include other SEP-HCP Plan Area counties since the Bexar County occurrence record is doubtful (Dixon 2000).

The timber/canebrake rattlesnake was listed by the State of Texas as threatened in March 1987 (Dixon 2000). However, this species is not listed as threatened or endangered by the USFWS, nor is the species currently a candidate for such listing. NatureServe lists the global and national conservation status of this species as “apparently secure” since the species is uncommon, but not rare, and there is some cause for long-term concern due to declines or other factors throughout its range.

The main threat to this species is loss of habitat; habitat fragmentation and isolation of populations, which may become small and nonviable; and direct mortality caused by humans (including illegal snake hunters) and vehicles as habitat is encroached upon by urban/residential development (NatureServe 2009).

2.2 TEXAS INDIGO SNAKE

The Texas indigo snake (*Drymarchon corais erebennus)* is a large glossy blue-black snake and one of Texas' largest snakes in both length and weight (Werler and Dixon 2007). In Texas, this species occurs within the mesquite grassland savannah habitats of south Texas. A drought-sensitive species, the Texas indigo snake requires water associated diurnal habitats, such as areas near streams, ponds, windmill seeps and resacas to provide suitable sources of daytime humidity. This species relies on the underground burrows of small mammals for refuge from the evening heat and other nocturnal predators, and will also retreat to damp underground shelters in times of severe drought when much of the surface water has evaporated in order to prevent loss of body moisture (Werler and Dixon 2007).

The Texas indigo snake primarily occurs in Mexico and is only a peripheral resident within the United States, limited to the semiarid thornbrush environment of south Texas. This species occurs as far northwestward and inland as Val Verde, Kinney, and Medina Counties. As late as the 1950's, the Texas indigo snake occurred along the southern border of Bexar County, however, it is no longer found there (Werler and Dixon 2007).

The Texas indigo snake is listed by the State of Texas as threatened species (TPWD 2009). This species is still uncommon throughout the south Texas brush county despite protection under state law (Dixon 2000). This species is not listed as threatened or endangered by the USFWS, nor is the species currently a candidate for such listing. NatureServe lists the state conservation status of this species as "vulnerable" due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.

In Texas, the primary threats to the Texas indigo snake include habitat destruction and fragmentation. Much of the suitable wildlife habitat for this species has disappeared, especially in lower Rio Grande Valley, due to encroachment of agriculture and urban development (NatureServe 2009, Werler and Dixon 2007). Secondary threats to this species include mortality on roads, wanton killing, and, to a lesser degree, collection for the pet trade (NatureServe 2009). Competition for water resources with human populations has also been suggested as a threat (Mike Duran, The Nature Conservancy vertebrate biologist, pers. comm. 2010). Although the status of this species may be somewhat secure in southern Texas, it may be more vulnerable at the edge of its range in the southern portions of Kinney, Medina, and Val Verde counties (Mike Duran, The Nature Conservancy vertebrate biologist, pers. comm. 2010).

2.3 TEXAS TORTOISE

The Texas tortoise (*Gopherus berlandieri*) is one of only four species of North American tortoises. One of Texas' most interesting reptiles, this species is found in open scrub woods, arid brush, lomas, and grass-cactus associations; often in areas with sandy well-drained soils. When inactive, this tortoise occupies underground burrows or shallow depressions dug at base of bush or cactus (NatureServe 2009). The Texas tortoise is primarily vegetarian, feeding heavily on the fruit of the common prickly pear and other mostly succulent plants; although captive populations are known to eat meat (TPWD 2009). The longevity of this tortoise is thought to be as great as 60 years. This species has very low reproductive rate and take over a decade to reach sexual maturity (Judd and Rose 2000, TPWD 2009).

The distribution of the Texas tortoise is relatively small, occurring only in South-Central Texas and northern Mexico into the Mexican states of Coahuila, Nuevo Leon, and Tamaulipas (Judd and Rose

2000, TPWD 2009). Museum records show this species as randomly occurring in nine other counties (Brazos, Brewster, Burnet, Callahan, Dallas, Galveston, Fort Bend, Matagorda, and Sutton) outside of South-Central Texas. However, these occurrences are most likely due to accidental introductions (Dixon 2000). Within the SEP-HCP Plan Area, the Texas tortoise is known to occur in Bexar, Comal, and Medina counties, but off of the Edwards Plateau (Dixon 2000; Mike Duran, The Nature Conservancy vertebrate biologist, pers. comm. 2010).

The Texas tortoise was listed as a threatened species by the State of Texas in 1977 due to its low reproductive rates, exploitation by pet suppliers, and other factors (TPWD 2009). The Texas tortoise is not listed as threatened or endangered by the USFWS, nor is the species currently a candidate for such listing, since within the United States, the species only occurs in Texas and state laws ensure sufficient protection. Despite protection under state law, the populations of this species in Texas are still declining (Judd and Rose 2000). The NatureServe state conservation status of this species is listed as "vulnerable" due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.

Major causes of the severe decline of Texas tortoise populations, and continued primary threats to this species include their low reproductive rate, historic heavy exploitation by pet suppliers, and other human induced factors (TPWD 2009). Vehicular mortality, human collection, and habitat alterations associated with agriculture or grazing "improvements" (introduction of buffel grass) have greatly reduced distribution and abundance in lower Rio Grande Valley of Texas, northeastern Tamaulipas (Mexico), and around Zapata and Laredo, Texas. Fencing associated with deer management can cause substantial mortality and interfere with movements (Judd and Rose 2000). Other threats to this species include the release of sick pets into the wild and habitat fragmentation, though more research is needed (Judd and Rose 2000, NatureServe 2009). This species may be more vulnerable on the edge of its range than it is range wide, and evidence suggests that urbanization and increased roads and road traffic may eliminate functional tortoise populations (Mike Duran, The Nature Conservancy vertebrate biologist, pers. comm. 2010).

2.4 CAGLE'S MAP TURTLE

Cagle's map turtle (*Graptemys caglei*) is a small emydine aquatic turtle endemic to the watersheds of the Guadalupe River basin in Texas (Dixon 2000). This species has very specific habitat requirements for feeding and nesting. Typical habitat characteristics include, but are not limited to, riffle areas and shoreline vegetation for foraging habitat, shoreline for nesting sites, and logs, stumps, and exposed roots for basking sites within areas of specific river flow regimes that are altered by impoundments (Killebrew, Rogers, and Babitzke 2002, Killebrew 1991a). Habitat requirements include a river bed consisting mostly of silt and gravel, and gravel bars connecting long pool areas with a shallow average depth and a muddy, moderate flow. A highly aquatic species, optimal habitat appears to include both riffle and pools, including areas with gravel bar riffles and transition areas between riffles and pools. These habitat types are areas of high productivity for aquatic insect species and are important for foraging (Killebrew 1991a). Sexually segregated in their feeding habits, adult males are primarily insectivorous and occasionally feed on terrestrial insects and adult females eat mainly Asiatic clams and some insects. Both sexes consume the seeds and fruits of plants in limited quantities. Juveniles of both sexes are insectivorous and mollscivorous. However, juvenile males primarily consume only gastropods, while juvenile females primarily consume only pelecyopds (Killebrew 1991b).

Cagle's map turtle is endemic to Texas and only occurs within the watersheds of the Guadalupe River basin of eleven counties in Texas (Bexar, Blanco, Comal, Dewitt, Gonzales, Guadalupe, Hays, Kendall, Kerr, Lavaca, and Victoria counties) (Dixon 2000). However, it may now be extirpated in the San Antonio drainage (Vermesch 1992). Within the SEP-HCP Plan Area, Cagle's map turtle is known to occur in Comal, Kendall, and Kerr counties (Dixon 2000). Populations are known to occur upriver of the Kerrville area in Kerr County, but its distribution across the Edwards Plateau is poorly documented (Simpson and Rose 2007). A recent study reported that Cagle's map turtle does inhabit the Blanco River; however, the population densities of the species in the Blanco River are low, and the turtles are probably restricted to areas where deep pools provide suitable habitat during drought (Simpson and Rose 2007).

Cagle's map turtle was petitioned to be listed as a federally endangered species in 1991 (Killebrew 1991a). Upon review in 1993, the USFWS listed Cagle's map as a candidate species, stating listing was warranted, but precluded (USFWS 1993). Upon review in 2006, USFWS announced that because of stable population size, increased protection, and no foreseeable threats from reservoir construction, the listing of Cagle's map turtle was not warranted (USFWS 2006). Cagle's map turtle is listed as a threatened species by the State of Texas (TPWD 2009). The NatureServe state conservation status of this species is listed as "vulnerable" due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.

Primary threats to the Cagle's map turtle include habitat loss due to reservoir construction, water diversions, water quality degradation, and human depredation (collection for pet trade and intentional shooting) (USFWS 2003). Over 50% of the suitable habitat would be eliminated by construction of the Cuero Reservoir; several other reservoirs are proposed along tributaries to the Guadalupe River. Limestone "riffle bar" habitat is threatened by siltation, impoundment, and other alterations (NatureServe 2009).

2.5 SPOT-TAILED EARLESS LIZARD

The spot-tailed earless lizard (*Holbrookia lacerata*) occurs in central and southern Texas and adjacent northern Mexico (NatureServe 2009,Axtell 1968). Within Texas, this species is split into two different subspecies north and south of the Balcones Escarpment (the Plateau earless lizard (*H. l. lacerata*) to the north and the southern earless lizard (*H. l. subcaudalis*) to the south) (Axtell 1968, Conant and Collins 1991, Dixon 2000). The spot-tailed earless lizard has been recorded from moderately open prairie-brushland vegetation communities, including prairies, grasslands, savannas, and open woodlands (Axtell 1968; Bartlett and Bartlett 1999; NatureServe 2009; Mike Duran, The Nature Conservancy vertebrate biologist, pers. comm. 2010). While many records note that the species uses fairly flat areas free of vegetation or other obstructions, this association may be overemphasized due to the difficulty finding and observing this species (Mike Duran, The Nature Conservancy vertebrate biologist, pers. comm. 2010).

The small range of the spot-tailed earless lizard in central and southern Texas and adjacent Mexico has been declining in Texas since the 1970s (NatureServe 2009). County records for the spot-tailed earless lizard exist for Bexar, Blanco, Comal, Kendall, and Kerr counties of the SEP-HCP Plan Area (Dixon 2000).

The spot-tailed earless lizard is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe's state

conservation status for this species is listed as "vulnerable" due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.

NatureServe identifies the primary threats to the spot-tailed earless lizard as agricultural herbicides and insecticides. Habitat loss and fragmentation, including the conversion of large amounts of habitat to agriculture, sown to exotic grasses for improved grazing, or fragmented by road construction are also possible threats to this species. However, more information is needed regarding the overall biology and conservation status of this lizard (NatureServe 2009).

2.6 TEXAS HORNED LIZARD

The Texas horned lizard (*Phrynosoma cornutum*) is the state reptile of Texas and the only species of horned lizard to have dark brown stripes that radiate downward from the eyes and across the top of the head (TPWD 2009). This species occupies habitats typically of flat open terrain with sparse plant cover, and is often found in areas of sandy, rocky, or loamy soils (Conant and Collins 1991). Texas horned lizards hibernate in burrows generally from October to April (Garrett and Barker 1987). This lizard is and insectivore and feeds primarily on Harvester ants which comprise up to 69% of their diet (Pianka and Parker 1975).

The Texas horned lizard historically occurred throughout Texas and Oklahoma, as well as portions of Louisiana, Arkansas, Missouri, Kansas, Colorado, New Mexico, Arizona, and northeastern Mexico (Stebbins 1985). It has been reported throughout the majority of Texas, including all seven counties within the SEP-HCP Plan Area (Dixon 2000). Populations decreased greatly in the 1950s and 1960s and now the species occurs in Texas primarily in the western two-thirds of the state (Garrett and Barker 1987).

The Texas horned lizard is listed by the State of Texas as threatened species (TPWD 2009). The Texas horned lizard is not listed as threatened or endangered by the USFWS, nor is the species currently a candidate for such listing. NatureServe lists the global and national conservation status of this species as "apparently secure" since the species is uncommon, but not rare, and there is some cause for long-term concern due to declines or other factors throughout its range.

Major threats to the Texas horned lizard may be related to the spread of fire ants, use of insecticides to control fire ants, heavy agricultural use of land and/or other habitat alterations, and overcollecting for the pet and curio trade (NatureServe 2009). The Texas horned lizard is extremely vulnerable to habitat changes, especially the loss of harvester ants due to the interspecific competition and chemical control of fire ants (Carpenter et al. 1993, Henke and Fair 1998). The widespread use of broadcast insecticides is also thought to contribute to declines. Insecticides can be detrimental by directly causing illness or death or indirectly by severely reducing or eliminating harvester ants (Henke and Fair 1998).

2.7 TEXAS GARTER SNAKE

The Texas garter snake (*Thamnophis sirtalis annectens*) is a moisture-dependent snake found in a wide variety of habitats, but primarily in the vicinity of streams, rivers, ponds, lakes, and marshes (Werler and Dixon 2007). This species mainly feeds on earthworms, frogs, and small toads; and sometimes small mammals and birds and bird eggs (NatureServe 2009). The range of the Texas garter snake is primarily within the central third of Texas, along the eastern edge of the Edwards Plateau.

Within the SEP-HCP Plan Area, this species is known to occur within Bexar, Blanco, Comal and Kendall counties (Dixon 2000).

The Texas garter snake is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe's state conservation status for this species is listed as "vulnerable" due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.

3.0 SIGNATURES

This report was prepared by professional wildlife biologists at the consulting firm of Loomis Partners, Inc. in conformance with the methods and limitations described herein.

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4.0 REFERENCES

Axtell, R. W. 1968. Holbrookia lacerata. Cat. Am. Amph. Rep. 56.1-56.2.

Bartlett, R. D. and P. P. Bartlett. 1999. A field guide to Texas reptiles & amphibians. Gulf Publishing Company, Houston, Texas. xviii + 331 pp.

Carpenter, C. C., R. St. Clair, P. Gier, and C. C. Vaughn. 1993. Determination of the distribution and abundance of the Texas horned lizard (PHRYNOSOMA CORNUTUM) in Oklahoma. Final Report to Oklahoma Department of Wildlife Conservation, Federal Aid Project E-18.

Conant, R. and J.T. Collins. 1991. Peterson Field Guides Series: Reptiles and Amphibians of Eastern/Central North America, 3rd ed. Houghton Mifflin Company: Boston. 450 pp.

Duran, M. 2010. Personal communication to Jim Bergan (The Nature Conservancy) regarding comments on SEP-HCP draft resource assessments. Received via email from Jim Bergan to Amanda Aurora (Loomis Partners) on June 7, 2010.

Garrett, J.M. and D.G. Barker. 1987. A Field Guide to Reptiles and Amphibians of Texas. Texas Monthly Press.

Henke, S. E., and W. S. Fair. 1998. Management of Texas horned lizards. Wildlife Management Bulletin of the Caesar Wildlife Research Institute, Texas A & M University-Kingsville, Bull. No. 2. 7 pp.

Judd, F. W., and F. L. Rose. 1983. Population structure, density and movements of the Texas tortoise GOPHERUS BERLANDIERI. Southwest. Nat. 28:387-398.

Killebrew, F. C. 1991a. A petition for threatened status listing of *Graptemys caglei* (Testudines, Emydidae). Letter to U.S. Fish and Wildlife Service, Corpus Christi Ecological Services Field Office. April 8, 1991. 15 p.

Killebrew, F. C. 1991b. Habitat characteristics and feeding ecology of Cagle's Map Turtle (*Garptemys caglei*) within the proposed Cuero and Lindenau reservoir sites. Prepared for Texas Parks and Wildlife Department under interagency contract (91-483-797) with the Texas Water Development Board, Austin. 15 pp.

Killebrew, F. C., W. J. Rogers, and J. B. Babitzke. 2002. Assessment of instream flow and habitat requirements for Cagle's map turtle (*Graptemys caglei*). Report to Edwards Aquifer Authority Contract #00-52-AS, 60 pp.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed May 2010.

Pianka, E. R., and W. S. Parker. 1975. Ecology of horned lizards: a review with special reference to PHRYNOSOMA PLATYRHINOS. Copeia 1975(1):141-162.

Simpson, T. R. and F. L. Rose. 2007. Distribution of Cagle's Map Turtle (*Graptemys caglei*) in the Blanco and San Marcos Rivers. Texas Journal of Science, 59(3): 201 – 208.

Stebbins, R.C. 1985. A Field Guide to Western Reptiles and Amphibians - The Peterson Field Guide Series: 138-142, Taf. 96-102.

Texas Parks and Wildlife Department (TPWD). 2009. Wildlife fact sheets [on-line]. Accessed May 2010 at http://www.tpwd.state.tx.us/huntwild/wild/species/.

Texas Parks and Wildlife Department (TPWD). 2010. Annotated county lists of rare species: Bandera, Bexar, Blanco, Comal, Kendall, Kerr, and Medina Counties. Last updated March 12, 2010.

U.S. Fish and Wildlife Service (USFWS). 12 September 2006. Notice of findings on petition to list Cagle's map turtle. Federal Register 71(176): 53767.

U.S. Fish and Wildlife Service (USFWS). 2003. *Graptemys caglei*. Candidate assessment and listing priority assignment form. 9 pp.

U.S. Fish and Wildlife Service (USFWS). 22 January 1993. Notice of 12-month finding on petition to list Cagle's map turtle. Federal Register 58(13): 5701 – 5704.

Vermersch, T. G. 1992. Lizards and turtles of south-central Texas. Eakin Press, Austin, Texas. 170 pp.

Werler and Dixon. 2007. Texas Snakes: Identification, Distribution, and Natural History, Fifth printing. University of Texas Press: Austin. 437pp.

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DRAFT PERLIMINARY ASSESSMENT OF RARE MOLLUSK SPECIES OF THE SOUTHERN EDWARDS PLATEAU HABITAT CONSERVATION PLAN AREA

Texas Fatmucket (*Lamsilis bracteata)* Photo by Craig Stihler, USFWS

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Introduction

The proposed Plan Area of the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP) encompasses the following seven counties in Texas: Bexar, Bandera, Comal, Kendall, Kerr, Blanco and Medina counties. The following assessment covers rare mollusk species distributed within the Plan Area. Distribution data were gathered using the NatureServe Explorer conservation database (NatureServe 2009) and the Texas Parks and Wildlife's (TPWD) "Rare, Threatened and Endangered Species of Texas" database (Texas Parks and Wildlife Department 2009).

Species' Status

The Texas Parks and Wildlife's "Rare, Threatened and Endangered Species of Texas" database lists eleven rare mollusk species within the SEP HCP plan area. Of these, six are classified as "threatened" within the state of Texas and have been petitioned for federal listing (74 FR 66260). Two additional mollusks, one aquatic snail and one terrestrial snail have also been petitioned for listing (74 FR 66866). Table 1 summarizes the rare mollusks examined within this assessment. It is important to note, however, that the majority of these mussel species are known only historically from the SEP-HCP Plan Area counties and may be currently extirpated from these localities. County ranges in Table 1 depict historical data only. Information on current distributions for each species is provided in the text of this assessment.

Table 1. Rare Mollusks Species of the SEP-HCP Plan Area.

Species	**County Range**	**NatureServe Global Status ConservationRank[1]**	**State Protection Status (TPWD)**
Rock Pocketbook *Arcidens confragosus*	Bandera, Comal, Blanco	G4	None
Pistolgrip *Quadrula verrucosa*	Bexar, Kerr, Kendall, Comal, Blanco	G4G5	None
Creeper *Strophitus undulatus*	Bexar, Bandera, Kerr, Kendall, Comal	G5	None
Texas Fatmucket** *Lampsilis bracteata*	Bexar, Kerr, Kendall, Comal, Blanco	G1	Threatened
Golden Orb** *Quadrula aurea*	Bexar, Medina, Bandera, Kerr, Kendall, Comal, Blanco	G1	Threatened
Smooth Pimpleback** *Quadrula houstonensis*	Blanco	G2	Threatened
Texas Pimpleback** *Quadrula petrina*	Bexar, Medina, Bandera, Kerr, Kendall, Blanco	G2	Threatened
False Spike Mussel** *Quadrula mitchelli*	Bexar, Kerr, Kendall, Comal, Blanco	GH	Threatened
Texas Fawnsfoot** *Truncilla macrodon*	Bexar, Kerr, Kendall, Comal, Blanco	G2	Threatened
Mimic Cavesnail** *Phreatodrobia imitata*	Bexar	G1	None
Horsehoe Liptooth Snail* *Daedalochila hippocrepis*	Comal	G1	None

[1] NatureServe Global Conservation Status Rank of G1- Critically Imperiled; G2-Imperiled; G3-; G4- Apparently Secure; G5- Secure; GH- Possibly Extinct

*Species has been petitioned for federal listing under the Endangered Species Act (ESA).

**USFWS has concluded that listing of species under the ESA may be warranted.

Mollusks in Texas

In 1992, TPWD created its first freshwater mussel harvest regulations. A minimum shell size of 2.5 inches was established as well as 28 “no-harvest” sanctuaries (Howells 2010). Other TPWD regulations include: collection by hand only, limited harvest under a fishing license (other harvest under a mussel license), harvest during daylight hours only, weekend bag limits of 75 pounds or within 1500 feet of public waters, and limits on harvest size. In 2010, TPWD placed a moratorium on the sale on new commercial licenses and is only renewing licenses of previous resident or non-resident fisherman holding licenses obtained from May 2003 to May 1, 2006 (Winemiller et al. 2010).

General Habitat Requirements

Freshwater mussels may inhabit a wide range of water-body types, including large and small rivers, streams, lakes, ponds, canals and reservoirs. Environmental parameters, such as temperature tolerances, substrate size, water chemistry, flow regimes, depth of water, etc are species-specific (Winemiller et al. 2010). Certain mussels may require moderate to swiftly flowing waters and typically fail to survive in lakes or impoundments (Howells et al. 1996). The greatest number of species and individuals has been found in flowing waters and in areas with strong currents (Coker et al. 1921). Mud, sand, gravel and cobble, including any combination of these, are often the most heavily populated substrates (Howells et al. 1996). Limiting factors for freshwater mussels include deep shifting sand and silt, heavy boulder and cobble bottoms, densely vegetated and heavily shaded areas, although juveniles may sometimes utilize vegetation closely associated with fish hosts (Howells et al. 1996).

Threats

Mussels in Texas are threatened by modifications to waterways and streambeds, pollution, deterioration of water quality, sedimentation, agricultural runoff, commercial mussel fisheries and withdraws of ground or surface water that change water levels and velocities. Introduced Asian clams also compete with native mussels (Howells 1996).
Neck (1982) found that reservoir construction, land clearing, urban development, and groundwater withdrawal were major proximate causes of habitat and flow alteration. Winemiller et al. (2010) summarized four primary threats to mussel diversity and abundance: 1) urbanization affects on the hydrology and sediment dynamics of streams and rivers, 2) nutrient loading from both urban and agricultural sources, 3) water withdrawals and diversions of both subsurface and surface waters in areas of rapid population growth, and 4) introduction and range expansion of invasive species like loricariid catfishes (*Pterygoplichthys* sp, and *Hypostomus* sp.), and Asian clams (*Corbicula fluminea*).

Data Gaps

Freshwater mussel abundance in Texas has been poorly studied. Information on reproductive biology, environmental requirements and population status of many of these species is currently lacking.

Species Descriptions and Distributions

Rock Pocketbook (Arcidens confragosus)

The Rock Pocketbook is a relatively large freshwater mussel with a shiny bright green to yellow green shell when young. Older specimens are tan to darker green or almost black. Texas specimens can grow to about 6 inches in shell length. Shell shape is quadrate to subrhomboidal, inflated (Howells et al. 1996). Rock Pocketbooks are considered long-term breeders and *spawn* from September through June (Baker 1928). Larval hosts include rock bass (*Ambloplites rupestris*), American eel (*Anguilla rostrata*), freshwater drum (*Aplodinotus grunniens*), gizzard shad (*Dorosoma cepedianum*), white crappie (*Pomoxis annularis*), and channel catfish (*Ictalurus punctatus*) (Howells et al. 1996).

This mussel typically inhabits standing or slow moving waters, though it is known to tolerate moderate currents. It anchors in mud, sand, or gravel and may prefer medium to large-sized rivers (Baker 1928, Murray and Leonard 1962, Buchanan 1980, Oesch 1984, Howells et al. 1996). It is typically found at depths from 4 to 42 inches, but may also occur in much deeper water. Goodrich and van der Schalie (1944) noted that it prefers mud bottoms in deep water, and some specimens from reservoirs demonstrate that it can inhabit such impoundments.

Howells et al. (1996) described Rock Pocketbook as often rare to uncommon throughout its range, although the species is widely distributed. It inhabits waters as far south as the Guadalupe River system in Texas and ranging north and east into the Midwestern states. It is extirpated from Ohio and threatened in Wisconsin (NatureServe 2009). According to TPWD (2009), this species can be found in the both the Red River and Guadalupe river basins. Within the plan area, it has been documented in Bexar, Blanco, and Comal counties (TPWD 2009).

Although considered rare throughout the state by TPWD (2009), this species is not listed as threatened or endangered by the State of Texas or the U.S. Fish and Wildlife Service (USFWS), nor is it a candidate for federal listing.

Creeper/ Squawfoot (Strophitus undulatus)

The Creeper is a large mussel with a yellow-brown to greenish-brown to dark brown or black outer shell, a bluish-white, sometimes creamy interior, and orange soft tissues. It grows up to 4 inches in length. Shell is oblong, subelliptical or suboval; thin and fragile when small but thicker and stouter with age (Howells et al. 1996).

Gravid females are reported from July to May and it is noted that Creepers might be able to complete their life cycle without a fish host (Baker 1928, Howells et al. 1996), as is required by many Texas freshwater mussels. Known larval fish host do include, however, the Rio Grande killifish (*Fundulus zebrinus*), Largemouth bass (*Micropterus salmoides*) and the green sunfish (*Lepomis cyanellus*) (Fuller 1978).

The Creeper is known from both large and small streams, where it seems to prefer gravel or gravel/mud in flowing waters. It has been reported from fairly deep waters in large to medium rivers on mud and sand (Baker 1928), occasionally from gravel and cobble (Murray and Leonard 1962) and in silt in still and slow flowing waters (Buchanan 1980). It may be especially sensitive to drought (Metcalf 1982, Howells et al. 1996). Specific microhabitat requirements are not known and limiting factors are poorly understood.

In Texas, it occurs in the Guadalupe, Colorado and San Antonio River drainage basins. Historically, it was also known from both the Neches and Trinity River basins. It varies across the US from abundant and secure to “critically imperiled” in some states like Alabama, Delaware, Rhode Island, and Texas (NatureServe 2009). Within the SEP HCP plan area, this mussel has been historically documented from Bexar, Bandera, Kerr, Kendall, Comal and Blanco counties (TPWD 2009).

Although considered rare throughout the state by TPWD (2009), this species is not listed as threatened or endangered by the State of Texas or the USFWS, nor is it a candidate for federal listing.

Pistolgrip (Quadrula verrucosa)
The Pistolgrip mussel is a large (almost 7 inches in length) olive-yellow/yellow-brown when young, brown to black when older, freshwater mussel. Internally it is white and iridescent posteriorly with white soft tissues and brown gills. Shell shape is elongate, quadrate, or rhomboidal with females more elongate and slender and males shorter and wider (Howells et al. 1996).

Gravid females have been recorded in August in central Texas populations (Littleton 1979), although populations in West Virginia and Virginia exhibit gravid females in April through early June (Jirka and Neves 1992). Larval hosts include yellow bullhead (*Ameiurus natalis*), brown bullhead (*Ameiurus nebulosa*), as confirmed by Hove et al. (1998), and flathead catfish (*Pylodictis olivaris*) (Hove et al. 2004).
Pistolgrip can be found on almost any substrate from rock and packed mud to soft sand and silt, often buried (Murray and Leonard 1962, Howells et al. 1996). It is reported from still waters by Buchanan (1980) and in riffles and runs (Stansbery 1965, Howells et al. 1996). This species may be found living at river depths of one foot up to 20 feet (Parmalee and Bogan, 1998).

Its distribution in Texas includes the San Antonio River drainage and water systems to the north and east. Surveys in 1992 and 1994 conducted by Texas Parks and Wildlife Department found only one live specimen west of the Neches River, though many live specimens were found in the Neches and Sabine River Drainages (Howells et al. 1996). In the earlier part of the century, Pistolgrips were often harvested for the shell-button industry or cultured pearl industry. This, however, does not seem to have been common in Texas, although during the “pearl rush” of the early 1900’s it was one of the primary species taken from the Caddo Lake area. Presently, it is not generally sought by pearlers in Texas (Howells et al. 1996).
Although considered rare throughout the state by TPWD (2009), this species is not listed as threatened or endangered by the State of Texas or the USFWS, nor is it a candidate for federal listing.

Horseshoe Liptooth Snail (Daedalochila hippocrepis)
The Horseshoe Liptooth is a terrestrial snail known only from Landa Park in New Braunfels, Comal County, Texas, where it can be found under leaf litter on wooded hillsides (TPWD 2009). Very little is known about its natural history, population dynamics, or threats to its persistence. In 2009, it was one of 475 species petitioned for listing but it was determined that not enough information about the species or its threats was available to warrant listing (74 FR 66866). Although considered rare throughout the state by TPWD (2009), this species is not listed as threatened or endangered by the State of Texas or the USFWS. NatureServe (2009) lists its status as “critically imperiled”. The Horseshoe Liptooth snail is not included under “Evaluation Species” in the Comal County Regional Habitat Conservation Plan.

Mimic Cavesnail (Phreatodrobia imitata)
The mimic cavesnail is a freshwater snail that lives underground and is known only from two wells in the Edwards Aquifer below Bexar County (Hershler and Longley, 1986). NatureServe database (2009) lists it as “Critically Imperiled”. More information regarding the species range, ecology, life history, and population is needed, as little is currently known. Presently, the Mimic Cavesnail is not state or federally protected but it was

petitioned for listing as threatened or endangered in 2009 (74 FR 66866). The USFWS determined that inclusion on the list of threatened and endangered wildlife may be warranted due to loss of habitat from groundwater withdrawal and contamination. Although considered rare throughout the state by TPWD (2009), this species is not listed as threatened or endangered by the State of Texas.

Threatened Species Descriptions and Distributions

The following six species are listed as threatened in the state of Texas (TPWD 2009). Presently, they are being reviewed for federal listing (74 FR 66263, December 15, 2009) under the Endangered Species Act.

Texas Fatmucket (Lampsilis bracteata)
Description and Life History- The Texas fatmucket is a medium sized (3.5 by 2 inch) freshwater mussel with a tan to brown colored shell with dark brown, green, or black rays (Howells et al. 1996). General shell shape is an elongate oval to elliptical or subrhumboidal. Soft tissues are tan to off white with gray to black edges on the mantle. The larval stage, or glochidia, is described by Howells et al. (1996) as moderately large, subelliptical and spineless. Females have been found with glochidia in marsupial from July through October, although females may brood larvae throughout the year (Howells 2000). Furthermore, Louisiana Fatmucket has been found brooding glochidia during most months in Texas waters, lending further support to the theory that the Texas species does the same (Howells 2000). Glochidia utilize bluegill (*Lepomis macrochirus*) and green sunfish (*Lepomis cyanellus*) as hosts (Howells et al. 1996) and transform into the adult stage around 21 days (Howells 1997). In laboratory studies, Glochidia transformed after 21 days at 24 degrees Celsius after attachment to gills of Bluegill (*Lepomis macrochirus*) and Green Sunfish (*L. cyanellus*); no attachment occurred on Blacktail Shiner (*Cyprinella venusta*) or Goldfish (*Carassius auratus*) (Howells 1997).

Habitat Requirements- Generally, Texas Fatmucket is restricted to moderate-size streams and smaller rivers in flowing waters (Howells 2010). It occurs on sand, mud, or gravel substrates in rivers and streams of the San Antonio, Guadalupe, and Colorado River systems (TPWD 2009). It has been found in association with gaps between bedrock slabs and course gravel in moderately flowing water (Howells et al. 1996). The species appears to be intolerant of impoundment and occupies flowing waters less than 3 feet deep (NatureServe 2009). Surviving populations appear to occur at sites where one or both banks are of relatively limited elevation, allowing flood waters to spread out over terrestrial lands and thereby reducing damage from scouring (Howells 2010).

Range and Distribution- The Texas Fatmucket is endemic to the Texas Hill Country and the east-central Edwards Plateau Region (Howells 1996). Historically, it ranged from Travis County upstream to the headwaters in Kerr County in the Guadalupe System, and from Bexar County in the San Antonio drainage (Howells 2010). The historic range of this species included Bexar, Blanco, Comal, Kendall, and Kerr counties within the SEP-HCP Plan Area, although only seven, very small populations of the Texas fatmucket are currently known (Howells 2010). Of these seven sites, one appears to have been completely eliminated by dewatering and possibly overcollecting (Howells 2006). The only current site that falls within the Plan Area is in Kerr County and appears to have been negatively impacted and possibly extirpated as a result of dewatering and construction activities (NatureServe 2009, Howells 2010).

Threats-Poor land management, including intense overgrazing, resulting in excessive runoff and scouring floods have reduced this species since the turn of the century (NatureServe

2009). One Texas Fatmucket population was found when flood waters stranded specimens in 2002 (Howells et al. 2003). Other threats to the Texas Fatmucket include impacts associated with increased human populations within its range and the subsequent increase in aquifer pumping (Howells 2010). Brune (2002) reported that flows in many Texas springs have been reduced or eliminated which have caused a reduction, and in some cases elimination, of spring feeds to streams, as may have been the case with the Kerr County population (Howell 2006).

Data Gaps- Population estimates for the Texas Fatmucket at its known sites are currently lacking. Relatively few individuals have been encountered in survey efforts at any of the known population sites and no large populations have been confirmed in recent years. (Howells 2010). Information on fecundity estimates is also lacking (Howells 2010). Additionally, basic information on environmental aspects of its biology, such as in-stream flow limitations, minimum and maximum oxygen levels, critical spawning and incubation temperatures, etc., are difficult to ascertain, considering the rarity of the species and its sensitivity to disturbance (Howells 2010).
Although distribution data on this species is generally well reported, additional small populations may exist on private lands and efforts to access these lands may be warranted (Howells 2010).

Golden Orb (Quadrula aurea)
Description and Life History- The golden orb is a freshwater mussel with a shell usually less than 3.25 inches that may be yellow-brown, greenish-brown, tan with an orange tint or dark brown and almost black (Howells 2002). Shell is moderately thick and somewhat inflated and the shape is subrectangular to broadly elliptical or slightly oblong (Howells et al. 1996). It breeds at least from May through August, as females with eggs were found at this time (Howells 2000).

Habitat Requirements- Golden Orb has been found almost exclusively in flowing waters in moderate-size streams and rivers (Howells 2010). It has not been found in reservoirs built on rivers previously containing populations suggesting the species may be intolerant of impoundment (Howells et al. 1996). Shells collected on the San Saba River and Guadalupe River were found in sand and gravel; shells collected at Lake Corpus Christi were found in mud at the bases of inundated willows (Howells et al. 1996).

Range and distribution-Golden orb is endemic to Central Texas with its historic range including the Guadalupe-San Antonio River basin and Nueces-Frio River Basin (Howells 2002). Presently, it is known from nine locations, several of which have only been recently located. Among these, moderately sized populations may survive at only six sites (Howells 2010). Although historically known from seven counties within the plan area, only one small population, possibly extant, is currently recorded within the plan area, in Kerr County (Howells 2010). The other eight known populations occur in Gonzales, Victoria, Goliad, Live Oak and San Patrico counties.

Threats- Continued human population growth and development, habitat loss and modification and disturbance in conjunction with decreasing water supplies all serve as potential threats to this species (Howells 2010).

Data Gaps- Currently, there are no data on fecundity, glochidia, or hosts for this species. Additional information on species environmental tolerances is also lacking.

Smooth Pimpleback (Quadrula houstonensis)
Description and Life History- The smooth pimpleback (*Quadrula houstonensis*) is a yellow-buff to yellow-green when young, ashy-brown when older, mussel that grows up to 2.5 inches in length and around 2 inches in height (Simpson 1914). Shell shape is rounded and blunt, subrhumboidal to subquadrate and is heavy and globular. It has a silvery-white inside shell and off-white to tan soft tissue (Howells et al. 1996).

Some taxonomic uncertainty appears to exist between the smooth pimpleback and golden orb where morphological differences between the two start to blur in some central and western waters, as is the case with smooth pimpleback and western pimpleback (*Quadrula mortoni*) in eastern waters (Howells et al. 1996). This species has also been confused with pimpleback (*Q. pustolosa*) and Texas pimpleback (*Q. petrina*). Thus, the term "houstonensis" may have sometimes been used as a "catch-all" for generally unusual pimplebacks in Texas. Pimplebacks from the upper Trinity River drainage remain problematic and have been variously assigned to *houstonensis*, *pustulosa*, and *mortoni* (NatureServe 2009).

Habitat Requirements- Smooth pimpleback can be found in mixed mud, sand, and finer gravel in the lower Trinity, Colorado and Brazos River drainage basins (TPWD 2009). It is found in moderate to large- sized streams, rivers and some reservoirs (Howells 2010) and seems to tolerate slow to moderate flow rates, It is not, however, very tolerant of dramatic water level fluctuations, scoured bedrock substrates or shifting sand bottoms (TPWD 2009).

Range and distribution- Historically, simple pimpleback was restricted to the central and lower reaches of the Brazos and Colorado rivers and their tributaries in Central Texas (Howells et al. 1996). It has also been reported from the Trinity River drainage (Strecker 1931). Small populations in the upper Trinity River system may or may not be this species, but pimplebacks now found in the lower Trinity and San Jacinto rivers are almost certainly another species (Reimer and Linum 2005).

Recent field work conducted by Karatayev and Burlakova (2007 and 2008) and also Randklev and Kennedy (2008) have found the simple pimpleback more common at some sites in the central Brazos River drainage than previously documented. Howells (2002) claims dramatic reduction in distribution and abundance, some even prior to European contact and subsequent environmental impacts. He also cites that over the previous decade the only specimens from the Colorado River drainage are a single specimen from one reservoir and 13 from another, along with three from the lower Colorado River. In the Brazos River drainage scattered sightings were found from the Waco area to the mouth of the Navasota River as well as in the Little Brazos River, Leon River, and elsewhere (Howells 2002).

Karateyev and Burlakova (2008) found it to be abundant in the Brazos River drainage basin where they found it in five bodies of water on 14 sites (Karatayev and Burlakova 2008). Limited abundance, patchy distribution, and recent losses associated with pollution, flooding, or droughts confound defining exact distribution. Currently, no populations are known within the SEP-HCP Plan Area (Howells 2010).

Threats- Continued human population growth and development, habitat loss and modification and disturbance in conjunction with decreasing water supplies all serve as potential threats to this species (Howells 2010).

Data Gaps- Many aspects of species biology are currently lacking. Presently, there is no information on brooding season, fecundity, glochidia or host fishes. Additional information on species environmental tolerances is also lacking.

Texas Pimpleback (Quadrula petrina)
Description and Life History- The Texas pimpleback is a yellowish-brown, greenish-brown, yellowish-green to gray-green or dark brown mussel. It occasionally shows irregular green blotches in indistinct rays and is white internally and iridescent posteriorly with white to off white soft tissues. Shell shape is subelliptical, subrhomboidal or subquadrate, slightly oblong and rounded. Shell is moderately thick and solid; broadly rounded anteriorly and slightly rounded dorsally (Howells et al. 1996). Shell size is often larger than other pimpleback species in Texas and shell length is often 2 to 3.5 inches (Howells 2010).

Females have been found spawning from May to August, with varying timing reflecting seasonal temperature patterns (Howells 2010). Glochidia have been documented as hookless with elliptical shells (Howells et al. 1996, Howells 2010). Although eggs and glochidia have been obtained from Texas pimplebacks, host fishes utilized by this species remain unknown (Howells et al. 1996, Howells 2010).

Habitat Requirements- Texas pimplebacks occur on mud, sand, gravel, cobble substrates, and occasionally in gravel-filled cracks in bedrock slab bottoms (Howells 2010). They are present in medium-sized rivers or streams, typically in flowing waters. No populations have been documented in reservoirs and it has not been recorded at depths over 6.5 feet. Texas pimpleback appears to avoid silt, shifting sands and scoured areas (Howells 2010).

Range and distribution- Historically, the Texas pimpleback inhabited the San Antonio and Guadalupe drainage basins of central Texas (Stecker 1931, Howells 2002, Howells 2010) and was present in Bexar, Medina, Bandera, Kendall, Kerr, and Blanco counties of the SEP-HCP Plan Area.

This species has experienced a dramatic reduction in range (NatureServe 2009). TPWD has conducted surveys throughout the species historic range from 2005 to the present. Only two locations yielded alive or recently dead specimens. These two sites were: Concho County-Concho River upstream of the Paint Rock area and the Guadalupe River, southwest of Victoria. Two additional sites, one in Menard County and another in Hays County, may still have small, persisting populations of the Texas pimplebacks (Howells 2010).

Threats- Specific to the Concho County site in the Concho River drainage upstream of the Paint Rock area, extensive cotton farming occurs. This and other ranching activities may contribute contaminants to the system which will ultimately affect Texas pimpleback populations. Dewatering poses another threat. In 1997, river flow was dramatically reduced resulting in the loss of many Texas pimplebacks (Howells 1998) with deaths due both directly to dewatering and to over-heated shallows where some animals were trapped. Howells (2002) cites several ins
tances where local populations were extirpated by dewatering in 1999-2000.
The status in the upper San Saba River, Menard County, is undetermined following dewatering and subsequent severe flooding in 2000 (Howells 2002). Hoofstock are grazed through this area and residential development has increased in surrounding land and along river banks, both of which may negatively impact Texas pimpleback populations in this area (Howells 2010).

Howells (2002) points out that the Texas pimpleback is large enough that it is occasionally harvested for commercial uses. Although there has been no indication of over harvest by

shell musselers or pearl hunters, the TPWD state classification of “threatened” now precludes this take, as well as any incidental harvest by anglers seeking mussels as bait (Howells 2010).

Data Gaps- Information on fecundity is currently lacking and reproductive season is not fully understood. Host fishes for larval stage are unknown. Additional information on species environmental tolerances is also lacking (Howells 2010).

False Spike Mussel (*Quadrula mitchelli*)
Description and Life History-The false spike mussel’s external coloration may be tawny-brown, olive, greenish-yellow, brown or black (Howells 2010) with beaks and posterior slopes orange-yellow (Howells et al. 1996). It is often rayed with yellow-olive or green markings and has a single olive-green ray on the posterior slope Inside, the shell is white and iridescent (Howells et al. 1996). Shell shape ranges from subrhomboidal to suboval and is slightly inflated. Shell is solid and moderately thick in adults (Howells 2010).

Habitat Requirements- Very little has been reported on habitat requirements or preferences of False Spike (Howells 2010). Howells et al. (1996) cites one report of False Spike being found in 2 foot deep water in the Guadalupe River on substrates of cobble and mud with water lilies present. The most recently found dead material for this species was found in the San Marcos River area, amongst steep, unstable sand banks (Howells 2006). Much of this stretch of the river has deep-shifting sand areas or scoured runs of heavy cobble and rocks (Howells 2010). Other habitat requirements are unknown (NatureServe 2009).

Range and distribution- Historically, False Spike occurred within two geographically distinct populations- one in the Rio Grande drainage and another in Central Texas. It was known across the SEP- HCP Plan Area in Bexar, Kerr, Kendall, Comal, and Blanco counties (Texas Parks and Wildlife Department 2009). Within central Texas, False Spike occurred in the Guadalupe-San Antonio and Colorado drainages and some locations in the Brazos River basin (Howells 2010).
No living populations are currently known (Howells 2010). The last record of this species was in 2000 when two recently dead individuals were found in the lower San Marcos River. This location has been revisited several times since 2000 without success (Howells 2010).

Threats- The False Spike mussel likely faces different threats in different drainages. In the Guadalupe and Rio Grande systems low flows may be a problem, while in the Colorado or Brazos River water quality, sedimentation, and complications from runoff and invasive species could be a larger threat.

Data Gaps- More information on life history, habitat preferences, and population status is needed, especially information on habitat such as preferred flow rates and substrate.

Texas Fawnsfoot (Truncilla macrodon)
Description and Life History-The Texas Fawnsfoot grows up to almost 2 inches in length and 1.5 inches in height and can be dirty- to smoky-green, tan, brown, yellow-brown, or reddish-brown, often with a pattern of broken rays and irregular blotches, inverted “V”s or zig-zag markings. Its interior shell is bluish-white to white and iridescent posteriorly (Howells et al. 1996). Shell shape is elongate, oval, slightly to moderately compressed, solid, but rather thin to moderately thick. Females are less pointed posteriorly (Howells 2010). Larval host fish was reported as freshwater drum (Surber 1913) but no current data exist.

Habitat Requirements- Little is known about habitat requirements for this species (Howells 2010). Only a few specimens have been found alive or recently dead since 1980. It is likely these were washed or otherwise removed from their preferred microhabitat sites which remain undetermined (NatureServe 2009). Howells (2010) suggests that, generally speaking, Texas Fawnsfoot have a preference for flowing waters of rivers and larger streams. Living specimens have not been documented in reservoirs suggesting intolerance of impoundment, but have been found alive in the past in flowing rice irrigation canals. It most likely prefers sand, gravel, and perhaps sandy-mud bottoms in moderate flows (NatureServe 2009).

Range and distribution- Texas Fawnsfoot is historically known from the Colorado, Trinity, and Brazos River drainages (Howells et al. 1996). Within the SEP-HCP Plan Area, it was known from only Blanco County (Texas Parks and Wildlife Department 2009). Only about 200 specimens have been documented since its initial description in 1859, and only five living shells had been found in recent decades until Karatayev and Burlakova (2007) recovered one single live specimen in the Brazos River at IH 10 in 2006. According to Howells (2010), a living population was found in the Brazos River in Washington County in 2008 and, more recently, in the Colorado River in 2009.

Threats- Environmental modification and degradation within the range of Texas Fawnsfoot continue. Aquatic habitat modification from widely ranging terrestrial sources continues to be a major threat as does dewatering during droughts and scouring flooding during times of intense precipitation (NatureServe 2009).

Data Gaps- Data are virtually non-existent on several aspects of this species biology, including required or preferred habitat, glochidia, host fishes, reproductive seasons, fecundity, and environmental tolerances (NatureServe 2009).

Literature Cited

Baker, F. C. 1928. The freshwater mollusca of Wisconsin. Part II. Pelecypoda. Bulletin of the Wisonsin Geologic and Natural History Survey 70:1-495.

Brune, G. 2002. Springs of Texas. Volume 1. Springs of Texas. Texas A&M Press, College Station. 566pp.

Buchanan, A. C. 1980. Mussels (naiades) of the Meramec River basin, Missouri. Missouri Department of Conservation Aquatic Series, 17, Jefferson City.

Coker, R.E., A.F. Shira, H.W. Clark and A.D. Howard. 1921. Natural history and propogation of freshwater mussels. U.S. Bureau of Fisheries Bulletin (Document 893) 37: 75-181.

Goodrich, C., and H. van der Schalie. 1944. A revision of the Mollusca of Indiana. American Midland Naturalist 32: 257-326.

Fuller, S.L.H., 1978. Fresh-water mussels (Unionidae) of the upper Mississippi River. Observations at selected sites within the 9-foot channel vanigation project on behalf of the U.S. Army Corps of Engineers. Academy of Natural Sciences, Philadelphia, Pennsylavania.

Hershler, R. and G. Longley. 1986. Phreatic hydrobiids (Gastropoda: Prosobranchia) from the Edwards (Balcones Fault Zone) Aquifer region, south-central Texas. Malacologia 27:127-172.Hove, M. and A.R. Kapuscinski. 1998. Ecological relationships between six rare Minnesota mussels and their host fishes. Final Report to the Minnesota Department of Natural Resources, Natural Heritage and Nongame Research Program, St. Paul, Minnesota. 17 pp.

Hove, M., M. Berg, S. Schieffers, G. Widiker, V. Kanodia, K. Yngve, C. Nelson, M. Marzec, D. Hornbach, A. Kapuscinski. 2004. High school and university researchers verify flathead catfish as host for pistolgrip (Tritogonia verrucosa). Ellipsaria 6(3): 16-18.

Howells, R.G., R.W. Neck, and H.D. Murray. 1996. Freshwater Mussels of Texas. Texas Parks and Wildlife Press, Austin, Texas. 218 pp.

Howells, R. G. 1997. New Fish hosts for nine freshwater mussels (Bivalvia: Unionidae) in Texas. The Texas Journal of Science 49 (3): 255-258.

Howells R. G. 1998. Distributional surveys of freshwater bivalves in Texas; progress report for 1997. Texas Parks and Wildlife Department, Management Data Series 147, Austin, TX.

Howells, R. G. 2000. Reproductive seasonality of freshwater mussels (Unionidae) in Texas. Pages 35-48 in R.A. Tankersley and five coeditors. Freshwater mollusk symposia proceedings. Ohio Biological Survey Special Pulbication Columbus.

Howells, R. G. 2002. Freshwater musses (Unionidae) of the pimpleback complex (Quadrula spp.) in Texas. Texas Parks and Wildlife Department, Management Data Series 197, Ausin.

Howells, R. G. 2003. Declining status of freshwater mussels of the Rio Grande. Pages 59-73. in G.P. Garrett and N.L. Allen, editors.

Howells, R. G. 2006. Statewide freshwater mussel survey. State Wildlife Grant Final Report T-15-P, Texas Parks and Wildlife Department, Austin.

Howells, R. G. 2010. Rare Mussels: summary of selected biological and ecological data for Texas, six Edwards Plateau species. Biostudies, Kerrville, TX.

Jirka, J.K, and R.J. Neves. 1992. Reproductive biology of four species of freshwater mussels (Mollusca: Unionidae) in the New River, Virginia and West Virginia. Journal of Freshwater Ecology 7: 35-44.

Karatayev, A.Y., L. E. Burlakova. 2007. Distributional survey and habitat utilization of freshwater mussels. Final Report. Buffalo State College, Buffalo, New York. Prepared for the Texas Water Development Board, Austin. 52 pp.

Karatayev, A.Y., L. E. Burlakova. 2008. Distributional survey and habitat utilization of freshwater mussels. Final Report. Buffalo State College, Buffalo, New York. Prepared for the Texas Water Development Board, Austin. 47 pp.

Littleton, T. G. 1979. The distribution and abundance of the freshwater mussels (Bivalvia: Unionacea) of the Navasota River, Texas. Master's Thesis, Texas A&M University, College Station.

Murray, H.D. and A.B. Leonard. 1962. Handbook of unionid mussels in Kansas. University of Kansas Museum of Natural History, Special Publication 28, Lawrence.

Metcalf, A.L. 1982. Fossil unionacean bivalves from three tributaries of the Rio Grande. Pages 43-59 in J.R. Davis, editor. Proceedings of the symposium on recent benthological investigations in Texas and adjacent states. Texas Academy of Science, Austin.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. http://www.natureserve.org/explorer, Accessed May 06, 2010. 2010.

Neck, R.W., 1982. A review of interactions between humans and freshwater mussels in Texas. pp. 169-182 in J.R. Davis (ed.). Proceedings of the Symposium on Recent Benthological Investigations in Texas and Adjacent States. Aquatic Science Section, Texas Academy of Science. 278 pp.

Oesch, R. D. 1984. Missouri naiads: a guide to the mussels of Missouri. Missouri Department of Conservation, Jefferson City.

Parmalee, P.W. and A.E. Bogan. 1998. The Freshwater Mussels of Tennessee. University of Tennessee Press: Knoxville, Tennessee. 328 pp.

Randklev, C. R. and J.H. Kennedy 2008. Preliminary summary report on Brazos River mussel survey performed 15-18 July. University of North Texas, Denton.

Reimer, M.M. and L.A. Linam. 2005. Texas mussel watch, a citizen based volunteer monitoring program. Ellipsaria, 7(3): 5-6.

Simpson, C.T. 1914. A descriptive catalogue of the naiads, or pearly fresh-water mussels. B. Walker, Detroit, Michigan.

Strecker, J. 1931. The distribution of naiads or pearly fresh-water mussles of Texas. Baylor University Museum Bulletin 2.

Stansbery, D.H. 1965. The molluscan fauna. 119-124 in O.H. Prufer and six coeditors. The McGraw Site –a study of Hopewellian dynamics. New Series 4(1): Cleveland Museum of Natural History.

Surber, T. 1913. Notes on the natural hosts of freshwater mussels. Report in the U.S. Commission of Fisheries and Special Papers, Document 771: 1-10.

U.S. Fish and Wildlife Service (USFWS). 2009. “Endangered and Threatened Wildlife and Plants; Partial 90-Day Finding on a Petition to List 475 Species in the Southwestern United States as Threatened or Endangered with Critical Habitat”. Federal Register 50:17 (December 16, 2009) p. 66866.

U.S. Fish and Wildlife Service (USFWS). 2009. “Endangered and Threatened Wildlife and Plants; Partial 90-Day Finding on a Petition to List 475 Species in the Southwestern United States as Threatened or Endangered with Critical Habitat”. Federal Register 50:17 (December 16, 2009) p. 66260.

Winemiller, K., N.K. Lujan, R.N. Wilkins, R.T. Snelgrove, A.M. Dube, K. L. Skow, and A.G. Snelgrove. 2010. Status of freshwater mussels in Texas. Texas A&M Department of Wildlife and Fisheries Sciences and Institute of Renewable Natural Resources. College Station, Texas. 66 pp.

PLANT SPECIES OF CONCERN

RESOURCE ASSESSMENT

FOR THE SOUTHERN EDWARDS PLATEAU HABITAT CONSERVATION PLAN

DRAFT MARCH 30, 2011

1.0 INTRODUCTION

This resource assessment briefly describes the current status and habitat requirements of rare plant species that occur in the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP) Plan Area. The purpose of this assessment is to help provide the basic background information for the Habitat Conservation Plan and associated Environmental Impact Statement.

This list of plant species was generated from the Texas Parks and Wildlife Department (TPWD) annotated county lists of rare species for the counties of the SEP-HCP Plan Area (Bandera, Bexar, Blanco, Comal, Kendall, Kerr, and Medina) on March 12, 2010. These county lists identify vertebrates, invertebrates, and vascular plants of conservation concern within the state of Texas. Information provided by the TPWD county rare species lists includes federal and state regulatory status, county occurrence, and brief life history and habitat descriptions.

Further information regarding species descriptions, regulatory status, and habitat descriptions for the plant species of concern was obtained from U. S. Fish and Wildlife Service (USFWS) Federal Register publications and web-based species databases, TPWD wildlife fact sheets and books, journal articles, natural history books, and NatureServe's Online Encyclopedia of Life. NatureServe assesses the conservation status, taxonomy, distribution, and life history information of species and ecosystems throughout North America by utilizing databases maintained by natural heritage program scientists and other collaborators. They use this information to assign global, national, and state conservation status ranks to each species it tracks (see www.natureserve.org for more information).

Table 1 includes the regulatory status, occurrence, and general habitat characteristics for rare plant species within the SEP-HCP Plan Area (TPWD 2010).

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TABLE 1: REGULATORY STATUS, OCCURRENCE, AND HABITAT CHARACTERISTICS FOR PLANT SPECIES OF CONCERN OF THE SEP-HCP PLAN AREA.

Common Name	Scientific Name	Federal Regulatory Status[1]	State Regulatory Status[1]	SEP-HCP Counties of Potential Occurrence[2]	General Habitat Characteristics
Elmendorf's onion	*Allium elmendorfii*	none	None	Bexar	Texas endemic; grassland openings in oak woodlands on deep, loose, well-drained sands; in Coastal Bend, on Pleistocene barrier island ridges and Holocene Sand Sheet that support live oak woodlands; to the north it occurs in post oak-black hickory-live oak woodlands over Queen City and similar Eocene formations; one anomalous specimen found on Llano Uplift in wet pockets of granitic loam; flowering March-April, May
Hill Country wild-mercury	*Argythamnia aphoroides*	none	none	Bandera Bexar Blanco Comal Kendall Kerr	Texas endemic; mostly in bluestem-grama grasslands associated with plateau live oak woodlands on shallow to moderately deep clays and clay loams over limestone on rolling uplands, also in partial shade of oak-juniper woodlands in gravelly soils on rocky limestone slopes; flowering April-May with fruit persisting until midsummer
basin bellflower	*Campanula reverchonii*	none	none	Kendall	Texas endemic; among scattered vegetation on loose gravel, gravelly sand, and rock outcrops on open slopes with exposures of igneous and metamorphic rocks; may also occur on sandbars and other alluvial deposits along major rivers; flowering May-July
Comal snakewood	*Colubrina stricta*	none	none	Comal	in El Paso County, found in a patch of thorny shrubs in colluvial deposits and sandy soils at the base of an igneous rock outcrop; the historic Comal County record does not describe the habitat; in Mexico, found in shrublands on calcareous, gravelly, clay soils with woody associates; flowering late spring or early summer
Sabinal prairie-clover	*Dalea sabinalis*	none	none	Bandera	Texas endemic; information sketchy, but probably in rocky soils or on limestone outcrops in sparse grassland openings in juniper-oak woodlands; flowering April-May or May –June

TABLE 1: REGULATORY STATUS, OCCURRENCE, AND HABITAT CHARACTERISTICS FOR PLANT SPECIES OF CONCERN OF THE SEP-HCP PLAN AREA.

Common Name	Scientific Name	Federal Regulatory Status[1]	State Regulatory Status[1]	SEP-HCP Counties of Potential Occurrence[2]	General Habitat Characteristics
sandhill woollywhite	*Hymenopappus carrizoanus*	none	none	Bexar Medina	Texas endemic; disturbed or open areas in grasslands and post oak woodlands on deep sands derived from the Carrizo Sand and similar Eocene formations; flowering April-June
longstalk heimia	*Nesaea longipes*	none	none	Bandera Kerr	moist or subirrigated alkaline or gypsiferous clayey soils along unshaded margins of cienegas and other wetlands; occurs sparingly on an alkaline, somewhat saline silt loam on terraces of spring-fed streams in grassland; also occurs commonly in moderately alkaline clay along perennial stream and in subirrigated wetlands atop poorly-defined spring system; also occurs in low, wetland area along highway right-of-way; flowering May-September
canyon mock-orange	*Philadelphus ernestii*	none	none	Blanco Comal Kendall	Texas endemic; usually found growing from honeycomb pits on outcrops of Cretaceous limestone exposed as rimrock along mesic canyons, usually in the shade of mixed evergreen-deciduous canyon woodland; flowering April-June, fruit dehiscing September-October
Texas mock-orange	*Philadelphus texensis*	none	none	Bandera Comal Kendall Medina	limestone outcrops on cliffs and rocky slopes, on boulders in mesic canyon bottoms, usually in shade of mixed evergreen-deciduous slope woodland forest; flowering April-May, but readily recognizable throughout the growing season
Correll's false dragon-head	*Physostegia correllii*	none	none	Bexar	wet, silty clay loams on stream sides, in creek beds, irrigation channels and roadside drainage ditches; or seepy, mucky, sometimes gravelly soils along riverbanks or small islands in the Rio Grande; or underlain by Austin Chalk limestone along gently flowing spring-fed creek in central Texas; flowering May-September

TABLE 1: REGULATORY STATUS, OCCURRENCE, AND HABITAT CHARACTERISTICS FOR PLANT SPECIES OF CONCERN OF THE SEP-HCP PLAN AREA.

Common Name	Scientific Name	Federal Regulatory Status[1]	State Regulatory Status[1]	SEP-HCP Counties of Potential Occurrence[2]	General Habitat Characteristics
Parks' jointweed	*Polygonella parksii*	none	none	Bexar	Texas endemic; mostly found on deep, loose, whitish sand blowouts (unstable, deep, xeric, sandhill barrens) in Post Oak Savanna landscapes over the Carrizo and Sparta formations; also occurs in early successional grasslands, along right-of-ways, and on mechanically disturbed areas; flowering June-late October or September-November
canyon rattlesnake-root	*Prenanthes carrii*	none	none	Bandera Kerr	Texas endemic; rich humus soils over limestone in upper woodland canyon drainages, upper small spring fed drainages, typically near springs in deep soils around the springs and on limestone shelves, honeycomb rock (porous rock); flowering and fruiting late August-November
big red sage	*Salvia pentstemonoides*	P	none	Bandera Bexar Kendall Kerr	Texas endemic; moist to seasonally wet, steep limestone outcrops on seeps within canyons or along creek banks; occasionally on clayey to silty soils of creek banks and terraces, in partial shade to full sun; basal leaves conspicuous for much of the year; flowering June-October
Tobusch fishhook cactus	*Sclerocactus brevihamatus ssp tobuschii*	LE	E	Bandera Kerr	Texas endemic; shallow, moderately alkaline, stony clay and clay loams over massive fractured limestone; usually on level to slightly sloping hilltops; occasionally on relatively level areas on steeper slopes, and in rocky floodplains; usually open areas within a mosaic of oak-juniper woodlands, occasionally in pine-oak woodlands, rarely in cenizo shrublands or little bluestem grasslands; sites are usually open with only herbaceous cover, although the cactus may be somewhat protected by rocks, grasses, or spike mosses; flowering late January--March (rarely early April)

TABLE 1: REGULATORY STATUS, OCCURRENCE, AND HABITAT CHARACTERISTICS FOR PLANT SPECIES OF CONCERN OF THE SEP-HCP PLAN AREA.

Common Name	Scientific Name	Federal Regulatory Status[1]	State Regulatory Status[1]	SEP-HCP Counties of Potential Occurrence[2]	General Habitat Characteristics
bracted twistflower	*Streptanthus bracteatus*	none	none	Bandera Bexar Comal Medina	Texas endemic; shallow, well-drained gravelly clays and clay loams over limestone in oak juniper woodlands and associated openings, on steep to moderate slopes and in canyon bottoms; several known soils include Tarrant, Brackett, or Speck over Edwards, Glen Rose, and Walnut geologic formations; populations fluctuate widely from year to year, depending on winter rainfall; flowering mid April-late May, fruit matures and foliage withers by early summer
granite spiderwort	*Tradescantia pedicellata*			Blanco	Texas endemic; mostly in fractures on outcrops of granite, gneiss, and similar igneous and metamorphic rocks, or in early successional grasslands or forb-dominated assemblages on well-drained, sandy to gravelly soils derived from same; flowering at least April-May

[1] E - ENDANGERED; T – THREATENED; P – PETITIONED
[2] TPWD (2010)

Four additional species that are not included in TPWD (2010) are also addressed in this assessment, as NatureServe identifies them as similarly rare (i.e., they have a global conservation status rank of G1G2). Table 2 includes the regulatory status, occurrence, and habitat characteristics for the four additional plant species of concern within the SEP-HCP Plan Area (NatureServe 2009).

TABLE 2: REGULATORY STATUS, OCCURRENCE, AND HABITAT CHARACTERISTICS FOR FOUR ADDITIONAL PLANT SPECIES OF CONCERN WITHIN THE SEP-HCP PLAN AREA

Common Name	Scientific Name	Federal Regulatory Status[1]	State Regulatory Status[1]	SEP-HCP Counties of Potential Occurrence[2]	General Habitat Characteristics
Watson's milkpea	*Galactia watsoniana*	none	none	Bandera	Endemic to the Edwards Plateau of central Texas. Known only from mesic forested canyons in Bandera County.
California satintail	*Imperata brevifolia*	none	none	Blanco	Central Texas west to New Mexico, Nevada, Utah, Arizona, and California, also in Sonora, Jalisco and Baja California.

TABLE 2: REGULATORY STATUS, OCCURRENCE, AND HABITAT CHARACTERISTICS FOR FOUR ADDITIONAL PLANT SPECIES OF CONCERN WITHIN THE SEP-HCP PLAN AREA

Common Name	Scientific Name	Federal Regulatory Status[1]	State Regulatory Status[1]	SEP-HCP Counties of Potential Occurrence[2]	General Habitat Characteristics
Llano butterweed	*Packera texensis*	none	none	Blanco	Endemic to Texas. Known counties in the Llano Uplift area; evidently disjunct in Callahan County on the rolling plains. Most sites are open to partially shaded sites on siols derived from granite, gneiss or other igneous or metamorphic rocks.
Canyon bean	*Phaseolus texensis*	none	none	Bandera Kendall Kerr	Endemic to the Edwards Plateau of central Texas. Occurs in openings in woodlands in relatively mesic limestone canyons.

[1] E - ENDANGERED; T – THREATENED; P – PETITIONED
[2] NatureServe (2009) and B. Carr pers. comm.. (2010)

2.0 SPECIES DESCRIPTIONS, REGULATORY STATUS, AND HABITATS

2.1 ELMENDORF'S ONION

Elmendorf's onion (*Allium elmendorfii*) is an herbaceous perennial of the Lily family that flowers from March through April or May. This species is found in deep, loose, well-drained sands among the grassland openings in oak woodlands occurring over Eocene sands in south-central Texas, south to the Pleistocene and Holocene sands of the Coastal Bend, and the Llano Uplift (Poole et al. 2007).

This species is endemic to Texas and is known from only 11 counties (Atascosa, Bee, Bexar, Gonzales, Guadalupe, Kennedy, Llano, Nueces, Refugio, San Patricio, and Wilson). However, populations from Bexar, Kennedy, and Llano counties are historical (Poole et al. 2007). Elmendorf's onion is not likely to occur widely across the SEP-HCP Plan Area, since only one historic occurrence of the species has been recorded in this area (from Bexar County) and deep sandy soils are limited to the far south and east edges of the Plan Area.

Elmendorf's onion is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the conservation status of the species as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

Primary threats to this species include agriculture, grazing, and housing development, with the primary threat being grazing since the species occurs in pasture lands (NatureServe 2009).

2.2 HILL COUNTRY WILD-MERCURY

Hill Country wild-mercury (*Argythamnia aphoroides*) is a herbaceous perennial found growing mostly in bluestem-grama grasslands associated with plateau live oak woodlands on shallow to moderately deep clays and clay loams over limestone on rolling uplands (Poole et al. 2007). This species is endemic to the Edwards Plateau in central Texas. Hill Country wild-mercury has been known

to occur within six of the seven counties within the SEP-HCP Plan Area (Bandera, Bexar, Blanco, Comal, Kendall, and Kerr counties) (TPWD 2010).

In 1980, the USFWS identified Hill Country wild-mercury as a candidate species for federal listing as threatened or endangered (48 FR 82480). Upon further review in 1993, the species was removed from the list of candidates (58 FR 51144). Currently, the species is not listed as threatened or endangered by the USFWS or the State of Texas, nor is the species currently a candidate for such listing. However, the USFWS informally identifies Hill Country wild-mercury as a species of concern (USFWS 2010a, 2009). NatureServe identifies the conservation status of the species as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

Primary threats to this species include overgrazing and housing and recreation development (NatureServe 2009).

2.3 BASIN BELLFLOWER

Basin bellflower (*Campanula reverchonii*) is an herbaceous annual of the Bluebell family that produces light-blue, funnel-shaped flowers from May to July. Endemic to the Llano Uplift of Central Texas, this species occurs on loose gravel, gravelly sand, and rock outcrops on sparsely vegetated open slopes with exposures of igneous and metamorphic rocks. Outside of the Llano uplift, historic records for this species are known from Kendall and Travis counties that suggest that it may also occur along major rivers on other alluvial deposits or sand bars (Poole et al. 2007). Within the SEP-HCP Plan Area, this species is only known from an historic record in Kendall County.

Basin bellflower is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. This species was previously listed by the USFWS as a candidate species; however, after further review in the 1990's, it was removed from the list of candidate species. NatureServe identifies the global conservation status of the species as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

Primary threats to this species include granite mining and recreational activities, such as hiking and rock climbing (NatureServe 2009).

2.4 COMAL SNAKEWOOD

Comal snakewood (*Colubrina stricta*) is a small, alternate-leaved, shrub that ranges from 3 to 13 feet in height, with small greenish-yellow flowers producing black, shiny seeds. Within Texas, this species is known from only El Paso and Comal counties, of which the Comal County is a historic location. Populations of this species are also known from Coahuila and Nuevo Leon, Mexico. Within El Paso County, the Comal snakewood population is found over colluvial deposits and sandy soils at the base of an igneous rock outcrop within a patch of thorny shrubs. In Mexico, this species is found in shrublands over calcareous, gravelly, clay soils. The historic population within Comal County is the only record of Comal snakewood occurring within the SEP-HCP Plan Area, and the population has not been rediscovered within Comal County (Poole et al. 2007).

The USFWS previously identified Comal snakewood as a candidate for federal listing as threatened or endangered (48 FR 82480); however, upon further review in 1993, it was removed from

the list of candidate species (58 FR 51144). Currently, Comal snakewood is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing.. Comal snakewood is informally identified by the USFWS as a species of concern (USFWS 2010a, 2009). NatureServe identifies the state conservation status of the species as "critically imperiled" because of extreme rarity or because of some factors, such as very steep declines, making it especially vulnerable to extirpation from the jurisdiction (NatureServe 2009).

Little documentation is available regarding potential threats to this species. However, Comal snakewood may be threatened by brush control activities (NatureServe 2009).

2.5 SABINAL PRAIRIE-CLOVER

An herbaceous perennial of the Legume Family, the Sabinal prairie-clover (*Dalea sabinalis*) is a small forb with alternately arranged, yellowish-green, pinnately compound leaves with a terminal pink to rose-colored multi-flowered cylindrical spike. This species is thought to flower from April to May or May to July. It is assumed that the Sabinal prairie-clover occurs on sparse grassland openings within oak-juniper woodlands over rocky soils or limestone outcrops; however, no precise information is known about this species habitat requirements (Poole et al. 2007, NatureServe 2009).

Endemic to the Edwards Plateau, the Sabinal prairie-clover has not been observed since the 1950's, and no extant populations are known (NatureServe 2009). Very few historical occurrences of this species are known, but the species has been recorded from from Bandera County and Val Verde County (NatureServe 2009). Poole et al. (2007) also describes this species as historically occurring in Uvalde County. The historic record from Bandera County is the only record within the SEP-HCP Plan Area.

The Sabinal prairie-clover was designated as a candidate species by the USFWS in the 1980's (45 FR 82480 and 48 FR 53640), but was removed from the list in 1993 (58 FR 51144). Currently, Sabinal prairie-clover is informally identified by the USFWS as a species of concern (USFWS 2010a). However, this species is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the global conservation status of the species as "possibly extinct" since it is known from only historical occurrences, but there is still some hope of rediscovery. Although there is evidence that the species may be extinct or may be eliminated throughout its range, there is not enough information available to state this with certainty (NatureServe 2009).

NatureServe (2009) identifies the primary threats to this species as overgrazing, introduction of exotic animals, and resort development.

2.6 WATSON'S MILKPEA

Watson's milkpea (*Galactia watsoniana*) is a recently described species that is endemic to the Edwards Plateau of central Texas (Holmes and Singhurst 2008). It is known from the southern part of the Balcones Escarpment in Bandera County, Texas (Holmes and Singhurst 2008, NatureServe 2009). Two localities for this species have been recorded in the canyonlands of the upper drainage of the Medina and Sabinal rivers. Watson's milkpea occurs on shaded, gently sloping terraces above creeks, most often in areas of sparse vegetation where *Quercus muehlenbergii* and *Acer grandidentatum* are the dominant plants (Holmes and Singhurst 2008, NatureServe 2009).

Watson's milkpea is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the global conservation status of the species as "critically imperiled" and at very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors (NatureServe 2009).

Relatively little information is available about this newly described species. Potential threats to this species may include grazing and invasive exotic plants (Holmes and Singhurst 2008, NatureServe 2009). Holmes and Singhurst (2008) suggest that the existing populations are expected to be declining, based on present land use patterns.

2.7 SANDHILL WOOLLYWHITE

Sandhill woollywhite (*Hymenopappus carrizoanus*), also known as Carrizo Sands woollywhite, is an erect, herbaceous biennial of the Sunflower family. Flowering from late spring to early summer, this species has numerous small white flowers and grows up to approximately 5 feet tall (Poole et al. 2007, NatureServe 2009).

A Texas endemic, the sandhill woollywhite only occurs in disturbed or open areas in grasslands and post oak woodlands within the narrow band of the Carrizo Sands and similar Eocene. This species is found over sands within sand post oak-bluejack oak woodlands that support a variety of xeric species and foliose lichens (Poole et al. 2007, NatureServe 2009). Within the SEP-HCP Plan Area, this species has been documented in Bexar and Medina counties.

Sandhill woollywhite is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the global conservation status of the species as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

Urban sprawl from San Antonio is the primary threat to this species across much of its range (Poole et al. 2007).

2.8 CALIFORNIA SATINTAIL

The California satintail (*Imperata brevifolia*) is a native, perennial grass that had been known to occur in moist or wet sites in typically hot, arid environments from California to Texas (NatureServe 2009). According to the Flora of North America (vol. 25), the current distribution of the species was thought to be limited to the Grand Canyon National Park (Flora of North America Editorial Committee 2003). However, the species was discovered in Blanco County, Texas, in 2008 and has also been recorded from Brewster, Hudspeth, and Jackson counties, Texas (Bill Carr, The Nature Conservancy of Texas botanist, pers. comm. 2010). Little to no additional information about the distribution or range of this species in Texas is available.

California satintail is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the global conservation status of the species as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

This species may be vulnerable to changes in land uses, since many sites were the species had been collected (most collections were made prior to 1945) are now used for housing or agriculture (Flora of North America Editorial Committee 2003).

2.9 LONGSTALK HEIMIA

Longstalk heimia (*Nesaea longipes*) is also known as gray stalkflower or stalkflower heimia and has conspicuous, long-stalked magenta flowers that grow from numerous prostrate or semi-scandent stems. An herbaceous perennial of the Loosestrife Family, this species is restricted to wet areas, including desert springs-runs of the Chihuahuan Desert region and seepage slopes and perennial streams on the Edwards Plateau (Poole et al. 2007, NatureServe 2009).

Mostly found within the Chihuahuan Desert region of Texas and New Mexico, longstalk heimia is only known from a few widespread pockets of appropriate habitat within its range (NatureServe 2009). It is also known to occur on the Edwards Plateau of south-central Texas. Within the SEP-HCP Plan Area, longstalk heimia has been recorded in Bandera, Kerr, and Medina counties (Poole et al. 2007, NatureServe 2009). However, this species is thought to be possibly extirpated from Bandera County (NatureServe 2009).

Longstalk heimia is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the global and state conservation status of the species as “imperiled” due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

Longstalk heimia requires desert spring-runs or moist to wet areas around spring outlets, seeps, and perennial streams. Activities that disrupt the spring-runs flow or diminish vegetation in the vicinity of springs are the primary threat to this species (NatureServe 2009).

2.10 LLANO BUTTERWEED

Llano butterweed (*Packera texensis*) is a recently discovered perennial aster endemic to Texas. This species is known from only a few localities primarily from the Llano Uplift in Blanco, Gillespie, Llano, and Mason counties (Trock and O'Kennon 2003). Some specimens have been collected from sites not from within the Llano Uplift, indicating a possibly disjunct population on the Rolling Plains in Callahan County, Texas. The species appears to be substrate specific and occurs on limestone plateaus overlain by dry, granitic sands and gneiss, on roadsides, in partially shaded areas, and in oak woodlands (Trock and O’Kennon 2003).

Llano bitterweed is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the conservation status of the species as “imperiled” due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

No information regarding the potential threats to this species was available.

2.11 CANYON BEAN

Canyon bean (*Phaseolus texensis*) is a recently identified viney pea endemic to the eastern and southern Edwards Plateau of central Texas in Bandera, Kendall, Kerr, Travis, and Uvalde counties

(Delgado-Salinas and Carr 2007). This species occurs on limestone soils in mixed woodlands, on limestone cliffs and outcrops, frequently along creeks (Delgado-Salinas and Carr 2007).

This species is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the conservation status of the species as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

Canyon bean may be threatened by human activities (Delgado-Salinas and Carr 2007, NatureServe 2009). No other information pertaining to potential threats was available for this species.

2.12 CANYON MOCK-ORANGE

Canyon mock-orange (*Philadelphus ernestii*) is a deciduous shrub with loose bark and white showy flowers. The species grows in varying amounts of sunlight on honeycomb pitted rocks, rimrock, or other outcrops of Cretaceous limestone along mesic canyons within juniper woodlands. Common woody vegetation associated with canyon mock-orange habitat includes shrubby boneset, elbowbush, shin oak, Lindheimer's silk tassel, and Texas mulberry (McNeal 1989, Poole et al. 2007).

This species is endemic to the eastern portion of the Edwards Plateau where it is known from only 6 counties (Bandera, Blanco, Comal, Hays, Kendall, and Travis). Canyon mock-orange occurs within four of the seven counties within the SEP-HCP Plan (Poole et al, 2007, NatureServe 2009). Upcoming editions of The Flora of North America may combine this species and the Texas mock-orange under the name of *Philadelphus texensis* (Jackie Poole, Texas Parks and Wildlife Department, pers. comm. 2010).

Canyon mock-orange was identified as a candidate species by the USFWS in the 1980's (45 FR 82480 and 48 FR 53640). However, upon further review in 1993, it was removed from the list of candidate species (58 FR 51144). The USFWS currently considers canyon mock-orange as an informal species of concern (USFWS 2010a). However, this species is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the conservation status of the species as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

Habitat that supports the canyon mock-orange is heavily grazed by sheep, goats, deer, and exotic ungulates. This species is preferred by herbivores and is heavily browsed when accessible. Susceptible to browsing pressure, this species will produce a short plant with little reproductive success (Poole et al. 2007, NatureServe 2009). Primary threats to this species include grazing, residential development, and recreational development (NatureServe 2009).

2.13 TEXAS MOCK-ORANGE

Texas mock-orange (*Philadelphus texensis*) is a deciduous shrub with loose bark and solitary, but closely spaced, white flowers that blooms from April to May. This species is found mostly in the shade of mixed evergreen-deciduous slope woodland forest along limestone outcrops on cliffs and rocky slopes, and on boulders in mesic canyon bottoms (Poole et al. 2007, NatureServe 2009).

In Texas, Texas mock-orange occurs in the southern portion of the Edwards Plateau; however, a few disjunct populations are known from the limestone mountains of Coahuila and Durango, Mexico

(Poole et al. 2007, NatureServe 2009). Within the SEP-HCP Plan Area, this species is known from Bandera, Comal, Kendall, and Medina counties, however, the Comal County record is historic. Upcoming editions of The Flora of North America may combine the Texas mock-orange and canyon mock-orange under the name of *Philadelphus texensis* (Jackie Poole, Texas Parks and Wildlife Department, pers. comm. 2010).

Texas mock-orange is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the global and state conservation status of the species as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

Texas mock-orange, like canyon mock-orange, suffers from browsing pressure and habitat that supports this species is heavily grazed by sheep, goats, deer, and exotic ungulates. Grazing and browsing pressure is the primary threat to this species (NatureServe 2009, Poole et al. 2009).

2.14 CORRELL'S FALSE DRAGON-HEAD

Correll's false dragon-head (*Physostegia correllii*) is an herbaceous, somewhat succulent and robust perennial with spikes of lavender flowers that have purple streaks. The plant blooms from late-June through late-September. This species is found in wet habitats associated with streamsides, creekbeds, irrigation channels, and roadside ditches on silty clay loams (Poole et al. 2007, NatureServe 2009). Along riverbanks and small islands of the Rio Grande, this species occurs on seepy, mucky, and sometimes gravelly soils and has also been found at a site along a springfed creek in Travis County underlain by Austin Chalk (Poole et al. 2007).

Ranging from Northern Mexico, through Texas to Louisiana, Correll's false dragon-head is a fairly widespread, but rare, wetland obligate species. In Texas, this species has been recorded from Bexar, Galveston, Gillespie, Kinney, Montgomery, Travis, Val Verde, and Zapata counties; although the species may be extirpated from Gillespie County (Poole et al. 2007, NatureServe 2009). The species has been recently recorded from Bexar County (Jackie Poole, Texas Parks and Wildlife Department, pers. comm. 2010).

Correll's false dragon-head is informally identified as a species of concern by the USFWS (USFWS 2010a). However, this species is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. The species had been identified as a candidate for federal listing by the USFWS in the 1980's (45 FR 82480 and 48 FR 53640). However, it was subsequently removed from the list of candidate species in 1993 (58 FR 51144). NatureServe identifies this species global conservation status and state conservation status for Texas as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

Primarily known from habitats subject to disturbance and human use (e.g., roadsides, irrigation ditches, and creekbeds), Correll's false dragon-head is highly vulnerable. Altogether, less than 15 occurrences of this species are known, and many historic populations have not been verified recently. Primary threats to this species involve loss or degradation of the wetland habitats that occur within the xeric region that the Correll's false dragon-head is found (NatureServe 2009).

2.15 PARKS' JOINTWEED

Parks' jointweed (*Polygonella parksii*) is an herbaceous annual within the Knotweed or Buckwheat family that blooms from September to November. This species ranges in height from approximately 1 to 5 feet, with erect, almost leafless, slender stems that are green in youth and turn red with age. The plant also has grass-like leaves and small white flowers. Parks' jointweed occupies post oak savanna landscapes on loose, deep, whitish sand blowouts (i.e., unstable, deep, xeric, sandhill barrens). This species is also found in early successional grasslands on mechanically disturbed areas and along rights-of-way (Poole et al. 2007, NatureServe 2009).

An endemic to the Post Oak Belt of Central Texas, Parks' jointweed is known to occur predominantly over the Carrizo and Sparta geologic formations in eight Texas counties (Atascosa, Bexar, Burleson, Guadalupe, Leon, Milam, Robertson, and Wilson) (Poole et al. 2007, NatureServe 2009). Within the SEP-HCP Plan Area, Parks' jointweed is only known to occur in Bexar County.

Parks' jointweed is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. However, in the 1980's it was identified by the USFWS as a candidate species (45 FR 82480 and 48 FR 53640); however, upon further review in 1993, it was removed from that list (58 FR 51144). NatureServe identifies the global and state conservation status of the species as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

The primary threat to this species is habitat loss. Many of the soil types that occur within habitat for the Parks' jointweed are being put into cultivation and irrigated (NatureServe 2009).

2.16 CANYON RATTLESNAKE-ROOT

Canyon rattlesnake-root (*Prenanthes carrii*) is an alternate-leaved, milky sapped, herbaceous perennial with a tuberous taproot. The plant has a flowering head that contains 9 to 15 flowers and blooms from late August to November. It is found in the upper portion of woodland canyon drainages on rich humus soils associated with Lacey oak, chinquapin oak, Texas red oak, or bigtooth maple. It also occurs in creekside seepage shelves in close association with American sycamore, buttonbush, southern maiden-hair fern, and sawgrass (Poole et al. 2007).

A Texas endemic, canyon rattlesnake root is only known to occur in the southern and southwestern areas of the Edwards Plateau, within Bandera, Gillespie, Kerr, and Real counties (Poole et al. 2007, NatureServe 2009). This species is known to occur within the SEP-HCP Plan Area in Bandera and Kerr counties.

Canyon rattlesnake-root is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the global and state conservation status of the species as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

No information was available regarding primary threats to this species (NatureServe 2009).

2.17 BIG RED SAGE

Big red sage (*Salvia pentstemonoides*), a member of the Mint Family, is a robust herbaceous perennial with erect, square stems and a tall flower spike that produces large showy wine-red flowers at regular intervals. Blooming from June to October, this species is found within canyons along moist to seasonally wet steep limestone outcrops or along creek banks. Occasionally it is found in clay or silt soils along rocky creekbeds, floodplains, and terraces in areas of partial shade to full sun (Poole et al. 2007, NatureServe 2009).

Endemic to the Edwards Plateau, big red sage was thought to be extinct until the late 1980s when a single large and several very small populations were found. However, in 1997, the majority of the largest population was killed in an early and long summer flood, leaving only a few hundred total individuals left in the wild. Historically, this species was known from Bandera, Bexar, Gillespie, Guadalupe, Kendall, Kerr, Real, and Wilson counties; with Bexar, Gillespie, Guadalupe, Kerr, and Wilson currently identified as areas of historical occurrence (Poole et al. 2007, NatureServe 2009). Within the SEP-HCP Plan Area, big red sage is identified as occurring in Bandera, Bexar, Kendall, and Kerr counties, although Bexar and Kerr counties are historical occurrences (TWPD 2010).

The species was identified as a candidate for federal listing by the USFWS in the 1980's (45 FR 82480 and 48 FR 53640), but upon further review in 1993, it was removed from that list (58 FR 51144). Big red sage is informally considered a species of concern by the USFWS (USFWS 2010a). In 2007, a petition to list 475 species in the southwestern United States was submitted to the USFWS. On December 16, 2009, the USFWS issued their 90-day finding on 192 of the 475 petitioned species, identifying big red sage as a species for which information in the petition and otherwise readily available is substantial and indicates that listing as threatened or endangered may be warranted (74 FR 66866). However, this species is not currently listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the global and state conservation status of the species as "critically imperiled" and at very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors (NatureServe 2009).

Subject to weather conditions, particularly rain, the number of individuals of big red sage varies annually. It was estimated that population totals were probably less than a few hundred as of 1997. The small population size and restricted geographical distribution of the big red sage is the foreseeable threat with the greatest impact (NatureServe 2009). Other significant threats to the big red sage include the present threatened destruction, modification, or curtailment of its habitat or range resulting from aquifer drawdown; overutilization for commercial, recreational, scientific, or educational purposes as a result of commercial uses, and/or other natural or manmade factors affecting its continued existence resulting from flooding (74 FR 66866).

2.18 TOBUSCH FISHHOOK CACTUS

The Tobusch fishhook cactus (*Sclerocactus brevihamatus* subsp. *tobuschii*), also known as the shorthook fishhook cactus, is a small, round perennial cactus (usually 2 to 3 inches tall) with light yellow spines with red tips. The cactus has a short taproot and/or many fine fibrous roots, and yellow to cream flowers that bloom during February through March (Poole et al. 2007, TPWD 2009). This species occurs in moderately alkaline, shallow, stony, clay, clay loams, and gravelly soils among blocks of exposed Cretaceous limestone on relatively open, level to slightly sloping hilltops, relatively level areas on steeper slopes, or rocky floodplains within oak-juniper woodlands,. It is also occasionally found in

pine-oak woodlands, and rarely within cenizo shrublands or little bluestem grasslands (Poole et al. 2007, USFWS 2010b).

An endemic to the Edwards Plateau of Texas, the Tobusch fishhook cactus is known to occur in Bandera, Edwards, Kerr, Kimble, Kinney, Real, Uvalde, and Val Verde counties (Poole et al. 2007). The Tobusch fishhook cactus is known to occur in two of the seven counties of the SEP-HCP Plan Area (i.e., Bandera and Kerr counties).

The Tobusch fishhook cactus was federally listed as an endangered species, without a critical habitat designation, on November 7, 1979 (44 FR 64736). In 1983, this species was also listed as endangered by the State of Texas. NatureServe identifies the global conservation status of the species as "vulnerable" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extinction or elimination (NatureServe 2009). The USFWS issued a recovery plan for the Tobusch fishhook cactus in 1987.

Seven major objectives for recovery were identified in the recovery plan for the species, but only one downlisting criterion was given for the first objective and delisting criteria were not established. For the Tobusch fishhook cactus to be downlisted to threatened status, four safe sites containing at least 3,000 plants each would need to be established (USFWS 1987). The seven major objectives for recovery of the Tobusch fishhook cactus are:

- Objective 1. Remove immediate human threats by protecting known populations for collecting and habitat destruction.
- Objective 2. Establish a permanent living collection at a botanical garden or university.
- Objective 3. Minimize long-range threats by development of biological information relevant to recovery.
- Objective 4. Establish a long-term (five year) survey program to more precisely determine the true distribution of the species.
- Objective 5. Develop a comprehensive trade management plan for all cacti.
- Objective 6. Develop a program to provide propagated plants and seeds to the commercial market.
- Objective 7. Develop public awareness, appreciation, and support for the preservation of the species.

The USFWS completed a 5-year review of this species in January 2010 (USFWS 2010b). The review found that the Tobusch fishhook cactus has been documented on 10 protected sites; however, none of the populations come close to containing 3,000 individuals, and have fluctuated greatly in size. Currently, this species does not have an established permanent living collection at a botanical garden or university that has been verified. To date, nine research projects, including a master's thesis and a doctoral dissertation, have been published that contribute to the knowledge of the biology, life history, and management of the Tobusch fishhook cactus. Annual monitoring surveys of known populations have been conducted by TPWD and other organizations since 1991, which track the life histories of several thousand individuals of the species. A comprehensive trade management plan for all species of cacti has yet to be developed, although a project in 1991 did investigate the extent of legal trade in a

number of rare, threatened, and endangered cactus species. Results of this project identified six occurrences of legal trade in seeds of the Tobusch fishhook cactus. However, the species has been difficult to maintain in cultivation, and it appears to be of little commercial interest. A pamphlet containing photographs and information on the Tobusch fishhook cactus was produced by TPWD and the Natural Resource Conservation Service (NRCS) to be distributed to private landowners in the counties where this species is known to occur (USFWS 2010b).

Some of the major recommendations of 5-year status review for the Tobusch fishhook cactus include downlisting the Tobusch fishhook cactus to threatened status, assigning a new recovery priority number of 9C (meaning that the degree of threat is moderate, it has a high potential for recovery, and there is a potential conflict with economic activity), revising the current recovery plan to include both downlisting and delisting criteria that address each recovery objective in terms of threats to the species, and modifying the existing downlisting criterion (USFWS 2010b).

Primary threats to this species include insect parasitism, land subdivision and residential development, land use changes, fire suppression, and extreme overgrazing. Overgrazing has caused loss of plant cover and subsequent soil erosion in much of this species' habitat (NatureServe 2009). Burning during the plant's reproductive season (early to late spring) may also be a threat to this species (Poole 1999).

2.19 BRACTED TWISTFLOWER

The bracted twistflower (*Streptanthus bracteatus*), also known as the bracted jewelflower, is an herbaceous annual with showy purple flowers that bloom in April to late May. This species is associated with well-drained, gravelly clays and clay loams over limestone within canyon bottoms and openings on slopes of oak-juniper woodlands. It is often found amid dense shrub growth where some protection from browsing animals is afforded (NatureServe 2009, Poole et al. 2007).

The bracted twistflower is endemic to the Edwards Plateau, and is known to occur in Bandera, Bexar, Comal, Medina, Real, Travis, Hays, and Uvalde counties, of which occurrence records from Bandera, Comal, and Real counties are historic (Poole et al. 2007; NatureServe 2009; Jackie Poole, Texas Parks and Wildlife Department, pers. comm. 2010). Within the SEP-HCP Plan Area, the bracted twistflower has been reported to occur in Bandera, Bexar, Comal, and Medina counties.

The brackted twistflower was identified as a candidate species by the USFWS in the 1980's (45 FR 82480 and 48 FR 53640), but was removed from the list of candidate species in 1993 (58 FR 51144 51190). Bracted twistflower is currently informally considered a species of concern by the USFWS (USFWS 2010a). The bracted twistedflower is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the conservation status of the species as "imperiled" due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

Primary threats to this species include housing development and browsing pressure (NatureServe 2009). Many occurrences of this species are within rapidly developing urban areas, and housing developments have extirpated several sites. The introduction of domestic and exotic animals, as well as an overabundance of white-tail deer (particularly in urban areas), has drastically increased the browsing pressure on this species (Poole et al, 2007, NatureServe 2009). Known riverine habitat in the Austin area is threatened by flooding (upstream of Town Lake) and farming (downstream of Town Lake) (NatureServe 2009).

2.20 GRANITE SPIDERWORT

The granite spiderwort (*Tradescantia pedicellata*), also known as Edwards Plateau spiderwort, is a short stemmed, erect perennial herb with dark green to light yellowish-green linear-lanceolate leaves and terminal clusters containing a few three-petaled flowers. There is some question about the taxonomic status of this species, with some believing this species to be a hybrid cross. Granite spiderwort is found growing in clumps in fractures on outcrops of granite, gneiss, and similar igneous and metamorphic rocks, early successional grasslands, or forb-dominated assemblages on well-drained, sandy to gravelly soils derived from granite (Poole et al. 2007, NatureServe 2009).

Endemic to igneous and metamorphic rocks of Central Texas, mostly in the Llano Uplift area, this species is only known to occur in Blanco, Burnet, Llano, and Mason counties (Poole et al. 2007, NatureServe 2009). Populations within Blanco County are the only known locations within the SEP-HCP Plan Area.

Granite spiderwort is not listed as threatened or endangered by the USFWS or the State of Texas; nor is the species currently a candidate for such listing. NatureServe identifies the global conservation status of the species as “imperiled” due to a very restricted range, very few populations, steep declines and/or other factors that make it vulnerable to extirpation (NatureServe 2009).

Primary threats to this species include browsing by livestock, granite quarrying, and recreational development (NatureServe 2009).

3.0 SIGNATURES

This report was prepared by professional wildlife biologists at the consulting firm of Loomis Partners, Inc. in conformance with the methods and limitations described herein.

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4.0 REFERENCES

Carr, B. 2010. Personal communication to Jim Bergan (The Nature Conservancy) regarding comments on SEP-HCP draft resource assessments. Received via email from Jim Bergan to Amanda Aurora (Loomis Partners) on June 7, 2010.

Delgado-Salinas, A. and W. R. Carr. 2007. *Phaseolus texensis* (Leguminosae: Phaseolinae): a new species from the Edwards Plateau of central Texas. Lundellia 10: 11-17.

Flora of North America Editorial Committee. 2003. Flora of North America north of Mexico. Vol. 25. Magnoliophyta: Commelinidae (in part): Poaceae, part 2. New York: Oxford University Press. xxv + 783 pp.

Holmes, W. C. and J. R. Singhurst. 2008. A new species of *Galactia* (Fabaceae, Papilionoideae) from central Texas, U.S.A. Novon 18(3): 347-350.

McNeil, P. 1989. Status of *Streptanthus bracteatus, Philadelphus ernestii* and *Amorpha romerana* in Travis County: A Report for the Balcones Canyonlands Habitat Conservation Plan. Appendix G in Comprehensive Report of the Biological Advisory Team, 1990.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed May 2010.

Poole, J. M. 1999. The effect of fire on Tobusch fishhook cactus. Texas Parks and Wildlife Department, Wildlife Diversity Program. December 27, 1999. 4pp.

Poole, J. M. 2010. Personal communication to Amanda Aurora (Loomis Partners) regarding comments on SEP-HCP draft resource assessments. Received via email from Jackie Poole to Amanda Aurora dated June 23, 2010.

Poole, J. M., W. R. Carr, D. M. Price, and J. R. Singhurst. 2007. Rare Plants of Texas. Texas A&M University Press: College Station. 640 pp.

Texas Parks and Wildlife Department (TPWD). 2009. Wildlife fact sheets [on-line]. Accessed May 2010 at www.tpwd.state.tx.us/huntwild/wild/species/

Texas Parks and Wildlife Department (TPWD). 2010. County Lists of Texas' Special Species: Bandera, Bexar, Blanco, Comal, Kendall, Kerr, and Medina counties; last updated March 12, 2010.

Trock, D. K and R. J. O'Kennon. 2003. A new species of *Packera* (Asteraceae:Senecioneae) from the Edwards Plateau of Texas. Sida 20(3): 945-952.

U.S. Fish & Wildlife Service (USFWS). 1987. Tobusch fishhook cactus (*Ancistrocactus tobuschii*) recovery plan. U. S. Fish & Wildlife Service, Albuquerque, New Mexico. 40 pp.

U.S. Fish & Wildlife Service (USFWS). 2009. U.S. Fish & Wildlife Service Endangered Species Program Sacramento Fish & Wildlife Office: Species of Concern [on-line]. Accessed May 24, 2010 at http://www.fws.gov/sacramento/es/spp_concern.htm.

U.S. Fish & Wildlife Service (USFWS). 2010a. U.S. Fish & Wildlife Service Environmental Conservation Online System Species Profiles [online]. Accessed May 2010 at www.fws.gov/ecos/ajax/tess_public.

U.S. Fish & Wildlife Service (USFWS). 2010b. 5-Year review Tobusch fishook cactus/*Sclerocactus brevihamatus* spp. *tobuschii*. 49 pp.

EXISTING CONSERVATION LANDS

WITHIN THE SEP-HCP PLAN AREA

LOOMIS PROJECT NO. 080801

DRAFT FEBRUARY 21, 2011

1.0 INTRODUCTION

This resource assessment describes some of the existing known conservation lands (i.e., lands that are protected by conservation easements, and/or designated as parklands, preserve lands, mitigation lands, and other public lands) within the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP) Plan Area. The SEP-HCP Plan Area includes Bandera, Bexar, Blanco, Comal, Kerr, Kendall, and Medina counties.

The purpose of this assessment is to document the basic background information for the Habitat Conservation Plan and associated Environmental Impact Statement. The information included in this assessment is not a complete list of existing conservation lands, since the identity and location of some conserved properties (particularly private lands protected by conservation easements) were unavailable. Further, the boundaries of protected areas are, in some cases, approximate or estimated based on available information. The degree of protection for endangered species on these tracts also varies, but all are at least partially protected from future land development and some specifically target conservation of native wildlife and habitats (including endangered species). The information provided in this assessment is intended to assist conservation planning on a regional scale, and is not intended to direct the identification of any future preserve land acquisitions.

2.0 METHODS

The majority of the information on existing conservation lands within the SEP-HCP Plan Area was generated from data provided by the Texas Land Trust Council (TLTC) received on May 19, 2010. The TLTC data included tabular and spatial data that represents existing public and privately owned conservation lands managed by TLTC members, as well as known public conservation lands managed by State and Federal entities, such as Texas Parks and Wildlife Department (TPWD) and U.S. Fish and Wildlife Service (USFWS). Although the TLTC database included a large number of existing conservation lands, it is not a complete list of existing conservation lands. Many privately owned conservation easement lands were excluded from the spatial GIS portion of the database for confidentiality reasons.

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For properties included in the TLTC database that were lacking spatial information, Loomis searched the managing entity's website for additional publically available information on each property, cross-referenced any available information with the TLTC database, and then queried the most recent available parcel data from each Appraisal District within the SEP-HCP Plan Area (Bandera, Blanco, Bexar, Comal, Kendall, Kerr, and Medina counties) in an effort to locate the property. If the query returned potential results, all available information was verified to the extent practicable, and the likely property boundary from the appraisal district parcel layer was added to the database. There are several cases in which the protected portion of a property may be less than the total size of the parcel.

Each land trust entity included within the TLTC database and other known conservation groups were consulted in order to verify that the information acquired was correct and/or if there were any additional existing conservation lands that had not been accounted for. The following land trusts and conservation organizations were contacted regarding existing conservation easement and preserve holdings:

- The Nature Conservancy
- Texas Land Trust
- Hill Country Land Trust
- Cibolo Land Conservancy
- Green Spaces Alliance of South Texas
- San Antonio River Authority
- Guadalupe-Blanco River Trust
- San Antonio Water System
- The Conservation Fund
- Texas Agricultural Land Trust
- The Trust for Public Land

Loomis also used various other data sources identify additional conservation lands that were not included in the TLTC database. Various other available data sources included:

- USFWS 2006 Biological Opinion for Cibolo Canyon Master Phase 2;
- STRATMAP v2 parks and cultural polygon shapefile;
- City of San Antonio natural areas and open space parks;
- Draft Comal County Regional Habitat Conservation Plan;
- City of San Antonio GIS website – parks and recreation areas GIS database;
- Appraisal District parcel data for Bandera, Blanco, Bexar, Comal, Kendall, Kerr, and Medina counties;
- Draft Golden-cheeked Warbler Conservation Strategy for Proposed Recovery Unit 5 (SWCA Environmental Consultants 2008); and
- Other relevant information in Loomis' project files.

For conservation lands with corresponding spatial information, the amount of potential golden-cheeked warbler (*Dendroica chrysoparia*, GCW) habitat and potential karst habitat was estimated. Estimates of potential GCW habitat within the existing conservation lands are based on both Model C2010 (Diamond et al. 2010) and the 2007/2008 Texas A&M habitat model (Morrison et al. 2010). See the *Golden-cheeked Warbler* assessment attached as Appendix C to the SEP-HCP for more information

about these habitat models. Estimates of potential karst habitat are based on Karst Zones 1 through 4, as described by Veni (1994 and 2002).

3.0 EXISTING CONSERVATION LANDS

Approximately 134,800 acres are currently under some degree of conservation within the SEP-HCP Plan Area, including lands owned by public entities or conservation organizations, or private lands under conservation easements (Appendix A). Table 1 shows the approximate number of parcels and approximate total acres of existing conservation lands within the SEP-HCP Plan Area by county. The locations of public properties within the Plan Area are shown on Figure 1

TABLE 1. Existing conservation lands within the SEP-HCP Plan Area by county.

	Bandera County	Bexar County	Blanco County	Comal County	Kendall County	Kerr County	Medina County	Total
TOTAL LANDS								
No. of Properties	14	86	24	13	13	5	17	172
Acres	18,741	23,141	24,432	7,464	9,952	17,766	33,350	134,848
PUBLIC OWNED LANDS								
No. of Properties	3	65	3	10	2	2	4	89
Acres	12,057	19,586	5,636	5,622	117	6,647	2,527	52,192
CONSERVATION ORGANIZATION OWNED LANDS								
No. of Properties	2	3	1	1	5	1	0	13
Acres	1,844	58	227	692	376	138	0	3,335
PRIVATE OWNED LANDS								
No. of Properties	7	13	20	2	6	2	13	63
Acres	4,840	3,497	18,568	1,149	9,458	10,982	30,823	79,317

Some parcels and associated acreage cross county lines.

4.0 POTENTIAL GCW HABITAT ON CONSERVED LANDS

4.1 2007/2008 TEXAS A&M MODEL

Approximately 60,230 acres of potential GCW habitat is mapped by the 2007/2008 Texas A&M model on existing conservation lands within the Plan Area. This habitat represents approximately 5 percent of the total amount of potential habitat identified by this model in the Plan Area; although the degree of specific protection and management for the habitat may vary. Table 2 shows the approximate acreage of potential GCW habitat on existing conservation lands within the Plan Area by county.

TABLE 2. Estimated GCW habitat (per 2007/2008 Texas A&M habitat model) on spatially-identified conservation properties.

	Bandera County	Bexar County	Blanco County	Comal County	Kendall County	Kerr County	Medina County	Total
Total GCW Habitat on Conserved Properties (acres)	7,904	17,164	11,131	4,738	3,306	4,753	11,233	60,229
Potential Habitat with >= 50% Probability of Occupancy (acres)	7,613	16,703	10,574	4,591	3,184	3,925	10,960	57,550
Potential Habitat with < 50% Probability of Occupancy (acres)	291	461	557	147	122	828	273	2,679
Total Potential GCW Habitat in County (acres)	230,555	97,649	122,754	154,227	134,133	248,067	123,191	1,110,577
Percent of Total Habitat on Conserved Properties	3%	18%	9%	3%	2%	2%	9%	5%

Some parcels and associated acreage cross county lines.

4.2 MODEL C2010

Approximately 54,750 acres of potential GCW habitat is mapped by Model C2010 on existing conservation lands within the Plan Area. This habitat represents approximately 6 percent of the total amount of potential habitat mapped by Model C2010 in the Plan Area; although the degree of specific protection and management for the habitat may vary. Table 3 shows the approximate acreage of potential GCW habitat, as mapped by Model C2010, on existing conservation lands within the Plan Area by county.

TABLE 3. Model C2010 Potential GCW habitat on existing conservation lands within the SEP-HCP Plan Area by county.

	Bandera County	Bexar County	Blanco County	Comal County	Kendall County	Kerr County	Medina County	Total
Total GCW Habitat on Conserved Properties (acres)	7,856	17,228	6,353	4,517	2,859	4,230	11,747	54,790
Rank 1 Habitat (acres)	503	461	1,384	383	400	924	1,342	5,397
Rank 2 Habitat (acres)	724	834	1,565	474	382	840	1,796	6,615

Rank 3 Habitat (acres)	948	1,202	1,849	547	361	839	1,948	7,694
Rank 4 Habitat (acres)	5,681	14,731	1,555	3,113	1,716	1,627	6,661	35,084
Subtotal Ranks 3 and 4 Habitat (acres)	6,629	15,933	3,404	3,660	2,077	2,466	8,609	42,778
Total Potential GCW Habitat in County (acres)	222,634	100,120	85,698	160,462	109,839	183,771	126,713	989,237
Percent of Total Habitat on Conserved Properties	4%	17%	7%	3%	3%	2%	9%	6%

Some parcels and associated acreage cross county lines.

5.0 POTENTIAL KARST HABITAT ON CONSERVED LANDS

GIS data for potential karst habitat within the SEP-HCP Plan Area is only available for Bexar County and a small portion of the northeastern corner of Medina County. Potential karst habitat includes Karst Zones 1 through 4, as described by Veni (1994 and 2002). Potential karst habitat occurs on 77 of the existing conservation parcels with known locations, and includes approximately 22,600 acres in Karst Zones 1 through 4. In addition, 8 of the Critical Habitat Units (CHUs) identified by the USFWS (U.S. Fish and Wildlife Service (USFWS) 2010) occur entirely or partially on existing conservation lands, including 8 CHUs for the three covered karst invertebrates. Acreage of existing conservation lands and number of parcels within the Plan Area that occur within each karst zone is included in Table 4.

TABLE 4. Potential karst habitat on existing conservation lands within the SEP-HCP Plan Area.

	Zone 1	Zone 2	Zone 3	Zone 4	Total
Acres	9,299	7992	5,333	15	22,639
Number of Parcels*	21	32	47	2	77

*Some parcels contain portions of more than one karst zone.

6.0 POTENTIAL BCV HABITAT ON CONSERVED LANDS

Some of the currently conserved lands are protected and/or managed specifically for the black-capped vireo (*Vireo atricapilla*, BCV); however, information on the conservation or management obligations for most of the private conservation lands is lacking. Where such information was available, the database indicates that at least 1 conservation parcel (Love Creek Preserve in Bandera County which encompasses approximately 1,813 acres) is at least partially dedicated to the protection and management of the BCV. Five other currently conserved parcels within the SEP-HCP Plan Area have

known BCV populations: the Kerr Wildlife Management Area in Kerr County, Hill County State Natural Area in Bandera County, and Rancho Diana, Freidrich Park, and Crownridge Canyon in Bexar County. However, information on the specific management and conservation obligations for the BCV on these properties is lacking (Wilkins et al. 2006 and USFWS 2009).

7.0 SIGNATURES

This report was prepared by professional biologists at the consulting firm of Loomis Partners, Inc. in conformance with the methods and limitations described herein. The findings of this submittal are completely and accurately documented in this application package.

PREPARED BY:	APPROVED BY:
SIGNATURE	SIGNATURE
.	.
PRINTED NAME	PRINTED NAME
DATE	DATE

8.0 REFERENCES

Diamond, D. D., L. F. Elliott, and R. Lea. 2010. Golden-cheeked warbler habitat up-date – final report. Missouri Resource Assessment Partnership, University of Missouri, Columbia, MO. 8 pp.

Morrison, M. L., R. N. Wilkins, B. A. Collier, J. E. Groce, H. A. Mathewson, T. M. McFarland, A. G. Snelgrove, R. T. Snelgrove, and K. L. Skow. 2010. Golden-cheeked warbler population distribution and abundance. Texas A&M Institute of Renewable Natural Resources, College Station, Texas, USA. 194 pp.

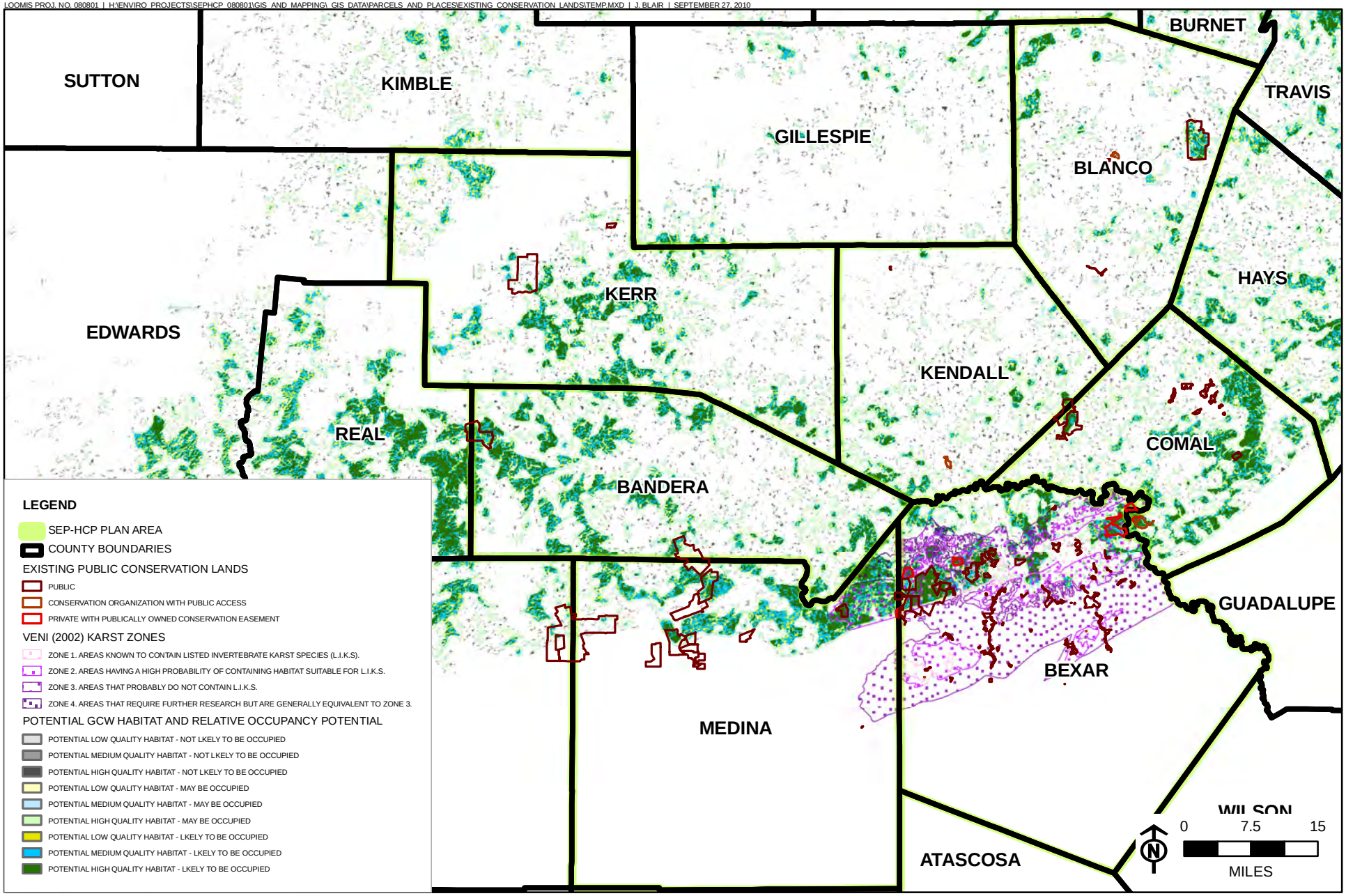
U.S. Fish & Wildlife Service (USFWS). 2009. Historic Bird Surveys Observations Data. BCVIObsPnt_through_03_NAD83UTM14.shp. Received September 2009.

U.S. Fish & Wildlife Service (USFWS). 2010. Environmental Conservation Online System Critical Habitat for Threatened and Endangered Species. Crithab_all_layers.zip and crithab_all_shapefiles.zip. Last Accessed March 30, 2010. http://criticalhabitat.fws.gov/.

Veni, G. 1994. Geologic controls on cave development and the distribution of endemic cave fauna in the San Antonio, Texas, region. Report prepared for Texas Parks and Wildlife Department and U.S. Fish and Wildlife Service.

Veni, G. 2002. Delineation of hydrogeologic areas and zones for the management and recovery of endangered karst invertebrate species in Bexar County, Texas. Report prepared for the U.S. Fish and Wildlife Service. 75 pp.

Wilkins, N., R. A. Powell, A. A. T. Conkey, and A. G. Snelgrove. 2006. Population status and threat analysis for the black-capped vireo. Department of Wildlife and Fisheries Sciences, Texas A&M University. Prepared for the U.S. Fish and Wildlife Service, Region 2. 146 pp.



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EXISTING PUBLIC CONSERVATION LANDS WITHIN THE SEP-HCP PLAN AREA

DRAFT SEPTEMBER 27, 2010
INFORMATION SUBJECT TO CHANGE

TABLE 1. NAME, ACREAGE, AND PRIMARY CONSERVATION METHOD OF CURRENTLY CONSERVED PARCELS WITHIN THE SEP-HCP PLAN AREA.

Site Name	County	Acreage	Owner Name	Owner Type
Bear Springs Blossom Preserve	BANDERA	31.27	Bear Springs Blossom Nature Group	Conservation Organization
Elam Creek Ranch	BANDERA	120.00	Private	Private
Gunsight Mountain Easements - Anderson	BANDERA	130.30	Private	Private
Gunsight Mountain Easements - Creveling	BANDERA	380.89	Private	Private
Gunsight Mountain Ranch Preserve	BANDERA	502.00	Private	Private
Jesus Canyon Preserve	BANDERA	167.00	Private	Private
Love Creek Preserve	BANDERA	1813.00	The Nature Conservancy	Conservation Organization
Rock Chimney Ranch	BANDERA	399.71	Private	Private
Various Properties	BANDERA	3140.00	Private	Private
3K Ranch	BANDERA/KENDALL	3754.25	Texas Parks and Wildlife Department (State)	Public
Hill Country State Natural Area	BANDERA/MEDINA	5122.30	Texas Parks and Wildlife Department (State)	Public
Lost Maples State Natural Area	BANDERA/REAL	3177.53	Texas Parks and Wildlife Department (State)	Public
Bamberger	BEXAR	72.58	City of San Antonio	Public
Blossom	BEXAR	14.77	City of San Antonio	Public
Bullis Park	BEXAR	51.71	City of San Antonio	Public
Casa Navarro State Historic Site	BEXAR	0.35	Texas Parks and Wildlfe Department	Public
Cathedral Rock	BEXAR	56.86	City of San Antonio	Public
Cedar Creek (Plum Valley)	BEXAR	240.00	City of San Antonio	Public
Centex Donated Properties	BEXAR	77.11	City of San Antonio	Public
Champions Ridge	BEXAR	5.76	Private	Private
Champions Ridge	BEXAR	26.00	Private	Private
Characol Creek	BEXAR	37.33	City of San Antonio	Public
Cibolo Canyon Master Phase 2- Wolverton Tract (not current)	BEXAR	1347.66	Private	Private
Cibolo Canyon Master Phase 2 - North Triangle Tract	BEXAR	258.71	Private	Private
Cibolo Creek Preserve	BEXAR	52.32	Texas Land Conservancy	Conservation Organization
City of San Antonio - Hampton Tract	BEXAR	50.00	City of San Antonio	Public
Classen Ranch	BEXAR	82.74	Private	Private
Comanche Lookout	BEXAR	38.00	City of San Antonio	Public
Community Gardens (multiple)	BEXAR	10.69	Private	Private
Conner	BEXAR	24.06	City of San Antonio	Public
Crystal Hills	BEXAR	44.54	City of San Antonio	Public
Culebra Creek	BEXAR	145.50	City of San Antonio	Public
Eisenhower Park	BEXAR	323.38	City of San Antonio	Public
Elizabeth P. Hill Preserve	BEXAR	718.95	Private	Private
Falcone Park	BEXAR	65.51	City of San Antonio	Public
Fest Road Park	BEXAR	20.00	City of San Antonio	Public
Fox Park	BEXAR	34.80	City of San Antonio	Public
French Creek Park	BEXAR	28.72	City of San Antonio	Public
Friedrich Park	BEXAR	267.03	City of San Antonio	Public
Friesenhahn	BEXAR	11.57	City of San Antonio	Public
Gary Park	BEXAR	5.00	Private	Private
Garza Park	BEXAR	21.52	City of San Antonio	Public
Gilbert Morgan Denman, Jr.Park	BEXAR	12.53	City of San Antonio	Public
Gold Canyon	BEXAR	65.06	City of San Antonio	Public
Gorrell Park	BEXAR	24.81	City of San Antonio	Public
Government Canyon State Natural Area	BEXAR	7037.01	Texas Parks and Wildlife Department (State)	Public
Government Canyon State Natural Area - Canyon Ranch	BEXAR	421.00	Texas Parks and Wildlife Department (State)	Public
Government Canyon State Natural Area - Kallison Ranch	BEXAR	1163.81	Texas Parks and Wildlife Department (State)	Public
Hardberger	BEXAR	311.35	City of San Antonio	Public
High Mountain	BEXAR	140.00	City of San Antonio	Public
Hilltop Acres	BEXAR	58.69	City of San Antonio	Public
Hornbeak	BEXAR	13.59	Private	Private
Huebner Creek Park	BEXAR	11.14	City of San Antonio	Public
Indian Springs/Upper Cibolo Creek	BEXAR	335.22	Private	Private
J. Frank Madla Natural Area	BEXAR	41.83	Private	Private
John James Park	BEXAR	89.65	City of San Antonio	Public
Kallison Park	BEXAR	15.24	City of San Antonio	Public
Laredo-Culebra	BEXAR	58.98	City of San Antonio	Public
Leon Creek Greenway - North Segment	BEXAR	543.86	City of San Antonio	Public
Leon Vista Park	BEXAR	6.17	City of San Antonio	Public
Lorence Creek Park	BEXAR	49.46	City of San Antonio	Public
McAllister	BEXAR	976.82	City of San Antonio	Public
McClain	BEXAR	97.50	City of San Antonio	Public
Medallion	BEXAR	155.98	City of San Antonio	Public
Mud Creek	BEXAR	67.37	City of San Antonio	Public
O. P. Schnabel	BEXAR	202.05	City of San Antonio	Public
Olmos Basin	BEXAR	1010.00	City of San Antonio	Public

TABLE 1. NAME, ACREAGE, AND PRIMARY CONSERVATION METHOD OF CURRENTLY CONSERVED PARCELS WITHIN THE SEP-HCP PLAN AREA.

Site Name	County	Acreage	Owner Name	Owner Type
Oscar Perez Park	BEXAR	17.02	City of San Antonio	Public
Oxbow Park	BEXAR	0.95	City of San Antonio	Public
Panther Springs	BEXAR	282.01	City of San Antonio	Public
Rancho Diana (Menchaca)	BEXAR	1150.00	City of San Antonio	Public
Rhode Park	BEXAR	0.97	City of San Antonio	Public
Robber Baron Cave Preserve	BEXAR	0.40	Texas Cave Management Association	Conservation Organization
Rocky Creek	BEXAR	20.00		Public
Rolling Oaks Cave Preserve	BEXAR	5.00	Texas Cave Management Association	Conservation Organization
Salado Creek Greenway - North Segment	BEXAR	206.92	City of San Antonio	Public
San Antonio Aquifer Parks - Crown Ridge Canyon	BEXAR	207.70	City of San Antonio	Public
San Antonio Aquifer Parks - Gallagher Ranch/Chris Hill	BEXAR	710.17	City of San Antonio	Public
San Antonio Aquifer Parks - Iron Horse Canyon	BEXAR	593.74	City of San Antonio	Public
San Antonio Aquifer Parks - Windgate I	BEXAR	1023.00	City of San Antonio	Public
San Antonio Aquifer Parks - Windgate II	BEXAR	90.70	City of San Antonio	Public
Scenic Sunset	BEXAR	25.63	City of San Antonio	Public
Slick	BEXAR	62.77	City of San Antonio	Public
Stone Oak	BEXAR	245.30	City of San Antonio	Public
Tobin	BEXAR	60.59	City of San Antonio	Public
Voelker Lane	BEXAR	14.00	City of San Antonio	Public
Walker Ranch	BEXAR	82.98	City of San Antonio	Public
Wilshire Terrace	BEXAR	11.16	City of San Antonio	Public
Woodland Hills	BEXAR	336.11	City of San Antonio	Public
WUEST/SAWS Easement I	BEXAR	401.80	Private	Private
WUEST/SAWS Easement II	BEXAR	249.26	Private	Private
City of San Antonio - Mayberry Tract	BEXAR,MEDINA	203.51	City of San Antonio	Public
Schuchart	BEXAR/MEDINA	97.65	City of San Antonio	Public
Baird Ranch Memorial Preserve	BLANCO	760.00	Private	Private
Baird Ranch Memorial Preserve	BLANCO	132.94	Private	Private
Bamberger Ranch	BLANCO	5506.88	Private	Private
Blanco State Park	BLANCO	105.24	Texas Parks and Wildlife Department	Public
Brushy Top Ranch	BLANCO	1641.75	Private	Private
Cunningham Interests, LTD	BLANCO	542.86	Private	Private
Cypress Mills Ranch	BLANCO	490.00	Private	Private
Kendrick-Ralston Preserve	BLANCO	197.00	Private	Private
Little Blanco River Ranch	BLANCO	20.50	Private	Private
Lyndon B. Johnson National Historical Park	BLANCO	131.67	USFWS	Public
Pedernales Falls State Park	BLANCO	5399.49	Texas Parks and Wildlife Department (State)	Public
Pedernales River	BLANCO	970.48	Private	Private
Pedernales River - Caven Family Partnership	BLANCO	206.00	Private	Private
Pedernales River - Dawson	BLANCO	940.34	Private	Private
Pedernales River - Hill Country Good Earth Partners	BLANCO	1561.55	Private	Private
Pedernales River - Winkler	BLANCO	1279.93	Private	Private
Pedernales River Nature Park	BLANCO	227.26	Lower Colorado River Authority	Conservation Organization
R. R. West Ranch	BLANCO	34.47	Private	Private
Sandyland	BLANCO	975.72	Private	Private
White Creek Canyon Ranch	BLANCO	310.00	Private	Private
Ferguson Ranch	BLANCO/GILLESPIE	215.00	Private	Private
Willow Springs Ranch	BLANCO/GILLESPIE	175.00	Private	Private
Pedernales River - Vista Ranch	BLANCO/HAYS	2132.87	Private	Private
The Narrows	BLANCO/HAYS	475.00	Private	Private
Black Angus Ranches, LTD	COMAL	941.09	Private	Private
Bracken Bat Cave & Nature Reserve	COMAL	692.00	Bat Conservation International	Conservation Organization
Canyon Park	COMAL	514.16	Comal County	Public
Comal Park	COMAL	136.83	Comal County	Public
Cranes Mill Park	COMAL	238.38	Comal County	Public
Honey Creek State Natural Area	COMAL	1825.23	Texas Parks and Wildlife Department (State)	Public
Jacobs Creek Park	COMAL	260.94	Comal County	Public
Morton Preserve	COMAL	293.96	Comal County	Public
North Park	COMAL	55.82	Comal County	Public
Overlook Park	COMAL	30.52	Comal County	Public
Potters Creek Park	COMAL	320.81	Comal County	Public
Rocky Creek Ranch	COMAL	208.80	Private	Private
Guadalupe River State Park	COMAL/KENDALL	1945.44	Texas Parks and Wildlife Department (State)	Public
Blanco River - Hale	KENDALL	665.70	Private	Private
Cibolo Bluffs	KENDALL	26.00	Cibolo Nature Center	Conservation Organization
Cibolo Nature Center	KENDALL	258.47	Friends of Cibolo Wilderness	Conservation Organization
Cibolo Nature Center	KENDALL	100.00	City of Boerne	Public
Cibolo Preserve	KENDALL	499.24	Cibolo Preserve	Private
Diamond K Ranch	KENDALL	4634.25	Private	Private

TABLE 1. NAME, ACREAGE, AND PRIMARY CONSERVATION METHOD OF CURRENTLY CONSERVED PARCELS WITHIN THE SEP-HCP PLAN AREA.

Site Name	County	Acreage	Owner Name	Owner Type
Friends of Cibolo Wilderness	KENDALL	27.09	Friends of Cibolo Wilderness	Conservation Organization
Herff-Rozzell Farm	KENDALL	64.00	Cibolo Nature Center	Conservation Organization
Linda Dean Ranch	KENDALL	620.00	Private	Private
McGown	KENDALL	440.00	Private	Private
Old Tunnel Wildlife Management Area	KENDALL	17.36	Texas Parks and Wildlife Department (State)	Public
Sheep Dip	KENDALL	1.20	Cibolo Nature Center	Conservation Organization
Various	KENDALL	2599.00	Private	Private
Kerr Wildlife Management Area	KERR	6399.12	Texas Parks and Wildlife Department (State)	Public
Los Rincones Preserve	KERR	137.96	Texas Land Conservancy	Conservation Organization
Lower Rio Grande Valley National Wildlife Refuge	KERR	247.81	USFWS	Public
On Cloud 9	KERR	676.97	Private	Private
Stowers Ranch	KERR	10305.00	Private	Private
Bourquin	MEDINA	610.12	City of San Antonio	Public
Brucks	MEDINA	777.91	Private	Private
City of San Antonio - Munford/Mustang Valley	MEDINA	2558.42	Private	Private
City of San Antonio - Provident Scenic Canyon	MEDINA	452.70	Private	Private
Dreiss and Laredo-Culebra	MEDINA	116.89	City of San Antonio	Public
Finger	MEDINA	1794.60	City of San Antonio	Public
Jordan Ranch	MEDINA	2922.00	Private	Private
Koch	MEDINA	814.06	Private	Private
Landmark Inn State Historic Site	MEDINA	5.75	Texas Parks and Wildlife Department (State)	Public
Moore	MEDINA	582.88	Private	Private
Oefinger	MEDINA	854.68	Private	Private
Saathoff	MEDINA	674.71	Private	Private
Various	MEDINA	406.00	Private	Private
Young Ranch	MEDINA	2927.49	Private	Private
Zuberbueler	MEDINA	813.69	Private	Private
Hammond	MEDINA/UVALDE	16111.24	Private	Private
Watson	UVALDE	926.96	Private	Private