



APPENDIX D

Biological Survey Report



BIOLOGICAL SURVEY REPORT
FOR
CONSTRUCTION, OPERATION, AND MAINTENANCE
OF TACTICAL INFRASTRUCTURE
USBP MARFA SECTOR, TEXAS



Prepared for

U.S. DEPARTMENT OF HOMELAND SECURITY
U.S. CUSTOMS AND BORDER PROTECTION
U.S. BORDER PATROL

Prepared by



MARCH 2008

ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
BA	Biological Assessment
BMP	Best Management Practice
BO	Biological Opinion
BSR	Biological Survey Report
CBP	U.S. Customs and Border Protection
CFR	Code of Federal Regulations
CWA	Clean Water Act
DHS	U.S. Department of Homeland Security
EA	Environmental Assessment
ESA	Endangered Species Act
IBWC	International Boundary and Water Commission
MBTA	Migratory Bird Treaty Act of 1918, as amended
NEPA	National Environmental Policy Act
POE	Port of Entry
ROE	Right of Entry
SFA	Secure Fence Act
TPWD	Texas Parks and Wildlife Department
USACE	U.S. Army Corps of Engineers
USBP	U.S. Border Patrol
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

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1. INTRODUCTION

The Biological Survey Report (BSR) synthesizes information collected from a variety of literature sources and field surveys to describe the biological resources within the project corridor, provides support information from the Project region, allows evaluation of the potential impacts of the Project on those biological resources within the project corridor by the Environmental Stewardship Plan (ESP), and provides the basis of recommendations for avoidance or reduction of those impacts using mitigation including best management practices (BMPs). Information was gathered from publicly available literature, data provided by relevant land management agencies, review of aerial photography and U.S. Geological Survey (USGS) topographic maps, data from the State of Texas, data from NatureServe, the National Wetlands Inventory (NWI), and corridor field surveys conducted in November 2007.

The BSR analyzes the potential impacts to biological resources resulting from the construction, operation, and maintenance of the Project. The BSR was prepared as an independent document that is an attachment to the ESP developed for this Project.

In general, the project corridor encompasses approximately 11 miles in length and approximately 196 acres within a 150-foot-wide area. In total, approximately 175 acres of nonnative and native vegetation providing wildlife habitat occurs in the project corridor. The remaining area, 30 acres (approximately 15% of the 150-foot-wide corridor) support land use in the form of fallow and irrigated agriculture, rail line, roads and trails, and open water.

Herbaceous vegetation (grasslands, forblands, emergent wetlands) comprises approximately 29 percent of the 150 foot-wide corridor. Shrublands (dwarf, short, and tall) comprise approximately 2 percent of the 150-foot-wide corridor. Woodlands comprise approximately 22 percent of the 150-foot-wide corridor. The vegetation represents a combination of mostly non-native grasses that have become established in dense stands on levee banks, river terraces, in hay fields, and as woodland understory; shrublands that are invading herbaceous vegetation stands or occur on gravelly upland substrates; and riparian woodlands.

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2. PROJECT DESCRIPTION

U.S. Customs and Border Protection (CBP) plans to construct, maintain, and operate tactical infrastructure consisting of pedestrian, aesthetic, or hybrid fence; associated access roads; patrol roads; and lights along the U.S./Mexico international border in the U.S. Border Patrol (USBP) Marfa Sector, Texas. **Figures 2-1** and **2-2** illustrate the locations of the new tactical infrastructure. The locations are based on a USBP Marfa Sector assessment of local operational requirements where it will assist USBP agents in reducing cross-border violator activities. The tactical infrastructure will be constructed in three discrete sections along the international border in Hudspeth and Presidio counties, Texas (**Table 2-1**). The individual tactical infrastructure sections range from 3.1 to 4.6 miles in length, or nearly 11 miles total.

Table 2-1. Tactical Infrastructure Sections, Marfa Sector

Section Number	USBP Station	General Location	Land Ownership	Length of Section (miles)
L-1	Sierra Blanca	Neely's Crossing	Public (USIBWC)	4.63
L-1A	Presidio	Rio Grande East of POE	Public (USIBWC) and private	3.3
L-1B	Presidio	Rio Grande West of POE	Public (USIBWC) and private	2.9
Total				10.73

Note: IBWC = International Boundary and Water Commission; POE = Port of Entry



Figure 2-1. General Location of Tactical Infrastructure, Section L-1

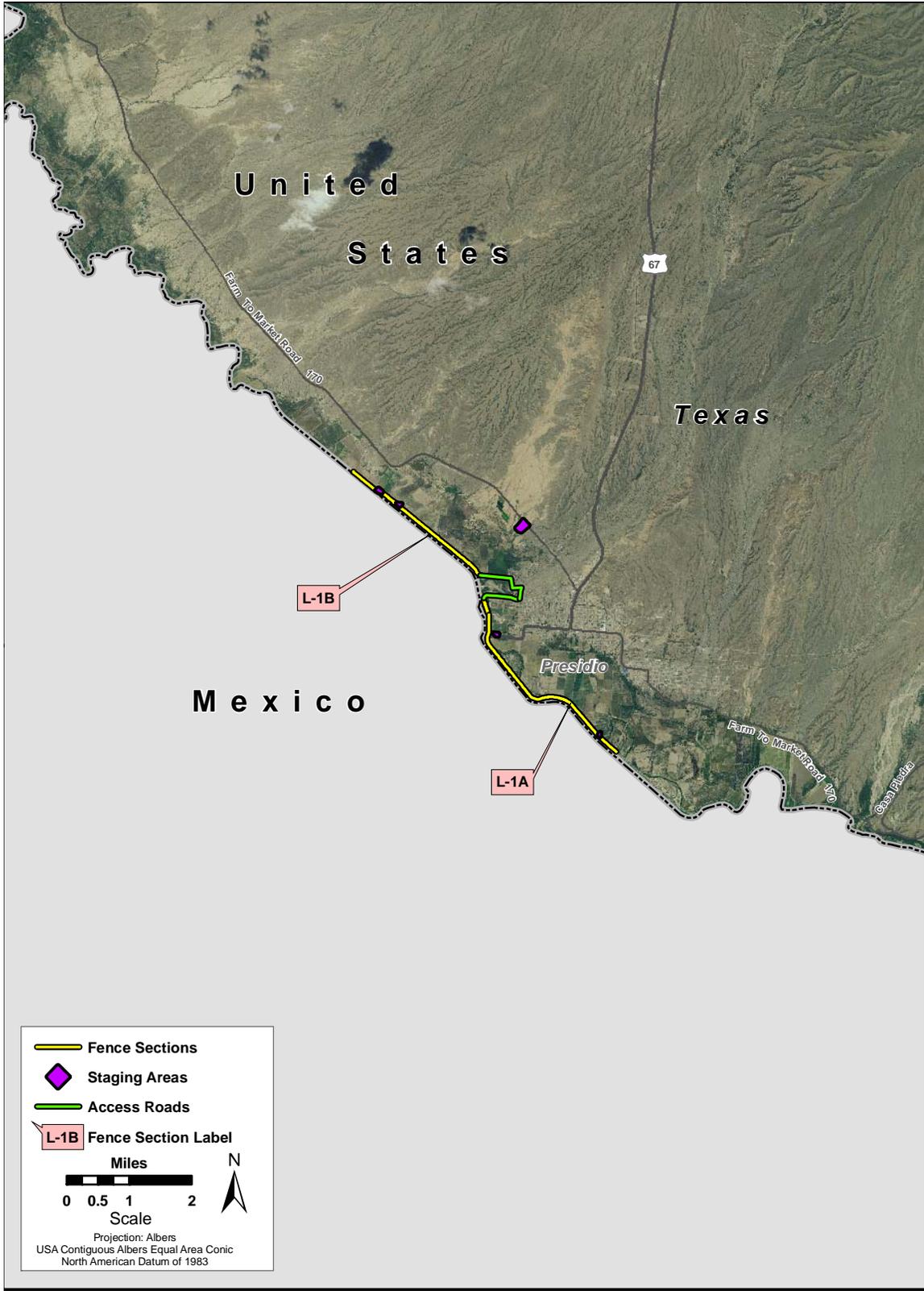


Figure 2-2. General Location of Tactical Infrastructure, Sections L-1A and L-1B

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3. SURVEY METHODS

To provide flexibility in placement of tactical infrastructure within the project corridor, and to ensure consideration of potential impacts due to construction, patrol, and maintenance, surveys were conducted in an area extending 150 feet on the north side (the side away from the Rio Grande) of the three individual tactical infrastructure sections and extending at least 0.5 mile past the ends of each section. The areas thus defined are referred to hereafter as the “survey corridor” or “project corridor.”

Intuitive controlled investigations of the survey corridor were conducted by employees of engineering-environmental Management, Inc. (e²M): James Von Loh (Senior Ecologist), Valerie Whalon (Staff Biologist), Karen Stackpole (Staff Biologist), Shannon Cauley (Wetlands Ecologist), and Brent Eastty (Staff Botanist). The November 2007 and January 2008 surveys examined the project corridor under rights-of-entry (ROE) approvals and CBP escort.

Due to the short time-frame for acquiring field information, e²M assigned senior ecologists and biologists familiar with the NEPA process, vegetation and wildlife habitat classification and mapping protocols, and field sampling methods to intuitively examine the landscape and project corridor for the 11-mile length. The surveys were controlled, in that ROE were approved for the 150-foot-wide corridor, and survey crews were required to be accompanied by USBP agents who served as guides, shared knowledge of wildlife sightings and other pertinent information, contacted landowners if necessary, and ensured surveyor safety while in the field. Investigations included observed plant and wildlife species lists by fence sections; assessment of habitat; surveys for rare plant and wildlife species, landscape photography points, and observation points; recording dominant species, location, cover, environmental conditions, and photo-documentation; determination of potential wetlands for January research; and general note-taking of natural resources and other NEPA reporting needs.

Biologists surveyed the length of the project corridor for each tactical infrastructure section. They conducted reconnaissance-level surveys on areas of land use (agricultural fields and access roads) and examined in more detail areas containing unique species compositions or habitat that might be conducive to sensitive species (grasslands, shrublands, woodlands, wetlands, water bodies, etc.). Observation data (UTM coordinates from GPS receivers, photographs, field notes, environmental information, vegetation structure, and plant community composition) were recorded at regular intervals along the project corridor where vegetation occurred as homogenous stands, and also where plant communities presented substantial shifts in species composition. These data were used to generate vegetation classifications and maps to inform delineation of habitat types, analyses of potential sensitive species occurrences, and analyses of potential project impacts on biological resources (**Attachment A**). Vegetation type and land use maps are included as a digital file in this final report. Although no protocol surveys were conducted, botanists and wildlife biologists specifically

examined habitats to determine the presence of state- and federal-listed species (Table 3-1). Descriptions of the federally listed species are provided in Attachment B.

Table 3-1. Federal and State Threatened and Endangered Species Potentially Occurring in the Project Area

Common Name	Scientific Name	County	Federal Status	State Status	Habitat
Plants					
Hinckley oak	Quercus hinckleyi	P	T	T	Arid limestone slopes at mid elevations in Chihuahuan Desert
Fish					
Blue sucker	Cycleptus elongatus	P		T	Larger portions of major rivers in Texas; usually in channels and flowing pools with a moderate current; bottom type usually of exposed bedrock, perhaps in combination with hard clay, sand, and gravel; adults winter in deep pools and move upstream in spring to spawn on riffles
Chihuahua shiner	Notropis chihuahua	P		T	Rio Grande basin, Big Bend region; clear, cool water that is often associated with nearby springs; often in pools with slight current or riffles over a gravel or sand bottom where vegetation may be present
Conchos pupfish	Cyprinodon eximius	P		T	Rio Grande and Devils River basins; sloughs, backwaters, and margins of larger streams, channels of creeks, and mouths
Mexican stoneroller	Campostoma ornatum	P		T	In Texas, Big Bend region; clear, fast riffles, chutes, and pools in small to medium-sized creeks with gravel or sand bottoms

Common Name	Scientific Name	County	Federal Status	State Status	Habitat
Reptiles					
Chihuahuan Desert lyre snake	Trimorphodon vilkinsonii	H		T	Mostly crevice-dwelling in predominantly limestone-surfaced desert northwest of the Rio Grande from Big Bend to the Franklin Mountains, especially in areas with jumbled boulders and rock faults/fissures
Mountain short-horned lizard	Phrynosoma hernandesi	H		T	Open, shrubby, or openly wooded areas with sparse vegetation at ground level; soil may vary from rocky to sandy
Texas horned lizard	Phrynosoma cornutum	H		T	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
Birds					
American peregrine falcon	Falco peregrinus anatum	H	DL	E	Nests in tall cliff eyries; migratory stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands
Arctic peregrine falcon	Falco peregrinus tundrius	H	DL	T	Migratory stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands
Interior least tern	Sterna antillarum athalassos	H	E	E	Nests along sand and gravel bars within braided streams, rivers; also known to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc.)
Mexican spotted owl	Strix occidentalis lucida	H	T	T	Remote, shaded canyons of coniferous mountain woodlands (pine and fir)

Common Name	Scientific Name	County	Federal Status	State Status	Habitat
Birds (continued)					
Northern aplomado falcon	Falco femoralis septentrionalis	H, P	E	E	Open country, especially savanna and open woodland, and sometimes in very barren areas; grassy plains and valleys with scattered mesquite, yucca, and cactus
Southwestern willow flycatcher	Empidonax traillii extimus	H, P	E		Thickets of willow, cottonwood, mesquite, and other species along desert streams
Yellow-billed cuckoo	Coccyzus americanus	H, P	C; NL		Deciduous woodlands with cottonwoods and willows; dense understory foliage is important for nest site selection; nests in willow, mesquite, cottonwood, and hackberry; forages in similar riparian woodlands
Mammals					
Black bear	Ursus americanus	H	T/SA;NL	T	Bottomland hardwoods and large tracts of inaccessible forested areas
Mexican long-nosed bat	Leptonycteris nivalis	P	E	E	Cave-dwelling species that usually inhabits deep caverns; nectivorous, with <i>Agave</i> spp. preferred

Sources: TPWD 2007; USFWS 2007

Notes: DL = De-Listed

E=Endangered

T=Threatened

C = Species for which the Service has on file enough substantial information to warrant listing as threatened or endangered

NL= Not listed

T/SA= Threatened due to similar appearance

H= Hudspeth County (Fence Section L-1)

P= Presidio County (Fence Sections L-1A and L-1B)

4. ENVIRONMENTAL SETTING

The project area climate is Subtropical Arid within the Modified Marine climatic type, meaning that summers are long and hot, and winters are short, dry, and mild (Larkin and Bomar 1983; Bailey 1995). The marine climate results from the predominant onshore flow of tropical maritime air from the Gulf of Mexico. Onshore air flow is modified by a decrease in moisture content from east to west and by intermittent seasonal intrusions of continental air. In the project area, summertime precipitation anomalies related to the mountain relief of the Trans-Pecos region occur.

Temperatures in El Paso occur in an average annual minimum and maximum of 52 °F and 77 °F, respectively (NOAA 2007). The lowest and highest temperatures recorded for El Paso are -8 °F and 114 °F. Presidio average low temperatures range from 35 °F in January to 74 °F in July, and average high temperatures range from 69 °F in January to 102 °F in June. The average annual precipitation of the Trans-Pecos region recorded in Presidio is 9.6 inches, and in El Paso 9.4 inches. The distribution of rainfall throughout the year is irregular but occurs predominantly during the summer months when seasonal monsoons occur, from June to September. A long growing season occurs in the proposed project region, over 250 days. The evaporation rate during the summer season is high, about twice the amount of precipitation.

The vegetation of the Trans-Pecos Region of southwestern Texas has generally been classified under the Dry Domain (300), Tropical/Subtropical Steppe Division (320) of Bailey (1995). The project area is more finely classified as the Chihuahuan Desert Province (321). The TPWD (2007) provides discussion and describes vegetation geography to biotic provinces and natural regions using topographic features, climate, vegetation types, and terrestrial vertebrates. This system places the project area in the Chihuahuan Biotic Province; Trans Pecos Natural Region; and the Level III Ecoregion of the Chihuahuan Desert.

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5. BIOLOGICAL RESOURCES

5.1 Vegetation Classification

NatureServe (2007) has defined ecological systems to represent recurring groups of biological communities that are found in similar physical environments and are influenced by similar dynamic ecological processes such as fire or flooding. Ecological systems represent classification units that are readily identifiable by conservation and resource managers in the field. The ensuing vegetation description for the project area was prepared in the framework of ecological systems that include:

1. Chihuahuan Creosote bush Desert Scrub (CES302.731)
2. Chihuahuan Mixed Salt Desert Scrub (CES302.017)
3. North American Arid West Emergent Marsh (CES300.729).

This chapter provides a brief description of each plant community that surveyors observed within the fence sections. Communities are distinguished using the NatureServe Vegetation Alliance level of classification or an approximation (provisional community name).

Classification of existing vegetation within this corridor was achieved by accessing the project corridor and staging areas as sampling observation points, and relating them to the NatureServe Explorer classification database (2007). At the coarsest level, the three above-named ecological systems were determined and local vegetation types described using the national system. A finer level of classification equaling or approximating the vegetation alliance level of the National Vegetation Classification System (NatureServe 2007) was used to prepare the plant community discussions under each ecological system. Vegetation stands and patches that are generally unclassified in the current system and sampled within the proposed project corridor typically consisted of non-native species, including Athel Tamarisk (*Tamarix aphylla*) Woodland, Salt-cedar (*Tamarix chinensis*) Woodland and Shrubland, Bermuda Grass (*Cynodon dactylon*) Semi-Natural Herbaceous Vegetation, and Russian-thistle (*Salsola australis*) Semi-Natural Herbaceous Vegetation.

5.1.1 Vegetation Description

Habitats observed, sampled, and photographed within the project corridor range from desert scrub of uplands and creeks to riparian woodland communities in the Rio Grande floodplain and non-native grasslands and forblands. Much of the vegetation cover along the sections consists of non-native tree, shrub, grass, and forb species that are themselves dominant or often support an overstory of honey mesquite or salt cedar shrubs or small trees. Agricultural fields occur along much of the project corridor near Presidio, where they typically lie fallow and support stands of annual Russian-thistle forbs. Where actively farmed, the fields produce hay crops, principally alfalfa, sorghum, and Bermuda grass. The Rio

Grande has been channelized throughout the project corridor, which in addition to levee and road construction has disturbed a majority of the project landscape.

A brief description of each plant community observed within the fence sections (L-1, L-1A, L-1B) is provided herein; they are distinguished using the NatureServe vegetation alliance level of classification or an approximation. To the extent possible, each community is illustrated and supported by representative ground photographs and foliar cover information for dominant species. Some vegetation patches and stands are introduced non-native species and do not readily fit into a recognized vegetation alliance or ecological system predominantly designed for native vegetation; they are discussed at the end of this section.

5.1.1.1 Chihuahuan Creosote bush Desert Scrub (CES302.731)

Creosote bush—Honey Mesquite Shrubland. This community occurs within Section L-1 near Sierra Blanca. The termini of bedrock ridges with gravelly slopes on the east end of the project corridor and a small area of gravelly upland slopes on the west end support creosote bush and honey mesquite shrubs 2–5 meters tall that provide 10–20 percent and 10–12 percent cover, respectively (see **Photograph 5-1**). These sites have moderately high diversity and support low cover of several succulents (*Opuntia* spp.) and the short shrub four-wing saltbush. The herbaceous layer is diverse and contributes sparse to low cover, up to 6 percent cover, of hairy grama, fluffgrass, hairy golden aster, and Russian-thistle.

5.1.1.2 North American Warm Desert Riparian Woodland and Shrubland (CES302.753)

Honey Mesquite Woodland. Honey mesquite woodlands characterized by small trees 2–5 meters tall occur within Sections L-1A and L-1B in the vicinity of Presidio, where they have become established in abandoned agricultural fields or form a linear band at the levee toe-of-fill (principally at the base of the south levee bank). In the canopy layer, honey mesquite cover ranges from 30 to 45 percent (see **Photograph 5-2**). The associated canopy tree salt-cedar contributes approximately 15 percent cover in each sampled stand. The herbaceous layer consists of Russian-thistle primarily, which provides 15–50 percent cover.

Salt-cedar / Bermuda Grass Shrubland and Shrub Herbaceous Vegetation. Salt-cedar tall shrubs, 2–5 meters tall, have invaded Bermuda grass-dominated grasslands within Section L-1 near Sierra Blanca (see **Photograph 5-3**). These stands occupy the narrow floodplain strip or first terrace between the Rio Grande and the access road, which is constructed on the short-stature levee. The tall shrub layer is monotypic with salt cedar and provides approximately 15–35 percent cover. The herbaceous layer contributes dense cover in the stand and is characterized by Bermuda grass (30–70 percent cover) and white aster (3–25 percent cover).



**Photograph 5-1. Photographs of Representative Habitat:
Creosote bush—Honey Mesquite Shrubland**

Seepwillow Shrub Herbaceous Vegetation. Seepwillow occurs on one site within Section L-1A near Presidio as a shrub herbaceous stand that has become established in a small drainage adjacent to an irrigation ditch (see **Photograph 5-4**). The seepwillow shrubs are 2–5 meters tall and provide approximately 15 percent cover. The associated herbaceous layer includes approximately 15 percent cover each by Bermuda grass, Johnsongrass, and the annual forb Russian-thistle.

Rabbitbrush Shrubland. Rabbitbrush short shrubs have become established on roadway fill within the Section L-1 near Sierra Blanca. On these sites, the fill material supporting rabbitbrush ranges from 30 centimeters to 1 meter deep, and the stands form along both sides of the access road (see **Photograph 5-5**). In the short shrub layer, rabbitbrush contributes 30–55 percent cover, and honey mesquite provides 2–4 percent cover. An herbaceous layer is represented by Bermuda grass, six-weeks grama, dropseeds, and Russian-thistle that provide low cover, up to 13 percent cover in sampled stands.



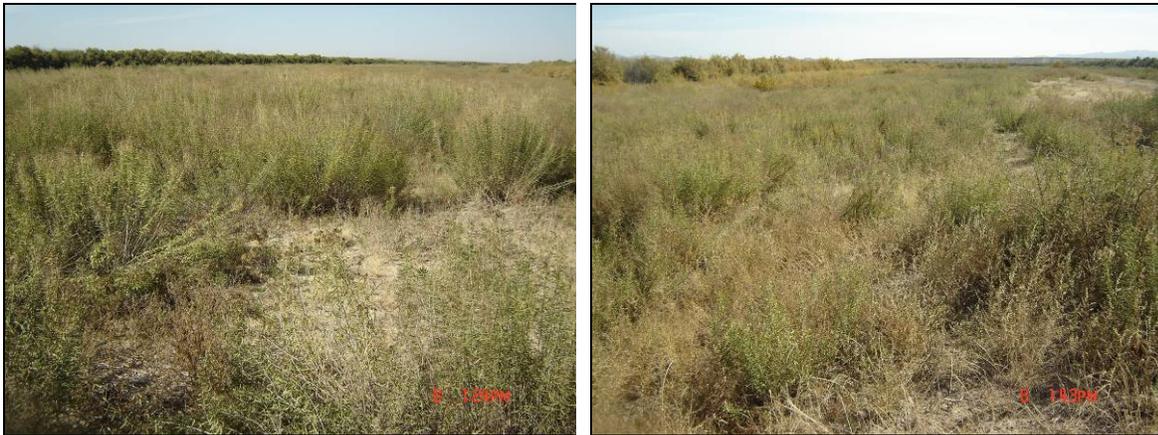
**Photograph 5-2. Photographs of Representative Habitat:
Honey Mesquite Woodland**



**Photograph 5-3. Photographs of Representative Habitat:
Salt-Cedar/Bermuda Grass Shrubland**



Photograph 5-4. Photographs of Representative Habitat: Seepwillow



Photograph 5-5. Photographs of Representative Habitat: Rabbitbrush

Seepweed Shrubland. Seepweed short shrubs are common understory associates in several plant communities and rarely form small stands within Section L-1 (see **Photograph 5-6**). One stand, where seepweed shrubs up to 1 meter tall contribute 40 percent cover, has become established in an area with silty soils that receive inflow from runoff during precipitation events. The tall shrubs (2–5 meters) honey mesquite and salt-cedar each provide sparse cover at the stand margin. The herbaceous layer contributes sparse cover and includes dropseeds and six-weeks grama. In a second stand within Section L-1, seepweed short shrubs provided 15 percent cover and were co-dominant with the tall shrub salt-cedar (12 percent cover) and the short shrub rabbitbrush (8 percent cover). The herbaceous layer, characterized by six-weeks grama and dropseeds, provides low cover, up to 11 percent cover.



Photograph 5-6. Photograph of Representative Habitat: Seepweed

Arrowweed Shrubland. One small patch of arrowweed short shrubs has become established along the access road within Section L-1 near Sierra Blanca (see **Photograph 5-7**). Arrowweed short shrubs to 1 meter tall provide approximately 40 percent cover within a matrix of Bermuda grass over an area of approximately 200 square meters.



Photograph 5-7. Photograph of Representative Habitat: Arrowweed

5.1.1.3 North American Arid West Emergent Marsh Ecological System (CES300.729)

Common Reed Semipermanently Flooded Herbaceous Vegetation. Resacas located south of Presidio retain water sufficiently on an annual basis to support dense stands of common reed to 5 meters tall (see **Photograph 5-8**). Common reed stands are nearly monotypic, with common reed providing 75–80 percent cover, while low cover, up to 10 percent cover, is contributed by narrowleaf cattail and Russian-thistle. Small stands of common reed are often intermingled with tree and shrub species along the Rio Grande, where they provide low to moderate cover. In one stand adjacent to the Rio Grande, common reed provides 35 percent cover and seepwillow tall shrubs contribute approximately 10

percent cover, in addition to sparse cover by honey mesquite and salt-cedar trees.



Photograph 5-8. Photographs of Representative Habitat: Common Reed

Narrowleaf Cattail—Common Reed Semipermanently Flooded Herbaceous Vegetation. One resaca located south of Presidio is sufficiently flooded annually to support approximately 50 percent cover by the tall graminoid, narrowleaf cattail (see **Photograph 5-9**). A band of common reed providing up to 45 percent cover has become established on saturated soils surrounding the narrowleaf cattail stand within the ponded water. A species of green algae occupies approximately 5 percent of the open water within the resaca. The tall shrubs honey mesquite and salt-cedar provide up to 10 percent cover on the upper wetland margin.



Photograph 5-9. Photographs of Representative Habitat: Narrowleaf Cattail

Crowngrass—Bermuda Grass Semipermanently Flooded Herbaceous Vegetation. A ponded area near the end of Section L-1 in the vicinity of Sierra Blanca supports shoreline cover by herbaceous vegetation (see **Photograph 5-10**). Crowngrass and Bermuda grass have become established in the shallow shoreline substrate and on small islands within the pond, contributing 15 percent and 4 percent cover, respectively. The tall shrub layer contributes approximately 12 percent cover and is characterized by salt-cedar to 5 meters tall. A species of green algae provides approximately 4 percent cover within the pond.



Photograph 5-10. Photographs of Representative Habitat: Crowngrass—Bermuda Grass

5.1.1.4 Non-Native Woodland, Shrubland, and Herbaceous Vegetation Alliances and Associations

Athel Tamarisk Woodland. A small stand of very large and old Athel tamarisk trees occurs near Presidio within Section L-1A, amid a broader disturbed area supporting Russian-thistle (see **Photograph 5-11**). These trees provide 75 percent cover, are up to 30 meters tall, are multiple branched from low on the trunk, and have very large basal diameters. A few honey mesquite and four-wing

saltbush shrubs providing low cover occur around the perimeter of the woodland stand. Russian-thistle stands that occur adjacent to the Athel tamarisk trees provide approximately 55 percent cover. This site was formerly a farmhouse, thus accounting for the establishment of these large trees.



Photograph 5-11. Photographs of Representative Habitat: Athel Tamarisk

Salt-cedar Species Semi-Natural Temporarily Flooded Woodland/Shrubland Alliance. Salt-cedar has become established as small trees with basal diameters to 35 centimeters and as multiple-stemmed tall shrubs. Stands have formed on the banks of the Rio Grande, the adjacent floodplain, the levee toe-of-fill, and around low-lying areas that flood after precipitation (see **Photograph 5-12**). In the canopy layer, salt-cedar ranges from 3 to 10 meters tall and provides 45–80 percent cover. Associated canopy trees and shrubs include honey mesquite and rarely tree tobacco and seepwillow, which provide low cover, up to 15 percent cover. The herbaceous layer is characterized by low cover, from 5 to 15 percent cover, of grasses and forbs, including Bermuda grass and Russian-thistle.



Photograph 4-12. Photographs of Representative Habitat: Salt-cedar

Bermuda Grass Semi-Natural Herbaceous Vegetation. Large stands of Bermuda grass have become established between the levee toe-of-fill and the Rio Grande along the Marfa Sector sections (see **Photograph 5-13**). The stands are 20–75 meters wide along much of the L-1, L-1A, and L1-B sections near Presidio and Sierra Blanca. This non-native rhizomatous grass provides 55–90 percent cover in most stands. The commonly associated forb Russian-thistle provides 1–15 percent cover in the remaining herbaceous layer. Sparse cover by honey mesquite short shrubs occasionally occurs, and one stand supports 10 percent cover by salt-cedar tall shrubs. Near Presidio, Bermuda grass stands are maintained by mowing as part of the levee and adjacent floodplain maintenance schedule, which reduces the invasion of this type by shrubs.



Photograph 5-13. Photographs of Representative Habitat: Bermuda Grass

Bermuda Grass—Bristlegrass Semi-Natural Herbaceous Vegetation. Near Sierra Blanca, pastures have been introduced north of the access road and include moderate to dense cover, up to 65 percent cover, by bristlegrass, Bermuda grass, and dropseeds (see **Photograph 5-14**). The forb cocklebur is common to these pastures and contributes up to 10 percent cover in most stands. Moderate to heavy grazing by cattle had occurred prior to sampling this vegetation type.



**Photograph 5-14. Photographs of Representative Habitat:
Bermuda Grass—Bristlegrass**

Bermuda Grass—Russian-thistle Semi-Natural Herbaceous Vegetation. Stands with co-equal dominance of Bermuda grass and Russian-thistle, approximately 15 percent cover for each species, occur between the levee toe-of-fill and the Rio Grande south of Presidio. Sites on the river side of the levee are typically dominated by Bermuda grass, but recent disturbance by bulldozers used in floodplain maintenance activities is evident (see **Photograph 5-15**). Bulldozers are used routinely to widen access roads, remove salt-cedar shrubs and trees from the levee toeslope, and repair damage to crossings of creeks and washes after flooding.

Russian-thistle Semi-Natural Herbaceous Vegetation. The non-native annual forb Russian-thistle is a notorious tumbleweed and has become established on soils disturbed for levee and road construction and also in adjacent agricultural fields lying fallow or abandoned. Stands are common on levees and fields within the Presidio sections, but rare within the Sierra Blanca project portion, becoming established as stands only on the road template. Russian-thistle provides cover ranging from 15–90 percent. They are maintained by mowing the levee banks, resulting in plants a few centimeters tall to some persisting up to 1–1.5 meters tall in agricultural fields (see **Photograph 5-16**). The short shrub layer provides sparse to low cover (up to 5 percent cover) on the levee banks and includes four-wing saltbush, seepweed, and honey mesquite. Low cover of Bermuda grass is occasionally present. The large, spherical Russian-thistle forbs break off at the base when mature and become tumbleweeds that blow into large mats or rafts against fencing and buildings. As such, they represent a fire hazard during the fall and winter months.



**Photograph 5-15. Photographs of Representative Habitat:
Bermuda Grass—Russian-thistle**

Alfalfa—Russian-thistle Semi-Natural Herbaceous Vegetation. One agricultural field near Presidio formerly planted with alfalfa and then allowed to lay fallow now supports moderate cover of alfalfa and Russian-thistle forbs (10 percent cover for each species) adjacent to the levee (see **Photograph 5-17**). Sparse cover by rough pigweed also occurs at this site. The adjacent levee bank, toe-of-fill, and fence row are dominated by moderate to dense Russian-thistle (up to 40 percent cover).



Photograph 5-16. Photographs of Representative Habitat: Russian-thistle



**Photograph 5-17. Photograph of Representative Habitat:
Alfalfa—Russian-thistle**

5.2 Plant Species Identified

Table 5-1 lists all plant species identified during the field surveys, including their wetland status and the fence section in which they were identified.

**Table 5-1. Plant Species Observed in Marfa Sector
Sections L-1, L-1A, and L-1B**

Section			Scientific Name/ Common Name	Wetland Indicator Status
L-1	L-1A	L-1B		
	X	X	<i>Allionia incarnata</i> /Hierba de la Hormiga, Umbrellawort	—
X	X		<i>Amaranthus retroflexus</i> /Rough Pigweed	FACU-
X		X	<i>Aster</i> sp./Aster	—
X	X	X	<i>Atriplex canescens</i> /Four-wing Saltbush	UPL
X	X	X	<i>Baccharis glutinosa</i> /Mule's Fat, Seepwillow	FACW
X		X	<i>Bothriochloa laguroides</i> /Silver Bluestem	—
X			<i>Bouteloua adscencionis</i> /Six-weeks Grama	—
X			<i>Bouteloua hirsuta</i> /Hairy Grama	—
X			<i>Cercidium texanum</i> /Paloverde	—
X		X	<i>Chloris cucullata</i> /Hooded Windmillgrass	—
X	X	X	<i>Clematis drummondii</i> /Barbas de Chivato, Old Man's Beard	—
X	X		<i>Condalia</i> sp./Condalia	—
X	X	X	<i>Cynodon dactylon</i> /Pato de Gallo, Bermuda Grass	FACU+
X			<i>Cyperus</i> sp./Flat Sedge	—
X			<i>Dyssodia</i> sp./Dogweed	—
X			<i>Echinocereus triglochidiatus</i> /Hedgehog Cactus	—
	X		<i>Ephedra</i> sp./Joint-fir	—
X			<i>Ericameria triantha</i> /Rabbitbrush	—
X			<i>Fouquieria splendens</i> /Ocotillo	—
X			<i>Gaura parviflora</i> /Butterfly-weed	NI
X			<i>Gutierrezia (Xanthocephalum) microcephala</i> /Snakeweed	—
X	X	X	<i>Helianthus annuus</i> /Annual Sunflower	FAC
		X	<i>Heliotropium curassivicum</i> /Heliotrope	FACW
X		X	<i>Heterotheca villosa</i> /Hairy Golden-aster	—
X		X	<i>Larrea tridentata</i> /Creosote bush	—
X		X	<i>Leucelene ericoides</i> /White Aster	—
X	X		<i>Lygodesmia</i> sp./Skeletonweed	—
X	X		<i>Medicago sativa</i> /Alfalfa	—
X			<i>Mentzelia</i> sp./Stick-leaf	—

Section			Scientific Name/ Common Name	Wetland Indicator Status
L-1	L-1A	L-1B		
X		X	<i>Nicotiana glauca</i> /Tree Tobacco	FAC
		X	<i>Nicotiana longiflora</i> /Annual Tobacco	—
		X	<i>Opuntia imbricata</i> /Cane Cholla	—
		X	<i>Opuntia leptocaulis</i> /Tasajillo, Christmas Cactus	—
X		X	<i>Opuntia phaeacantha</i> /Prickly-pear	—
X			<i>Opuntia violaceae</i> /Prickly-pear	—
X			<i>Panicum virgatum</i> /Switchgrass	—
X	X	X	<i>Parkinsonia aculeata</i> /Retama	FACW-
X			<i>Parkinsonia texana</i> /Paloverde, Texas Paloverde	—
X			<i>Paspalum dissectum</i> /Mudbank Crowngrass	OBL
	X	X	<i>Pennisetum ciliare (Cenchrus ciliaris)</i> /Buffelgrass	—
X	X	X	<i>Phoradendron tomentosum</i> /Mistletoe	—
X	X	X	<i>Phragmites australis</i> /Common Reed	FACW
	X		<i>Phyla nodiflora</i> /Frog Fruit	FACW
		X	<i>Pluchea (Tessaria) sericea</i> /Arrow-weed	NI
X			<i>Polygonum pensylvanicum</i> /Smartweed	FACW-
		X	<i>Populus deltoides</i> /Eastern Cottonwood	FAC
X			<i>Portulaca oleracea</i> /Common Purslane	—
X	X	X	<i>Prosopis glandulosa</i> /Mesquite, Honey Mesquite	—
X	X	X	<i>Salsola australis</i> /Russian-thistle	FACU
X			<i>Setaria geniculata</i> /Bristlegrass	—
X			<i>Solanum elaeagnifolium</i> /Trompillo, Silverleaf Nightshade	—
X	X		<i>Sorghum halepense</i> /Johnsongrass	FACU
X	X		<i>Sphaeralcea angustifolia</i> /Narrow-leaved Globe-mallow	—
X			<i>Sporobolus airoides</i> /Alkali Sacaton	FAC
X			<i>Sporobolus cryptandrus</i> /Whorled Dropseed	FACU-
X			<i>Sporobolus flexuosus</i> /Mesa Dropseed	FAC-
X		X	<i>Suaeda depressa</i> /Seepweed	FACW
X			<i>Suaeda suffrutescens</i> /Desert Seepweed	FACW
	X		<i>Tamarix aphylla</i> /Athel Tamarisk	FACW
X	X	X	<i>Tamarix chinensis</i> /Salt-Cedar	FACW

Section			Scientific Name/ Common Name	Wetland Indicator Status
L-1	L-1A	L-1B		
X			<i>Tridens pulchellus</i> /Fluffgrass	—
X	X		<i>Typha domingensis</i> /Tule, Narrow-leaf Cattail	OBL
	X	X	<i>Verbesina encelioides</i> /Cowpen Daisy	FAC
X			<i>Xanthium strumarium</i> /Cocklebur	FAC-
53	24	29	Total number of species in each section	
21	14	14	Total number of FACW- to OBL species per section	

Notes:

Wetland Indicator Status (NRCS 2007): Facultative Upland (FACU)—usually occurs in non-wetlands, but occasionally found in wetlands; Facultative (FAC)—equally likely to occur in wetlands or non-wetlands; Facultative Wetland (FACW)—usually occurs in wetlands but occasionally found in non-wetlands; Obligate Wetland (OBL)—occurs almost always under natural conditions in wetlands; Obligate Upland (UPL)—occurs almost always under natural conditions, in non-wetlands; No Indicator (NI)—insufficient information was available to determine an indicator status.

(*) = tentative assignments based on limited information, (-) = less frequently found in wetlands.

5.3 Wetlands and Waters of the United States

“Wetlands” and “waters of the United States” can be confusing terms and are defined here for the convenience of document users. The USACE has jurisdiction to protect wetlands under Section 404 of the Clean Water Act using the following definition:

... areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3[b]). Wetlands generally include swamps, marshes, bogs, and similar areas.

Wetlands have three diagnostic characteristics: (1) over 50% of the dominant species present must be classified as obligate, facultative wetland, or facultative, (2) the soils must be classified as hydric, and (3) the area is either permanently or seasonally inundated (USCAE 1987).

Waters of the United States are defined under Title 33 (Navigation and Navigable Waters) USC 1344 (Permits for Dredge or Fill Material) as follows:

- a. The term “waters of the United States” means
 1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce,

- including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters including interstate wetlands;
 3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
 - i. Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
 - ii. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
 - iii. Which are used or could be used for industrial purpose by industries in interstate commerce;
 4. All impoundments of waters otherwise defined as waters of the United States under the definition;
 5. Tributaries of waters identified in paragraphs (a)(1)-(4) of this section;
 6. The territorial seas;
 7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a)(1)-(6) of this section.
 8. Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 123.11(m) which also meet the criteria of this definition) are not waters of the United States.
 9. Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with the EPA.
- b. The term "wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.
 - c. The term "adjacent" means bordering, contiguous, or neighboring. Wetlands separated from other waters of the United States by man-made dikes or barriers, natural river berms, beach dunes and the like are "adjacent wetlands."
 - d. The term "high tide line" means the line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high

tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.

- e. The term "ordinary high water mark" means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.
- f. The term "tidal waters" means those waters that rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by hydrologic, wind, or other effects.

5.3.1 Field Evaluation Summary

The fence sections follow the IBWC levee system of the Rio Grande for the majority of their lengths. No permanent surface water features occur within the project corridors. Surface water features occurring adjacent to the project corridors include the Rio Grande River and open water components of resacas (bancos) that occur to the north of fence sections L-1 and L-1A. The fence alignments cross several ephemeral washes within the project corridors, and numerous washes cross under the access road to the north of fence Section L-1.

Jurisdictional Wetlands and Other Waters of the United States within the Project Areas. Field surveys were conducted in Sections L-1, L-1A, and L-1B on January 28 and January 29, 2008, to delineate jurisdictional wetlands and other waters of the United States (WOUS) within the project areas. Delineations were also conducted along access roads and staging areas associated with the fence alignments. Formal delineations were conducted within a 150-foot corridor associated with the fence alignments, 60 feet to either side of access roads, and within staging areas.

Determination of the occurrence and extent of jurisdictional wetlands and other WOUS was based on the application of procedures established in the USACE *Wetlands Delineation Manual*, Technical Report Y-87-1 (USACE 1987) and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region*, Technical Report ERDC/EL TR-06-16 (USACE 2006). Determination of the occurrence of

jurisdictional wetlands was based on the presence or absence of hydrophytic (wetland) vegetation, hydric (wetland) soils, and wetland hydrology. The presence of all three of the criteria is necessary for an area to be designated as a jurisdictional wetland under normal conditions.

Determination of the extent of jurisdictional washes (arroyos) and other WOUS in the project areas was based on characterization of the landward extent of the ordinary high water mark (OHM). Indicators used to determine the occurrence and extent of jurisdictional washes included the presence of developed channels, typically 2 feet or greater in width; the occurrence of an OHM; the absence of fine sediments along flow paths; distinct changes in the vegetative assemblage, or larger or more dense vegetation than surrounding areas; the presence of cut banks; the presence of litter, debris, or rack lines; occurrence of desiccation cracks or other indicators of hydrology; and other indicators of the occurrence of intermittent water flow regimes.

All wetlands and other WOUS within the projects areas were delineated.

Table 5-2 provides the section locations, wetland or other WOUS types, and the acreage of each identified wetland or other WOUS within a 60-foot-wide assessment corridor. The 60-foot corridor is considered the maximum width of potential impact associated with implementing the preferred alternative.

Based on the field surveys, 14 wetlands or other WOUS (WL 1 through WL 14) occur within the assessment areas. WL1 through WL9 occur in Section L-1; WL11 and WL 12 occur in Section L-1B; and WL 13 and WL14 occur in Section L-1A. The following text provides brief descriptions of the delineated wetlands.

WL1/L-1 is palustrine forested wetland associated with a resaca (banco). Vegetation in the wetland is characterized by a near monotypic cover of *Tamarisk ramosissima*.

WL2/L-1 is the eastern component of WL1. It is separated from WL1 by a road. Vegetation in WL2 is characterized by *Tamarisk ramosissima*.

WL3/L-1 is a palustrine emergent and scrub shrub habitat characterized by *Distichlis spicata* and cut *Tamarisk ramosissima*. An approximately three foot high berm separates the emergent and scrub shrub component of WL3 from adjacent open water habitat to the north.

Table 5-2. Wetlands and Other Waters of the U.S. and Acreages within the 60 Foot Impact Corridor in Sections L-1, L-1A, and L-1B

Wetland or Other WOUS Identification	Section	Wetland or Other WOUS Type	Acreage Within 60 Foot Potential Impact Corridor
WL 1	L-1	Palustrine forested wetland associated with a resaca	0.17 acre

WL 2	L-1	Palustrine forested wetland associated with a resaca	0.25 acre
WL 3	L-1	Palustrine emergent/scrub shrub wetland	0.0 acre
WL 4	L-1	Palustrine scrub shrub/emergent wetland with open water components	0.47 acre
WL 5	L-1	Palustrine emergent wetland bordering a palustrine forested/scrub shrub	0.0 acre
WL 6	L-1	Wash	0.02 acre
WL 7	L-1	Wash	0.02 acre
WL 8	L-1	Wash	0.04 acre
WL 9	L-1	Palustrine forested wetland associated with a playa	0.08 acre
WL 10	L-1B	Wash tributary to Cibelo Wash	0.08 acre
WL 11	L-1B	Cibelo Wash – north channel	0.47 acre
WL 12	L-1B	Cibelo Wash – south channel	0.08 acre
WL 13	L-1A	Palustrine emergent wetland associated with a resaca	0.0 acre
WL 14	L-1A	Palustrine emergent wetland associated with a resaca	0.0 acre

WL4/L-1 is a palustrine scrub shrub and emergent habitat bordering open water habitat. Vegetation in the wetland is characterized by *Distichlis spicata* and *Tamarisk ramosissima*. WL4 is connected to the open water component adjacent to WL3.

WL5/L-1 is a palustrine emergent wetland bordering palustrine forested and emergent habitat. Vegetation in the wetland is characterized by *Distichlis spicata* and *Tamarisk ramosissima*.

WL6/L-1 is an ephemeral drainage channel that drains directly to the Rio Grande. The channel narrows down and then ends approximately 250 feet upstream of the access road. The channel is approximately 8 to 10 feet wide at the road crossing.

WL7/L-1 is an ephemeral wash that drains directly to the Rio Grande. The channel narrows down and then ends approximately 75 feet upstream of the access road. The channel is approximately 2 to 8 feet wide upstream of the access road, and 4 to 5 feet wide downstream of the road.

WL8/L-1 is a wide shallow ephemeral wash that drains directly into the Rio Grande. The wash channel ranges from approximately 10 to 20 feet in width in

proximity to the road crossing. It narrows down to 8 feet approximately 150 feet downstream of the road crossing.

WL9/L-1 is characterized by a palustrine forested habitat bordering open water. Vegetation in the wetland is characterized by a near monotypic cover of *Tamarisk ramosissima*. Much of the open water component of WL9 had dried down at the time of the delineation.

WL10/L-1B is an ephemeral tributary channel to the Cibolo Wash.

WL11/L-1B is a wide ephemeral wash channel on the west side of Cibolo Wash.

WL12/L-1B is a wide ephemeral wash channel on the east side of Cibolo Wash.

WL13/L-1A is a palustrine emergent wetland associated with a resaca (banco). The wetland is characterized by a near monotypic stand of *Phragmites australis*.

WL14/L-1A is a palustrine emergent wetland associated with a resaca (banco). The wetland is characterized by a near monotypic stand of *Phragmites australis* bordered on the upland edge by a dense coverage of *Salsola tragus*.

5.3.2 Wetlands Vegetation Summary

Wetlands delineated within the Marfa Sector included palustrine forested, palustrine scrub shrub, and palustrine emergent wetlands. The characteristic species for each wetland type were:

- *Tamarisk ramosissima* in palustrine forested wetlands
- *Tamarisk ramosissima* in palustrine scrub shrub wetlands
- *Phragmites australis* in palustrine emergent wetlands.

5.3.3 Wetland Soils Summary

NRCS has not mapped soils on the Marfa Sector U.S./Mexico international border. Soils characterized in wetland habitats within the Marfa Sector exhibited hydric characteristics.

5.4 Noxious Weeds and Invasive Nonnative Species

The State of Texas maintains a noxious weed definition, species list, and control districts under a legislative determination (Texas Agriculture Code 2008). The legislature has determined that: (1) noxious weeds are present in this state to a degree that poses a threat to agriculture and is deleterious to the proper use of soil and other natural resources and (2) reclamation of land from noxious weeds is a public right and duty in the interest of conservation and development of the natural resources of the state (Chapter 388, Acts 1981, 67th Legislature). Under Chapter 388 of this Act: “a weed or plant is considered to be a noxious weed if declared to be a noxious weed by: (1) a law of this state or (2) the department

acting under the authority of Chapter 61 of this code or any other law of this state". This Act is administered by the Texas Department of Agriculture under Title 4, Part 1, Chapter 19, Subchapter T: Noxious and Invasive Plants.

The Act and other legislation provide a list of noxious weed species present and managed within Texas (**Table 5-3**). The website, TexasInvasives.org, provides a list of 137 plant species considered to be nonnative invasives and/or noxious weeds within Texas, seven of which occur within the project corridor and are listed in **Table 5-3**.

Table 5-3. Nonnative or Noxious Weeds Occurring Within the Project Corridor

Common Name	Scientific Name	Fence Sections Observed
² Bermuda Grass	<i>Cynodon dactylon</i>	L-1, L-1A, L-1B
² Tree Tobacco	<i>Nicotiana glauca</i>	L-1, L-1B
² Buffelgrass	<i>Pennisetum ciliare</i>	L-1A, L-1B
² Russian-thistle	<i>Salsola tragus</i>	L-1, L-1A, L-1B
² Johnsongrass	<i>Sorghum halepense</i>	L-1, L-1A
^{1,2} Athel Tamarisk	<i>Tamarix aphylla</i>	L-1B
^{1,2} Fivestamen Tamarisk	<i>Tamarix chinensis</i>	L-1, L-1A, L-1B

Source: http://www.texasinvasives.org/Invasives_Database/

Notes: 1= Noxious, 2=Nonnative Invasive.

In general, nonnative noxious and invasive plant species represent a serious management concern, and their inventory, monitoring, and control is expensive for land managers. Within the project corridor, seven species of nonnative plants have been identified, and two of these species (Athel tamarisk and fivestamen tamarisk) are considered noxious in Texas. Nonnative species usually lower the value of wildlife habitat and compete with agricultural crops, resulting in lower forage value and production. Once inventoried, methods commonly used to control nonnative species include biological, mechanical, and chemical. Controls must be ongoing to be effective in reducing, but only rarely eliminating, nonnative plant species.

5.5 Wildlife and Wildlife Habitat

5.5.1 Wildlife and Habitat Overview

The project corridor supports a diverse population and individuals of vertebrate and invertebrate wildlife species (see **Table 5-4** and **Attachment D**), and unique-to-common native and nonnative wildlife habitats, described as vegetation alliances, plant associations, and land use types in this BSR. **Table 5-4** lists wildlife observed during the field surveys. The table can provide a general

indication of species richness in each section. **Tables 5-5** and **5-6** lists the habitat observed during the surveys, and the estimated acreage in each segment. **Table 5-5** provides the acreage for habitats in a 60-foot corridor, and **Table 5-6** lists the acreage of habitats in a 150-foot corridor.

Table 5-4. Wildlife Observed During Natural Resources Surveys Conducted November 5 and 6, 2007

Common Name	Scientific Name	Species Status	Section		
			L-1	L-1A	L-1B
Insects					
Monarch Butterfly	Danaus plexippus	C		X	
Birds					
American Coot	Fulica americana	C	X	X	
American Kestrel	Falco sparverius	C		X	X
Barn Swallow	Riparia riparia	C		X	X
Bell's Vireo	Vireo bellii	C		X	
Cardinal	Cardinalis cardinalis	C	X		
Cattle Egret	Bubulcus egret	C	X		
Chipping Sparrow	Spizella passerina	C		X	X
Birds (continued)					
Curved Billed Thrasher	Toxostoma curvirostre	C	X		
Flycatcher	Empidonax sp.	C	X	X	
Gadwall	Anas strepera	C			X
Gambel's Quail	Callipepla gambelli	C	X		
Gray Flycatcher	Empidonax wrightii	C			X
Great Blue Heron	Ardea herodias	C		X	
Great Egret	Ardea alba	C	X		
Great-tailed Grackle	Quiscalus mexicanus	C		X	
Greater Roadrunner	Geococcyx californianus	C	X	X	
House Sparrow	Passer domesticus	C		X	
Loggerhead Shrike	Lanius ludovicianus	C	X	X	X
Mockingbird	Mimus polyglottos	C			X

Common Name	Scientific Name	Species Status	Section		
			L-1	L-1A	L-1B
Mourning Dove	Zenaida macroura	C		X	X
Northern Harrier	Circus cyaneus	C	X	X	X
Red-tailed Hawk	Buteo jamaicensis	C		X	
Red-winged Blackbird	Agelaius phoeniceus	C	X	X	X
Ring-necked Duck	Aythya collaris	C		X	
Rock Pigeon	Columba livia	C			X
Rufous-sided Towhee	Pipilo erythrophthalmus	C	X		
Say's Phoebe	Sayornis saya	C		X	
Teal	Anas sp.	C	X	X	
Western Kingbird	Tyrannus verticalis	C	X	X	X
Western Meadowlark	Sturnella neglecta	C	X	X	
Western Wood Pewee	Contopus sordidulus	C		X	
White-winged Dove	Zenaida asiatica	C			X
Mammals					
Collared Peccary (Javelina)	Pecari tajacu	C	X		
Coyote	Canis latrans	C	X		X
Deer	Odocoileus sp.	C			X
Mexican Ground Squirrel	Spermophilus mexicanus	C	X		
Reptiles					
Round-tailed Horned Lizard	Phrynosoma modestum	C	X		

Note: C = Common

5.6 Wildlife Observed

Table 5-4 lists wildlife observed during the field surveys. The table provides a general indication of species richness in each section.

5.7 Species Groups and Habitat Affinity

5.7.1 Mammals

Almost one-third of the 92 species of mammals that occur in the Trans-Pecos region are primarily restricted in distribution to that region. Most of these mammals are species characteristic of the arid Mexican Plateau and southwestern United States or the montane woodlands of the western United States. Some of the mammals occurring principally in this region are the hooded skunk, wapiti, kit fox, western mastiff bat, pocketed free-tailed bat, gray-footed chipmunk, Merriam's kangaroo rat, and the Texas antelope squirrel. Black bear and mountain lions can also still be found in the Trans-Pecos region (NSRL 1997).

The diversity of the Trans-Pecos region is vast. For example, the Sierra Diablo Wildlife Mangement Area (WMA), located in the mountain range extending north and south along Hudspeth and Culberson county lines, supports the largest free-ranging desert bighorn sheep population in Texas. The WMA also has an established and stable desert mule deer population. This area consists of rugged hills and steep canyons, with an average elevation of 6,200 feet (TPWD 2007).

Table 5-5. Wildlife Habitat Types Observed in the 60-foot Mapping Corridor

Wildlife Habitat Type Observed	Acreage by Section Numbers			Total Acreage of Wildlife Habitats
	L-1	L-1A	L-1B	
Herbaceous Vegetation				
Bermuda Grass—Bristlegrass Herbaceous Vegetation	0.0134			0.013
Bermuda Grass Herbaceous Vegetation	11.6690			11.669
Common Reed—Cattail Herbaceous Vegetation				0.000
Crowngrass—Bermuda Grass Herbaceous Vegetation	0.2460			0.246
Russian-thistle Herbaceous Vegetation		19.3135	16.5744	35.888
Shrubland				
Creosote bush—Honey Mesquite Shrubland	0.7894			0.789
Rabbitbush—Seepweed—Arrowweed Shrubland	5.0176			5.018
Honey Mesquite Woodland/Shrubland		0.0792	0.1434	0.223
Woodland and Forest				
Athel Tamarisk Woodland				0.000
Salt Cedar/Bermuda Grass Woodland/Shrubland	12.4301		0.8148	13.245
Open Water				
Playa	0.2003			0.200
Land Use				
Agricultural Field				0.000
Other Land Use		0.0954		0.095
Rail-line		0.0230		0.023
Roads and Trails	2.8445	4.4557	3.5786	10.879
	33.2103	23.9668	21.1112	78.288

Table 5.6 Wildlife Habitat Types Observed in the 150-foot Mapping Corridor

Wildlife Habitat Type Observed	Acreage by Section Numbers			Total Acreage of Wildlife Habitats
	L-1	L-1A	L-1B	
Herbaceous Vegetation				
Bermuda Grass—Bristlegrass Herbaceous Vegetation	3.3634			3.363
Bermuda Grass Herbaceous Vegetation	15.6171			15.617
Common Reed—Cattail Herbaceous Vegetation		0.4130		0.413
Crowngrass—Bermuda Grass Herbaceous Vegetation	1.1638			1.164
Russian-thistle Herbaceous Vegetation		40.7682	38.2358	57.343
Shrubland				
Creosote bush—Honey Mesquite Shrubland	3.2450			3.245
Rabbitbush—Seepweed—Arrowweed Shrubland	11.9768			11.977
Honey Mesquite Woodland/Shrubland		5.2625	1.9476	5.406
Woodland and Forest				
Athel Tamarisk Woodland		0.1494		0.149
Salt Cedar/Bermuda Grass Woodland/Shrubland	43.7543	0.0306	0.8699	44.600
Open Water				
Playa	0.4083			0.408
Land Use				
Agricultural Field		7.0053	8.4786	7.005
Other Land Use		0.4664		0.466
Rail-line		0.0597		0.060
Roads and Trails	3.8041	5.9188	4.0259	13.302
	83.3328	60.0739	53.5578	196.965

The range of the Mexican long-nosed bat overlaps some of the medium to high elevations in Presidio County, which includes fence sections L-1A and L-1B. Habitats in the county include desert scrub, open conifer-oak woodlands, and pine forests in the Upper Sonoran and Transition Life Zones, generally arid areas where agave plants are present (USFWS 1994). Colonies roost in caves (or similar mines and tunnels), sometimes in culverts, hollow trees, or unused buildings.

5.7.2 Birds

More than 800 species of birds spend all or part of their lives in the United States as they migrate from summer breeding grounds in the north to winter in warmer climates of the south, including Latin America (USFWS 2002). Because migratory birds depend on habitats across many political boundaries, a coordinated conservation effort has been established internationally, with the USFWS being the principal federal authority in the United States.

Federal agencies in general are responsible to protect migratory birds under Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. This executive order states that migratory birds are of great ecological and economical value to the United States and to other countries. They contribute to biological diversity and bring tremendous enjoyment to those who study, watch, feed, or hunt them, and the critical importance of this shared resource has been recognized through ratification of international, bilateral conventions for migratory bird conservation. A list of all migratory birds included under this executive order is available under 50 *Code of Federal Regulations* (CFR) 10.13, and is also compiled in **Attachment D** of this Report.

A total of 54 species of birds are primarily confined to the Trans-Pecos region, among them the Crissal Thrasher, the Black-tailed Gnatcatcher, Gambel's Quail, and Lucy's Warbler. The Chisos Mountains of Big Bend National Park are the only place in Texas where the Lucifer Hummingbird, Gray-breasted Jay, Hutton's Vireo, and Painted Redstart can be reliably found (TPWD 2007).

A variety of habitats ranging from, but not limited to, sanddunes, desert-scrub, arid canyons, oak-juniper woodlands, lush riparian woodlands, plateau grasslands, cienegas (desert springs), pinyon-juniper woodlands, pine-oak woodlands and montane evergreen forests contribute to a diverse and complex avifauna in the region. As much as any other factor, elevation influences and dictates habitat and, thus, bird occurrence. Elevations range from the highest point in Texas at 8,749 feet (Guadalupe Peak) to under 2,000 feet (within Big Bend along the Rio Grande River). A total of 106 peaks in the region are over 7,000 feet in elevation; 20 are over 8,000 feet high. These montane islands contain some of the most unique components of Texas' avifauna (TPWD 2002).

In the southeastern portion of the region a number of eastern U.S. birds reach the western limits of their ranges. The Red-shouldered Hawk, Chuck-will's-

widow, Eastern Wood-Pewee, Acadian Flycatcher, White-eyed, Yellow-throated and Red-eyed Vireo, Carolina Wren, Northern Parula, and Yellow-throated and Black-and-white Warblers are representative of this group (TPWD 2002).

Montane habitats also harbor species of limited distribution. Numerous species of birds associated with the Rocky Mountains and/or Mexican highlands bird guilds normally occur only in islands of montane habitats within the region. Examples include the Band-tailed Pigeon, Flammulated and Northern Saw-whet Owl, Whip-poor-will, Blue-throated and Magnificent Hummingbird, Williamson's Sapsucker, Cordilleran Flycatcher, Hutton's Vireo, Mexican and Steller's Jays, Mountain Chickadee, Pygmy Nuthatch, Colima and Grace's Warblers, and Painted Redstart (TPWD 2002).

Other "borderland" specialties help characterize the region's avifauna. Included would be Gray and Zone-tailed Hawk, Common Black-Hawk, Elf Owl, Lesser Nighthawk, Common Poorwill, Lucifer Hummingbird, Vermilion Flycatcher, Verdin, Black-tailed Gnatcatcher, Varied Bunting, and Hooded Oriole (TPWD 2002).

Three federally listed endangered and one federally listed threatened bird species have ranges that overlap portions of the counties surrounding the Marfa fence sections L-1 through L-1B. The willow flycatcher was designated as a federally endangered species on March 29, 1995. It occurs in dense riparian habitats along streams, rivers, and other wetlands. At low elevations, the flycatcher breeds in stands of dense cottonwood, willow, and tamarisk thickets, as well as other lush woodland areas near water. The northern aplomado falcon was designated as endangered on March 27, 1986. Its habitat includes yucca-covered sand ridges in coastal prairies, riparian woodlands in open grasslands, and in desert grasslands with scattered curly-mesquite (*Hilaria belangeri*) and yucca. The interior population of the least tern was listed as endangered on June 27, 1985 (USFWS 1990). The Mexican spotted owl was designated as a federally threatened species on March 16, 1993. In the state of Texas, it is also designated as a threatened species. The Mexican spotted owl occurs in a variety of habitats, consisting of mature montane forests, shady canyons, and steep canyons at higher elevations. The key components in montane forests appear to be characteristics common in old-growth forests: uneven-age stands with high canopy closure and tree density, fallen logs, and snags.

5.7.3 Herpetiles

Over 200 species of reptiles and amphibians occur in Texas and the habitats found in the region. Habitat for approximately 60 species can be found along the Rio Grande River in Presido and Hudpeth counties. Several are listed as threatened in the state of Texas, including the plains black-headed snake, Texas horned lizard, short-horned lizard, and the reticulated gecko (WFSC 2008).

5.7.4 Invertebrates

There are 137 species of butterflies that have been recorded in Hudspeth and Presidio counties. Rare species include: Mary's giant skipper, scarce streaky skipper, and Poling's hairstreak. Suitable habitat for Mary's giant skipper is primarily thorn forests and desert hills. The scarce streaky skipper is found in desert foothills, canyons, and alluvial fans, and preferred habitat for Poling's hairstreak is primarily oak woodlands (Opler et. al 2006 and NatureServe 2008).

6. RARE SPECIES DATA

To ensure that the most recent data were acquired for rare species analyses, e²M requested Element Occurrence Data from NatureServe Central Databases in Arlington, Virginia, through a referral from the USFWS (NatureServe and e²M 2007). The data fields requested and geographic scope of this request were:

1. Location and habitat data for endangered, threatened, and candidate species provided in list form by the USFWS and supplemented with online information from the TPWD and information from the NatureServe database.
2. The USFWS requested that all rare species occurring within 25 miles of the international border with Mexico be considered in this data search. Data were therefore requested for the South Texas counties of Brewster, Cameron, Culberson, Dimmitt, Edwards, El Paso, Hidalgo, Hudspeth, Jeff Davis, Jim Hogg, Kinney, Maverick, Pecos, Presidio, Starr, Terrell, Val Verde, Webb, Willacy, Zapata, and Zavala.
3. Data were requested to be delivered electronically in the form of GIS layers depicting population polygons or point locations, and Excel tables for species lists/tabular data and narratives of habitat and natural history information.

To protect sensitive data, a license agreement between NatureServe and e²M was signed in 2007. Data covered under the LA reside in a Multi-Jurisdictional Dataset (MJD), which includes all precise species location data for species that are federally listed (listed endangered, listed threatened, or candidate) or are listed under the State of Texas endangered species legislation. Additionally, the license agreement describes a 25-mile occurrence corridor north of the international border between the United States and Mexico as the licensed dataset for this project. Data and text fields delivered by NatureServe under the license agreement included life history, threats, trends and management recommendations, classification status, confidence extent, county name, element information, U.S. Federal Information Processing Standard code, first observation date, global information, habitat types for animals, observation dates, location information, subnational information, survey information, and species status information.

The license agreement provides the following guidelines regarding external use of the data:

1. "Named" Locations: species names linked with locations cannot be displayed at a scale of less than 1:100,000, or the precise species location must be randomized within a USGS topographic quadrangle.
2. "Blind" Locations: when species names are not linked with locations, specific locations can be displayed, except when the species records are

flagged “sensitive” or if they can be identified easily by geographic attributes at a particular location.

3. Exceptions: the only allowable exception to the guidelines occurs when data are obtained from a source independent from NatureServe and the member programs.

The Texas Natural Diversity Database (TXNDD) was established in 1983 and is the TPWD’s most comprehensive source of information related to rare, threatened, and endangered animals, plants, exemplary natural communities, and other significant features. While these data are continually updated, there are gaps in coverage and species information due to lack of access to land for inventory, data from many sources, and a lack of staff and resources to collect and process data for all rare and significant resources.

For the project corridor, TXNDD was used to assist with the evaluation of environmental impacts of the sections under consideration. The interpretation and extrapolation of the data included consideration of the following factors: (1) data gaps occurring because of lack of access to private land, (2) the restriction of data extraction from only public information sources, (3) species and geographic coverage focused on the most rare species and ecosystems, and (4) the lack of precise locality data in many secondary sources. Because of the small proportion of public land versus private land in Texas, the TXNDD does not include a representative inventory of rare resources in the state. However, it is based on the best data available to TPWD in terms of rare species locations and distributions, and the use of qualified biologists to provide on-site inventory and evaluation.

7. PROJECT DATABASE AND INTERACTIVE GIS

A Microsoft (MS) Access database was developed to serve as a centralized storage system for data collected during biological field surveys. The database data entry form closely mimics the field form for recording ecological information within the project corridor (**Attachment C**).

During field surveys, UTM coordinates were collected with GPS receivers to locate observation points, photo-documentation points, wetlands, etc. The GPS data were post-processed and incorporated into feature classes for use in a GIS. Additional data collected in the field were manually entered into the MS Access database.

The information stored in the database was also linked to an interactive GIS. The interactive file, or published map document, can be viewed with ESRI's ArcReader. The datasets collected and included in the published map are: biological survey areas, observation points, NWI wetlands, field delineated wetlands, plant communities, wildlife habitats, wildlife areas and refuges, land use, and aerial photography. The observation points are interactively hyperlinked with ground photographs acquired in the field.

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**BIOLOGICAL SURVEY
ATTACHMENT A**

OBSERVATION POINT FORM AND INSTRUCTION MANUAL

OBSERVATION SURVEY FORM

SURVEY AND SITE INFORMATION

Point Code: TX _____ Quad name: _____ BPU Code: _____ Aerial Photo #: _____			
Type of Observation (Please Circle One): VEG/OBS OTHER (Specify) _____			
Site Name _____			
Survey Date _____		Surveyors _____	
Size of Area: _____			
GPS file name _____		Field UTM X _____ m E	
		Field UTM Y _____ m N	
<input type="checkbox"/> Coordinates from USGS Quad Map (if checked enter coordinates under GPS comments)			
Datum NAD 83 Zone: _____		GPS Unit: _____ PDOP: _____	
		3D Differential? Y / N	
GPS Comments: _____		Error: +/- _____ m	
Camera Name and Model: _____			
Roll #	Frame #	Photographer	Direction/Comments

ENVIRONMENTAL DESCRIPTION

Elevation _____ m /ft From: GPS / Map (circle one)		Slope _____ Aspect _____	
Topographic Position: _____			
Landform: _____		Geology: _____	
Cowardin System <input type="checkbox"/> Upland <input type="checkbox"/> Palustrine		Hydrology <input type="checkbox"/> Permanently Flooded <input type="checkbox"/> Unknown <input type="checkbox"/> Seasonally Flooded <input type="checkbox"/> Temporarily Flooded <input type="checkbox"/> Semipermanently Flooded <input type="checkbox"/> Saturated <input type="checkbox"/> Intermittently Flooded	
Environmental Comments: 			
Unvegetated Surface: <i>(please use cover scale below)</i>			
<input type="checkbox"/> Bare soil	<input type="checkbox"/> Small rocks (0.2-10cm)	<input type="checkbox"/> Wood (>1cm)	<input type="checkbox"/> Other (describe) _____
<input type="checkbox"/> Bedrock	<input type="checkbox"/> Large rocks (>10cm)	<input type="checkbox"/> Litter / duff	
<input type="checkbox"/> Sand (0.1-2mm)			

VEGETATION DESCRIPTION

Leaf phenology (of dominant stratum) Trees and Shrubs <input type="checkbox"/> Evergreen <input type="checkbox"/> Cold-deciduous <input type="checkbox"/> Mixed evergreen-cold-deciduous Herbs <input type="checkbox"/> Annual <input type="checkbox"/> Perennial	Leaf Type (of dominant stratum) <input type="checkbox"/> Broad-leaved <input type="checkbox"/> Needle-leaved <input type="checkbox"/> Microphyllous <input type="checkbox"/> Graminoid <input type="checkbox"/> Forb <input type="checkbox"/> Pteridophyte <input type="checkbox"/> Non-vascular <input type="checkbox"/> Mixed (describe)	Physiognomic Class <input type="checkbox"/> Forest <input type="checkbox"/> Woodland <input type="checkbox"/> Shrubland <input type="checkbox"/> Wooded Shrubland <input type="checkbox"/> Dwarf Shrubland <input type="checkbox"/> Shrub Herbaceous <input type="checkbox"/> Herbaceous <input type="checkbox"/> Nonvascular <input type="checkbox"/> Sparsely Vegetated <input type="checkbox"/> Wooded herbaceous	Cover scale for strata and unvegetated surfaces: 01 = 0 – 10% 02 = 10 – 25% 03 = 25 – 60% 04 = 60 – 100%
---	---	--	---

OBSERVATION SURVEY FORM

Provisional Community Name: _____ Plot Code: TX _ _ _

	Stratum Height Class	Stratum Cover Class	Dominant Species (mark Diagnostic species with *)	% Cover
T1 Emergent	_____	_____	_____	_____
			_____	_____
			_____	_____
T2 Canopy	_____	_____	_____	_____
			_____	_____
			_____	_____
T3 Sub-canopy	_____	_____	_____	_____
			_____	_____
			_____	_____
S1 Tall shrub (> 2 m)	_____	_____	_____	_____
			_____	_____
			_____	_____
S2 Short Shrub (< 2 m)	_____	_____	_____	_____
			_____	_____
			_____	_____
S3 Dwarf Shrub (< 0.5 m)	_____	_____	_____	_____
			_____	_____
			_____	_____
H Herbaceous	_____	_____	_____	_____
			_____	_____
			_____	_____
N Non-vascular	_____	_____	_____	_____
			_____	_____
			_____	_____

Height Scale for strata: 01 = < 0.5 m 06 = 10-15m 02 = 0.5-1 m 07 = 15-20m 03 = 1-2 m 08 = 20-35 m 04 = 2-5 m 09 = 35-50 m 05 = 5-10 m 10 = >50 m	Cover scale for strata and unvegetated surfaces: 01 = 0 - 10% 02 = 10 - 25% 03 = 25 - 60% 04 = 60 - 100%
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Vegetation Characterization in Texas OBSERVATION POINT MANUAL - 2007

This document is intended to assist you in collecting observation point data in Texas during the 2007 field season. Detailed, field-by-field instructions for data collection are provided.

VEGETATION DATA COLLECTION INSTRUCTIONS

LOCATING AN OBSERVATION POINT

You will locate sampling points based on homogenous or unique aerial photo signatures and by using site maps, topographic maps, handheld GPS receivers, and/or aerial photos.

- Topography (Topo) maps are useful in identifying the landscape through which you will be navigating, and in determining the elevation of a site.
- Aerial photos aid in navigating through the landscape, and are essential in determining where to sample to inform photo-interpreters (this will be explained in more detail). **Please** record the vegetation, and its condition, that you walk through and sample on the photo or accompanying digital orthophoto. Feel free to write comments regarding unique features as well.

Along the way... look around. Context is everything – you will have a much better sense of how your sample sites represent the landscape if you are always in analysis mode. Keep in mind that the goal of this field work and field work being conducted for vegetation classification is to sample **all** the different vegetation and geologic types that occur at the site.

Special Features... in the process of locating observation points you will encounter unique features or vegetative stands too small to sample, record their coordinates using the GPS receiver and note them on aerial photos and maps. These UTM coordinates may be added to the final production map as “Special Features. Locations of significant weed occurrences (highly invasive species that pose a big threat) and large areas of infestation may also be documented as they may represent a “semi-natural” vegetation type.

OBSERVATION POINT FORM INSTRUCTIONS – 2007

The primary role of Observation Point forms is to inform aerial photo interpretation; a secondary role is to help fill out plant association descriptions and provide distribution information for writing local descriptions of plant associations. They are representative of large and homogenous aerial photo signatures, unusual signatures, confusing signatures, and signatures that are slightly different due to shifts in dominant/understory species composition. The same vegetation type should be sampled where it occurs on different geology, where slope aspect leads to changes in density, and where effects due to fire, landslide, etc. have occurred.

• IDENTIFIERS / LOCATORS SECTION

Observation Point Code

This is a unique identifier you give each sample plot using the format “TX.XXX”. **Please record the observation point code on both sides of the form in the provided field.**

Quad Name

Record the **full name** of the 7.5-minute quadrangle, such as “The Knoll”.

Aerial Photo Number

The photo number is in the upper right hand corner of the photo in the format FLIGHTLINE-FRAME #. Record this number on the form. Locate your observation point on the Mylar overlay of the photo, and mark your location with a dot in a circle and the observation point number. *Again, please draw and comment on the photo overlay regarding the vegetation of the plot and the surroundings.*

County

This field will be completed in the office as part of processing the GPS data.

State

TX

Site Name

This is best determined from a topographic or site map. Select a nearby feature that is an obvious waypoint, such as the name of a canyon, lava flow, etc. This name does not need to be unique. If you sample a number of observation points in a small area, you can use the same site name for all of them.

Survey Date

Date the plot was sampled. Please use this format: Month - Day - Year.

Surveyors

List the last names of the field team members present.

GPS File Name - this is the name you give to the waypoint when you mark the observation point location in your GPS receiver. When logging an observation point, the file name would be "TX" and the number (e.g., TX101 for point #101). Mark the aerial photo with a dot with a circle around it and the observation point number, "TX101.

Datum

ALWAYS check datum settings on your GPS unit at the beginning of each day. It should **always** be NAD83. This information is **CRITICAL** for correctly applying your waypoints to the final vegetation map. If it is anything other than NAD83, **please, please, please** record this on the form. This step will keep your work from being wasted.

UTM Zone

This value is recorded from the GPS unit read-out.

Field UTM X, Field UTM Y

Record the UTM easting and northing you saved as a waypoint in your GPS receiver. Please double-check to make sure that the easting is six digits and the northing is seven digits. If recorded incorrectly, your plot will show up in Venezuela or the middle of Wyoming.

In mountainous or deep canyon country it is often difficult to obtain UTM coordinates from a GPS receiver (your unit has to be able to receive at least three or four satellites). If you are unable to obtain UTM coordinates in the observation point, or if the PDOP is greater than 8 (or EPE is greater than $\pm 50\text{m}$), first try to acquire a signal from a higher point outside (but still close to) the site. If that fails, you will need to estimate the UTM coordinates from the topo map, and manually enter these UTM's into the GPS unit.

Use a map which is in NAD83 if at all possible, since the project standard is the NAD83 datum. However, you may need to use USGS 7.5 minute maps, which use the NAD27 datum, note this.

GPS Unit:

Record the name and model of the GPS receiver being used to record data for the observation point. If a GPS unit was not used to determine UTM's record 'none' here and be sure to complete the 'GPS Comments' field below.

GPS Error

Note the PDOP (or "Estimated Position Error" (EPE), if you're using a Garmin unit) displayed on your GPS unit. The lower the number, the more accurate your reading.

3D Differential?

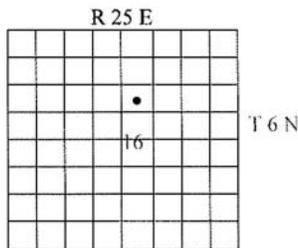
Circle Y or N accordingly. 3D differential is obtained when your GPS unit can "see" a satellite that does nothing but correct the tiny errors in the positioning or clocks of other GPS satellites. This satellite broadcasts a real-time differential correction so that your location coordinates are as accurate as possible. It is in geosynchronous orbit in the southern sky, so if you can see the southern sky, you will generally be able to obtain 3D differential. This system is known as the Wide-Area Augmentation System, or WAAS. The Garmin and Trimble units have a field in their setup pages for turning WAAS on or off. Please make sure that WAAS is always on.

GPS Comments:

VERY IMPORTANT: If you resorted to estimating the observation point location UTMs on the topo map, note that in this field. If you're usual GPS croaked and you had to borrow an old Magellan from a friend, note that. Also, if you left the site to obtain a reading from a high point, record that here, along with the compass bearing and distance of the GPS location from the observation point site (unless you used the offset function on the Trimble GeoXM- in that case, enter "point offset.")

Directions to Observation Point

Give precise directions to the observation point beginning with a landmark (e.g., a named point on the topo map, a major highway, marked trailhead) readily locatable on a 7.5 minute topo map as the starting point. Use clear sentences that will be understandable to someone who is unfamiliar with the area and has only your directions to follow. Give distances and use compass directions. Be aware of the ambiguity of words like "above", "near", "beyond", "on the back side of", "past". Again, using the GPS unit to give distances can be very helpful. If observation point locations lack major landmark features as guides, use township, range and sections from the topo maps. If there are no features within a reasonable distance of your site and writing directions is taking an inordinately long time, you can use a TRS description to the nearest quarter-quarter-quarter section. The TRS for the plot in the section below is "NW4SW4NE4 Sec. 16, T 6 N, R 25 E".



Photos Taken?

Circle Y or N accordingly for observation point photos.

Camera Name and Model

Circle or enter the name and model of your camera

Photos: Type/Roll Number/Frame Number/Photographer/Direction and Comments

For each photo taken at the observation point record the following: *Photo type*: indicate whether photo is a 'stand' or 'landscape' photo. *Photo number*: record photo number. *Photographer*: record last name of person taking photograph.

Directions/Comments: record the direction the photos were taken from and towards (eg. SE→NW) and any other comments to clarify contents of the photo (especially landscape/scenery photos).

Taking photographs

Take one representative digital photo of each observation point. The purpose is to obtain a good representation of the vegetation, not individual species. Try to include a little sky (about 10%) for perspective. Use a chalkboard to record the observation point number and the direction the photo is taken. Thus, for observation point 241, the board in the photo taken from the SE edge, facing NW, will read "SDC241, SE→NW". Take the photograph looking across the contour if site occupies a steep slope. In addition, you will need to keep a photograph log for all photos not taken on observation points.

SDC241 SE→NW

• ENVIRONMENTAL DESCRIPTION SECTION

Elevation

Take this measurement from the GPS receiver, in meters. Specify on the data sheet whether the measurement is in feet or meters, and whether your elevation source was the GPS unit or the topo map.

Slope

Measure the slope in degrees using a clinometer. The degree scale is the left-hand scale as you look through the clinometer. If the slope varies, estimate an average. If the observation point is on rolling microtopography, enter "variable." Describe these further under the Environmental Comments section.

Aspect

Measure the site aspect in degrees using a compass (set for local magnetic declination). If the slope is flat, enter "n/a" for aspect. If the site wraps around different aspects on a slope, enter "variable" and describe further under the Environmental Comments section.

Topographic Position

This is the position of the observation point on its related landform. Determining this requires you to think of the landform in cross-section, which is roughly diagramed below. You **must** use the terms listed below:

Interfluve (crest, summit, ridge). Linear top of ridge, hill, or mountain; the elevated area between two drainages that sheds water to the drainages.

High slope (shoulder slope, upper slope, convex creep slope). The uppermost inclined surface at the top of a slope. Includes the transition zone from backslope to summit. Surface is dominantly convex in profile and erosional in origin.

High level (mesa, summit). Level top of a plateau.

Midslope (transportational midslope). Intermediate slope position.

Backslope (dipslope). Subset of midslopes that are steep, linear, and may include cliff segments.

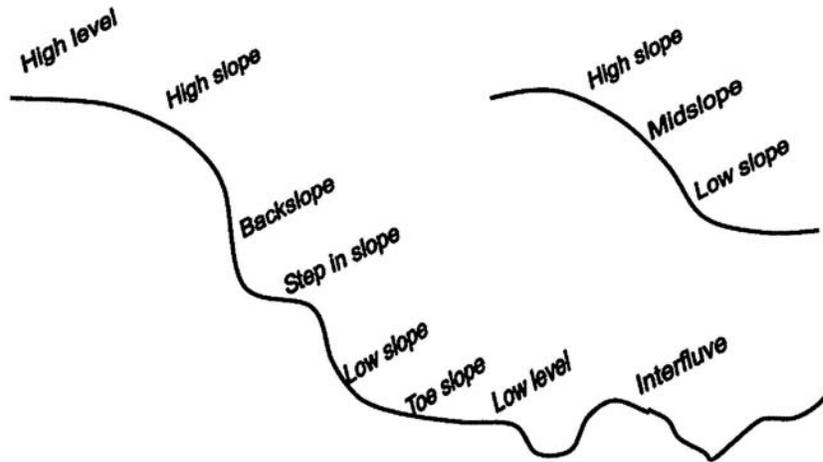
Step in slope (ledge, terracette). Nearly level shelf interrupting a steep slope, rock wall, or cliff face.

Lowslope (lower slope, foot slope, colluvial footslope). Inner gently inclined surface at the base of a slope. Surface profile is generally concave and a transition between midslope or backslope, and toeslope.

Toeslope (alluvial toeslope). Outermost gently inclined surface at base of a slope. In profile, usually gentle, linear and characterized by alluvial deposition.

Low level (terrace). Valley floor or shoreline representing the former position of an alluvial plain, or lake.

TOPOGRAPHIC POSITION

**Landform**

Enter the landform(s) that describes the site where the plot was sampled. Referring to the topo map for the landscape context may help you decide what landform(s) to choose. Note that the landform choices may describe different scales, or that a landform feature can be described by more than one term. For example, your plot may be on a ledge on the rim of a canyon. A suggested list of landforms and definitions is provided in **APPENDIX 1**.

Note: The topographic position selected above should relate to the scale of the landform chosen here.

Surficial Geology

Note the geologic substrate where the plant community occurs. The geology map should help, but if you can't tell the geology at all or you do not have the geology map with you at the plot, put a general description (e.g., coarse sandstone, green shale, aeolian sands, or obscured by soils).

Cowardin System

The majority of the plots you'll be conducting will be "Uplands". Any wetland plots will be in the Palustrine category. This includes riparian stands. They are all fed by groundwater and support vascular plant communities.

Palustrine: All nontidal wetlands dominated by trees, shrubs, persistent emergent species, emergent mosses, or lichens. This category also includes wetlands lacking such vegetation but with all of the following characteristics: (1) area less than 8 ha; (2) lacking an active wave-formed or bedrock boundary; (3) water depth in the deepest part of the basin less than 2 m (6.6 ft) at low water; and (4) ocean-derived salinities less than 0.5 parts per thousand.

Hydrology

This field will mostly be completed if you are in a wetland, however, some areas considered uplands may be subject to intermittent flooding. Select from the following definitions (from Cowardin et al. 1979):

Permanently flooded. Water covers the land surface at all times of the year in all years.

Semipermanently flooded. Surface water persists throughout growing season in most years except during periods of drought. Land surface is normally saturated when water level drops below soil surface.

Seasonally flooded. Surface water is present for extended periods during the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is very variable, extending from saturated to a water table well below the ground surface.

Saturated. Surface water is seldom present, but substrate is saturated to surface for extended periods during the growing season.

Temporarily flooded. Surface water present for brief periods during growing season, but water table usually lies well below soil surface. Often characterizes flood-plain wetlands.

Intermittently flooded. Substrate is usually exposed, but surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not predictable to a given season and is dependent upon highly localized rain storms. This modifier was developed for use in the arid West for water regimes of playa lakes, intermittent streams, and dry washes but can be used in other parts of the U.S. where appropriate. This modifier can be applied to both wetland and non-wetland situations.

Unknown. The water regime of the area is not known. The unit is labeled a non-tidal wetland.

Environmental Comments

Enter any additional noteworthy comments on the environmental setting and its effect on the vegetation. Examples include: "stunted trees due to shallow soils", "vegetation only where pockets of soil occur", or "large colluvial boulders and small rocks litter surface of soil". This field can also be used to describe site history such as fire events. This is an extremely important field for crews to document so please take the time to do a thorough job. Information from this field will be used to prepare local descriptions of the plant community and for photo interpretation.

Ground Cover

Estimate the approximate percentage of the *total* surface area covered by each category. The sum of all fields should equal 100%. A helpful hint in making ocular estimates is that in a 0.5-hectare (1.24-acre) observation point, one 7 x 7m square is equal to 1%. The sum of the cover values should equal 100%. *Notes:* Estimating lichens, dark cyanobacteria and moss also take an extra step in visualization. Also note that it is possible to have bare soil and sand in a plot if sand has blown in, or to have sand on the surface of the site. If a category is present but covers less than 1% (> 0.5%) of the ground, enter a "T" on the line next to it. If a category is present but covers a tiny bit (<0.5%) of ground, enter "t".

Animal Use Evidence

Comment on any evidence of use of the site by non-domestic animals (i.e., tracks, scat, burrows, etc.) and domestic animal use (grazing) under the Environmental Comments.

Natural and Anthropogenic Disturbance

Comment on any evidence of natural or anthropogenic disturbance and specify the source, severity and effects on the vegetation. Common disturbances on sites include gullies, colluvial deposition of rocks on slopes flash flooding and sometimes old tin cans from cowboys or miners. Notes on livestock grazing and other disturbances you may encounter in the buffer include off-road vehicle use, fire, and mass-wasting are valuable. Enter disturbance comments under the Environmental Comments

Other Comments

Record any other comments. What is the extent of the community you sampled? Describe the landscape context of the community. Describe the adjacent plant communities and their relationship to the plot. Are there any other landscape features or processes influencing this community? Is there an important species that occurs in the stand but is not within your plot? Is there a large amount of a dead plant material in the plot? Record these under the Environmental Comments field.

Unvegetated Surface

This field is an ocular estimate of ground cover. Because there is no designated sample size for areas surveyed as Observation Points, you will have to estimate percent covers for whatever size the documented area encompasses. For this estimate, you must use the cover classes listed in the bottom right hand corner of the data sheet. If an unvegetated surface category is not present in your observation point area (e.g., water is very uncommon in the sampling units), leave the corresponding line blank.

- **VEGETATION DESCRIPTION SECTION**

Leaf Phenology

Select the best description for the leaf phenology of the **dominant** stratum. The dominant stratum is the tallest stratum that contains at least 10% cover. Leave blank for non-vascular plots.

Evergreen. Greater than 75% of the total woody cover is never without green foliage. (Some tricky examples: most *Artemisia* and all *Chrysothamnus*)

Cold deciduous. Greater than 75% of the total woody cover sheds its foliage in connection with an unfavorable season mainly characterized by winter frost.

Mixed evergreen - cold deciduous. Evergreen and deciduous species are mixed within the type and generally contribute 25-75% of the total woody cover.

Perennial. Herbaceous vegetation composed of more than 50% perennial species.

Annual. Herbaceous vegetation composed of more than 50% annual species.

Leaf Type

Select the best description for the leaf form of the dominant stratum. The dominant stratum is the uppermost stratum that contains at least 10% total plot coverage. Within that dominant stratum, the species that makes up greater than 50% of cover defines the leaf type.

Broad-leaved. Woody vegetation that is primarily broad-leaved (Sagebrush, oak, California lilac).

Needle-leaved. Woody vegetation that is primarily needle-leaved (Juniper, pine, spruce, fir, hemlock).

Microphyllous. Woody cover that is primarily microphyllous (*Ephedra*).

Graminoid. Herbaceous vegetation composed of more than 50 percent graminoid species (grasses, sedges, rushes, etc).

Forb (broad-leaf-herbaceous). Herbaceous vegetation composed of more than 50% broad-leaf forb species (*Phlox*, *Astragalus*, *Lupinus*, *Thalictrum*, *Erigeron*, etc).

Pteridophyte. Herbaceous vegetation composed of more than 50 percent ferns or fern allies (scouring rushes).

Non-vascular. Dominated by lichens or mosses.

Mixed. As with leaf phenology, the dominant stratum may be composed approximately equally of species with several different leaf types. Describe the mix briefly or circle leaf types that apply.

Physiognomic Class

This represents what you see when you are standing in the plot looking across at the vegetation. The following definitions can be used as guidelines. For example, areas with scattered pines and junipers may not fit the cover classes below but they would best be described as a woodland.

Forest. Trees with their crowns overlapping (generally forming 60-100% cover).

Woodland. Open stands of trees with crowns not usually touching (generally forming 10-60% cover). Canopy tree cover may be less than 10% in cases where it exceeds shrub, dwarf-shrub, herb, and nonvascular cover, respectively.

Shrubland. Shrubs generally greater than 0.5 m tall with individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees generally less than 10% cover). Shrub cover may be less than 25% where it exceeds tree, dwarf-shrub, herb, and nonvascular cover, respectively. Vegetation composed of woody vines is included this class.

Wooded Shrubland

Trees forming approximately equal cover with a shrub component.

Dwarf-shrubland. Low-growing shrubs usually under 0.5 m tall. Individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees and tall shrubs generally less than 10% cover). Dwarf-shrub cover may be less than 25% where it exceeds tree, shrub, herb, and nonvascular cover, respectively.

Shrub Herbaceous. Low or taller shrubs forming approximately equal cover with a grass or forb component. Individuals or clumps of shrubs generally not touching and usually forming more than 25% cover; trees less than 10% cover. Spaces between shrubs are generally mostly occupied by grasses and/or forbs.

Wooded Herbaceous. Trees forming approximately equal cover with a grass or forb component.

Herbaceous. Perennial herbs (graminoids or forbs) dominant (generally forming at least 25% cover; trees, shrubs, and dwarf-shrubs generally with less than 10% cover). Herb cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and nonvascular cover, respectively.

Nonvascular. Nonvascular cover (bryophytes, lichens, and algae) dominant (generally forming at least 25% cover). Nonvascular perennial vegetation cover may be less than 25%, as long as it exceeds tree, shrub, dwarf-shrub, and herb cover.

Sparsely Vegetated. Abiotic substrate features dominant. Perennial vegetation is scattered to nearly absent and generally restricted to areas of concentrated resources. Total vegetation cover is typically less than 10% and greater than 2%. Badlands, ash fields, lava beds, or sand dunes supporting communities of annual plants should be included in this category, regardless of cover.

Provisional Community Name

Record the dominant species names creating the association which most closely resembles your observation point. Devise the name based on: (1) the dominant species of the dominant strata (including nonvascular) and (2) indicate the physiognomic class (this must match the physiognomic class checked on the back side of the datasheet). For example, if you are in a P-J woodland with only scattered shrubs but a really nice galleta grass layer, you would use a provisional name like "*Pinus edulis* – *Juniperus osteosperma* / *Pleuraphis jamesii* Woodland". The provisional name is also a great help to the ecologists who will be using your work to construct a classification. Note: this field should be completed only after the entire plot is completed.

• **DOMINANT PLANT SPECIES LIST**

Species/Strata Data. The form has been developed for recording information on *species* composition and cover and *strata* cover and height. Species lists (diagnostic species) and cover estimates should be completed first; then cover class and height class estimates for strata should be recorded. Write out the complete species name. The main body of the table is dedicated to recording species names and associated cover estimates. To begin, the observer needs to make a species list for the diagnostic species in the stand and assign each species to the appropriate stratum. The next section provides a brief discussion on assigning species to the appropriate strata, followed by instructions for completing the species level information.

Stratum: Species names will be recorded within the appropriate stratum. It is important that all crew members are consistent in assignment of species to strata throughout this project. Following are some guidelines to use in determining strata. Begin by assessing the strata at your site. Trees are defined as single-stemmed woody plants, generally 5 m in height or greater at maturity and under optimal growing conditions. Shrubs are defined as multiple-stemmed woody plants generally less than 5 m in height at maturity and under optimal growing conditions.

T1 Emergent, T2 Canopy, T3 Subcanopy. A uniform stand of pine or hemlock trees would be a good example of T2 "canopy", but where trees are absent you would begin with the shrubs, or herbaceous species if no shrubs are present. If the tree crowns in your plot are mostly touching and similar in height, but a given tree species is much taller that species would be a T1 "emergent." Occasionally, you will sample an area where there may be several tall, scattered pines and then shorter scattered junipers. In this case, the pines would be your "canopy" and the junipers would be the "subcanopy". You may also have pines listed in the "subcanopy" layer, if there are a number of short saplings in addition to mature tall trees.

The remaining vegetative strata are (remember to check with plant list for consistency):

S1 Tall Shrub. >2 meters tall. For example, *Sambucus racemosa*, *Amelanchier utahensis*, and *Cercocarpus ledifolius*.

S2 Short Shrub. <2 meters tall. For example, *Artemisia tridentata*, all *Symphoricarpos* spp.

S3 Dwarf Shrub. <0.5 meters tall. For example, *Artemisia arbuscula*.

H1 Graminoid. All grass species, including *Carex* spp. and *Juncus* spp.

H2 Forb. All forbs. (*Typha* is a forb.)

H3 Fern or Fern Ally. All ferns, including *Equisetum laevigatum*.

H4 Tree Seedlings. Seedlings are trees with vertical stems less than 1.5 m tall, but that may vary by species.

N Nonvascular. This is mainly mosses and lichens.

V Vine/liana. All vine species.

E Epiphyte. All epiphytic species.

Height can be used to define strata, but is not how species should be placed in strata. **Species characteristically belong to one stratum or another** (e.g., quaking aspen and juniper are canopy (T2), Utah serviceberry is a tall shrub (S1), antelope bitterbrush is a short shrub (S2), low sagebrush is a dwarf-shrub (S3), etc.), **EVEN when unusual environmental circumstances dictate that the plants have an unusually tall or unusually short growth form**. So even if the junipers growing in cracks are only 1.5 m tall, as long as they are mature trees, they are placed in the T2 category. About the only rule regarding height should be that the tree layer is (usually) higher than the tall shrub layer, is taller than the short shrub layer, etc.

The second point is to avoid splitting species between strata. If a few willow have been browsed to <1m tall, but most are 2m tall, they all are placed into the tall shrub stratum. There are two exceptions: (1) each height class covers more than 10% of plot, or (2) there is a reproductive layer of seedling shrubs or young trees.

The third point is how to define some of the "borderline/confusing" species. What we want to avoid is some folks calling *Apocynum* a forb and some calling it a dwarf-shrub or short shrub, for example.

Species / Percent Cover Estimates. Once you have identified your strata, list all diagnostic plant species in that strata and complete cover estimates per the following instructions.

1. **Species Name:** Refer to the plant list you have been provided for plant names used in this area. Always record the full scientific name for each species.
2. **Cover Class:** Estimate the aerial / crown cover of **each** species listed, using the cover class codes for the bottom of the page. These classes are as follows:
01 = 0-10% 02 = 10-25% 03 = 25-60% 04 = 60-100%
3. **% Cover:** Record continuous cover value used to make cover class estimates.

Unknowns. If you can't identify or easily key out the plant at the site, assign a name to it to be recorded on your data sheet. For example, if you know what family it is in or its genus, label it "unknown Asteraceae sp." or "Unk. *Erigeron* sp.". If there is more than one unknown in a family, add a number to the name you give them. If you do not know the family, label the plant "Unknown 1", using consecutive numbers for additional unknowns. Record the cover class and other data for the unknown as you would for any other species. Then, take a sample of the species with as much of the plant as possible, especially intact sexual parts, if present. Place the sample in a plastic baggie, and either label the plant (if you are putting more than one plant in the baggie) or label the baggie with the plot code, the date and the name you gave it on the data form. Plant samples in baggies can be stored in coolers or refrigerators for short periods. If you are not able to key the plant out soon after collecting it, or you intend to keep the sample for the park collection, press the plant and with a label stating the plot or location of its collection (include UTM's if the sample is not from a plot), date, collectors name and name you assigned the plant. Also, thoroughly label any plant specimens collected as proof of plant occurrence for plants not listed on the site plant list.

Strata / Height Class, Cover Class and Diagnostic Species. Once the species list and associated cover data have been completed, the observer should then complete the following fields as specified below.

1. Indicate the average height class of the stratum in the first column, using the Height Scale at the bottom of the form. The height scale for this project is as follows:

2.

01 = <0.5 m	03 = 1- 2 m	05 = 5 - 10 m	07 = 15-20 m	09 = 35 - 50 m
02 = 0.5 - 1 m	04 = 2-5 m	06 = 10-15 m	08 = 20-35 m	10 = > 50 m

3. Enter the average percent cover class of the whole stratum in the second column, using the Cover Scale at the bottom of the form (same cover scale as for species above).
4. '*' – This Column is used to indicate which species in the strata are particularly abundant.

Record information on *dominant species only*. There is one column that corresponds to the "Stratum" column in this table:

1. **Height.** Use the number code that best describes the heights of all plant species within a given stratum. The number codes are listed in the bottom left-hand corner of the data sheet.
2. **Cover Class.** For this ocular estimation you are looking at the aerial cover of **all** plants within a given stratum. Use the cover class codes listed in the bottom right hand corner of the data sheet and presented below.

Cover Classes	
01	0 - 10%
02	10 - 25%
03	25 - 60%
04	60 - 100%

3. **Dominant Species (Mark species that characterize the stand with a *).** List the plant species using the full scientific name. You may find that there are not enough lines, in which case you can write in the blank area under the stratum name and number codes.
4. **% Cover.** Estimate the percent aerial cover (T-100%) for each diagnostic plant species.

APPENDIX 1: Landform Glossary

(<http://soils.usda.gov/technical/handbook/contents/part629glossary1.html>)

alluvial cone - A semi-conical type of alluvial fan with very steep slopes; it is higher, narrower, and steeper (e.g., > 40% slopes) than a fan, and composed of coarser, and thicker layers of material deposited by a combination of alluvial episodes and to a much lesser degree, landslides (e.g., debris flow). Compare - alluvial fan, talus cone.

alluvial fan - A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes, shaped like an open fan or a segment of a cone, deposited by a stream (best expressed in semiarid regions) at the place where it issues from a narrow mountain or upland valley; or where a tributary stream is near or at its junction with the main stream. It is steepest near its apex which points upstream and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

alluvial flat (a) (colloquial: western US) A nearly level, graded, alluvial surface in bolsons and semi-bolsons which commonly does not manifest traceable channels, terraces or floodplain levels. Compare - flood-plain step, terrace, valley flat. (b) (**not preferred**) A general term for a small flood plain bordering a river, on which alluvium is deposited during floods.

alluvial plain - (a) A large assemblage of fluvial landforms (braided streams, terraces, etc.,) that form low gradient, regional ramps along the flanks of mountains and extend great distances from their sources (e.g., High Plains of North America. SW (b) (**not recommended**, use flood plain.) An general, informal term for a broad flood plain or a low-gradient delta. Compare - alluvial flat.

alluvial plain remnant - An erosional remnant of an alluvial plain which retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to a present-day stream or drainage network. Compare - alluvial plain, erosional remnant, paleoterrace.

alluvial terrace - (not preferred) refer to stream terrace.

alluvium - Unconsolidated, clastic material subaerially deposited by running water, including gravel, sand, silt, clay, and various mixtures of these. Compare - colluvium, slope alluvium.

anticline - (a) A unit of folded strata that is convex upward and whose core contains the stratigraphically oldest rocks, and occurs at the earth's surface. In a single anticline, beds forming the opposing limbs of the fold dip away from its axial plane. Compare - monocline, syncline, fold. (b) A fold, at any depth, generally convex upward whose core contains the stratigraphically older rocks.

arroyo - (colloquial: southwest A.) The channel of a flat-floored, ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material; sometimes called a wash. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed. Where arroyos intersect zones of ground-water discharge, they are more properly classed as intermittent stream channels.

artificial levee - An artificial embankment constructed along the bank of a watercourse or an arm of the sea, to protect land from inundation or to confine streamflow to its channel.

backslope - The hillslope profile position that forms the steepest and generally linear, middle portion of the slope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below. They may or may not include cliff segments (i.e. free faces). Backslopes are commonly erosional forms produced by mass movement, colluvial action, and running water. Compare - summit, shoulder, footslope, toeslope.

backswamp - A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces. Compare - valley flat.

badlands - A landscape which is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes with narrow interflaves. Badlands develop on surfaces with little or no vegetative cover, overlying unconsolidated or poorly cemented materials (clays, silts, or in some cases sandstones) sometimes with soluble minerals such as gypsum or halite.

bajada - (colloquial: southwestern US.) A broad, gently inclined, alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins. Synonym - coalescent fan piedmont. Compare - colluvial apron.

ballena - (colloquial: western US.) A fan remnant having a distinctively-rounded surface of fan alluvium. The ballena's broadly-rounded shoulders meet from either side to form a narrow summit and merge smoothly with concave sideslopes and then concave, short pediments which form smoothly-rounded drainageways between adjacent ballenas. A partial ballena is a fan remnant large enough to retain some relict fan surface on a remnant summit. Compare - fan remnant.

ballon - (colloquial: western US). A rounded, dome-shaped hill, formed by erosion or uplift.

bar - A general term for a ridge-like accumulation of sand, gravel, or other alluvial material formed in the channel, along the banks, or at the mouth of a stream where a decrease in velocity induces deposition; e.g. a channel bar or a meander bar. A generic term for any of various elongate offshore ridges, banks, or mounds of sand, gravel, or other unconsolidated material submerged at least at high tide, and built up by the action of waves or currents, especially at the mouth of a river or estuary, or at a slight distance offshore from the beach.

barchan dune - A crescent-shaped dune with tips extending leeward (downwind), making this side concave and the windward (upwind) side convex. Barchan dunes tend to be arranged in chains extending in the dominant wind direction. Compare - parabolic dune.

base slope - A geomorphic component of hills consisting of the concave to linear slope (perpendicular to the contour) which, regardless of the lateral shape is an area that forms an apron or wedge at the bottom of a hillside dominated by colluvial and slope wash processes and sediments (e.g., colluvium and slope alluvium). Distal base slope sediments commonly grade to, or interfinger with, alluvial fills, or gradually thin to form pediment over residuum. Compare - head slope, side slope, nose slope, interfluvium, free face.

basin - (a) Drainage basin; (b) A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated. (c) (colloquial: western US) A general term for the nearly level to gently sloping, bottom surface of an intermontane basin (bolson). Landforms include playas, broad alluvial flats containing ephemeral drainageways, and relict alluvial and lacustrine surfaces that rarely, if ever, are subject to flooding. Where through-drainage systems are well developed, flood plains are dominant and lake plains are absent or of limited extent. Basin floors grade mountainward to distal parts of piedmont slopes.

basin floor - A general term for the nearly level, lower-most part of intermontane basins (i.e. bolsons, semi-bolsons). The floor includes all of the alluvial, eolian, and erosional landforms below the piedmont slope. Compare - basin, piedmont slope.

basin-floor remnant - (colloquial: western US) A flat erosional remnant of any former landform of a basin floor that has been dissected following the incision of an axial stream.

bench - (not preferred) refer to structural bench.

beveled base - The lower portion of a canyon wall or escarpment marked by a sharp reduction in slope gradient from the precipitous cliff above, and characteristically composed of thinly mantled colluvium (e.g. < 1 m) and / or capped with a thin surficial mantle of large rock fragments from above, which overly residuum of less resistant rock (e.g., shale) whose thin strata intermittently outcrop at the surface; a zone of erosion and transport common in the canyonlands of the semi-arid, southwestern US. Compare - talus slope.

blowout - A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand, loose soil, or where protective vegetation is disturbed or destroyed; the adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Commonly small, some blowouts may be large (kilometers in diameter). Compare - deflation basin.

bluff - (a) A high bank or bold headland, with a broad, precipitous, sometimes rounded cliff face overlooking a plain or body of water, especially on the outside of a stream meander; ex. a river bluff. (b) (not preferred) use cliff. Any cliff with a steep, broad face.

bolson - (colloquial: western US.) A landscape term for an internally drained (closed) intermontane basin into which drainages from surrounding mountains converge inward toward a central depression. Bolsons are often tectonically depressed areas and, according to Peterson, include alluvial flat, alluvial plain, beach plain, barrier beach, lake plain, sand sheets, dunes, and playa. The piedmont slope includes slopes of erosional origin adjoining the mountain front (pediments) and complex construction surfaces (fans). A semi-bolson is an externally drained (open) bolson. Synonym - intermontane basin.

borrow pit - An excavated area from which earthy material has been removed typically for construction purposes offsite; also called borrow pit.

bottomland - (not recommended) use flood plain. An obsolete, informal term loosely applied to varying portions of a flood plain.

box canyon - a) A narrow gorge or canyon containing an intermittent stream following a zigzag course, characterized by high, steep rock walls and typically closed upstream by a similar wall, giving the impression, as viewed from its bottom, of being surrounded or "boxed in" by almost vertical walls. b) A steep-walled canyon heading against a cliff a dead-end canyon.

braided stream - A channel or stream with multiple channels that interweave as a result of repeated bifurcation and convergence of flow around inter-channel bars, resembling (in plan view) the strands of a complex braid. Braiding is generally confined to broad, shallow streams of low sinuosity, high bedload, non-cohesive bank material, and a steep gradient. At bank-full discharge, braided streams have steeper slopes and shallower, broader, and less stable channel cross sections than meandering streams. Compare - meandering channel, flood-plain landforms.

break - (slopes) An abrupt change or inflection in a slope or profile. Compare - knickpoint, shoulder, escarpment. (geomorphology) A marked variation of topography, or a tract of land distinct from adjacent land, or an irregular or rough piece of ground. Compare - breaks.

breaks - (colloquial: western US) A landscape or large tract of steep, rough or broken land dissected by ravines and gullies and marks a sudden change in topography as from an elevated plain to lower hilly terrain, or a line of irregular cliffs at the edge of a mesa or a river (e.g., the Missouri River breaks).

butte - An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments, commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks. Compare - mesa, plateau, cuesta.

caldera - A large, more or less circular depression, formed by explosion and/or collapse, which surrounds a volcanic vent or vents, and whose diameter is many times greater than that of the included vent, or vents. Compare - crater.

canyon - A long, deep, narrow, very steep-sided valley cut primarily in bedrock with high and precipitous walls in an area of high local relief (e.g., mountain or high plateau terrain), often with a perennial stream at the bottom; similar to but larger than a gorge. Compare - gorge, box canyon, slot canyon.

canyon bench - One of a series of relatively narrow, flat landforms occurring along a canyon wall and caused by differential erosion of alternating strong and weak horizontal strata; a type of structural bench.

canyonlands - A deeply and extensively dissected landscape composed predominantly of relatively narrow, steep-walled valleys with small flood plains or valley floors; commonly with considerable outcrops of hard bedrock on steep slopes, ledges, or cliffs, and with broader summits or interfluves than found in badlands. Sideslopes exhibit extensive erosion, active back-wearing, and relatively sparse vegetation.

channel - (a) The hollow bed where a natural body of surface water flows or may flow. The deepest or central part of the bed of a stream, containing the main current and occupied more or less continuously by water. (b) (colloquial: western US.) The bed of a single or braided watercourse that commonly is barren of vegetation and is formed of modern alluvium. Channels may be enclosed by banks or splayed across and slightly mounded above a fan surface and include bars and mounds of cobbles and stones. (c) Small, trough-like, arcuate or sinuous channels separated by small bars or ridges, caused by fluvial processes; common to flood plains and young alluvial terraces; a constituent part of *bar and channel* topography.

cinder cone - A conical hill formed by the accumulation of cinders and other pyroclastics, normally basaltic or andesitic composition. Slopes generally exceed 20 percent.

cliff - Any high, very steep to perpendicular or overhanging face of rock or earth; a precipice. Compare - bluff.

climbing dune - A dune formed by the piling-up of sand by wind against a cliff or mountain slope; very common in arid regions with substantial local relief and strong winds. Compare - sand ramp.

closed depression - A generic name for an enclosed area that has no surface drainage outlet and from which water escapes only by evaporation or subsurface drainage; an area of low ground indicated on a topographic map by a hachured contour line forming a closed loop. Compare - open basin.

collapse sinkhole - A type of sinkhole that is formed by collapse of a cave within the underlying soluble bedrock (e.g., limestone, gypsum, salt). Compare - solution sinkhole.

colluvium - Unconsolidated, unsorted material being transported or deposited on sideslopes and/or at the base of slopes by mass movement (e.g. direct gravitational action) and by local, unconcentrated runoff. Compare - alluvium, slope alluvium, scree, talus, mass movement.

complex landslide - A category of mass movement processes, associated sediments (complex landslide deposit) or resultant landforms characterized by a composite of several mass movement processes none of which dominates or leaves a prevailing landform. Numerous types of complex landslides can be specified by naming the constituent processes evident (e.g. a complex earth spread - earth flow landslide). Compare - fall, topple, slide, lateral spread, flow, landslide.

crest - (a) The commonly linear, narrow top of a ridge, hill, or mountain. It is appropriately applied to elevated areas where retreating backslopes are converging such that these high areas are almost exclusively composed of convex shoulders; (b) (not preferred) Sometimes used as an alternative for the hillslope component *summit*. Compare - summit (*part b*), saddle.

cuesta - An asymmetric, homoclinal ridge capped by resistant rock layers of slight to moderate dip (commonly less than 15 percent); produced by differential erosion of interbedded resistant and weak rocks. A *cuesta* has a long, gentle slope on one side (dip slope), that roughly parallels the inclined beds, and on the other side has a relatively short and steep or cliff-like slope (*scarp*) that cuts through the tilted rocks. Compare - hogback, mesa, dipslope, scarp slope, *cuesta* valley.

cuesta valley - A low relief, low angle, asymmetrical depression which lies parallel to the strike of underlying strata; a type of strike valley. It's formed by the differential erosion of weaker strata interbedded with more resistant bedrock. It may or may not contain a local drainage network and commonly lies above and is not connected to the regional drainage system. Compare - *cuesta*, valley, trough, hanging valley.

debris fall - The process, associated sediments (debris fall deposit) or resultant landform characterized by a rapid type of *fall* involving the relatively free, downslope movement or collapse of detached, unconsolidated material which falls freely through the air (lacks an underlying slip face); sediments have substantial proportions of both fine earth and coarse fragments; common along undercut stream banks. Compare - rock fall, soil fall, landslide.

debris flow - The process, associated sediments (debris flow deposit) or landform resulting from a very rapid type of *flow* dominated by a sudden downslope movement of a mass of rock, soil, and mud (more than 50% of the particles are > 2mm), and whether saturated or comparatively dry, behaves much as a viscous fluid when moving. Compare - lahar, mudflow, landslide.

deflation basin - A topographic basin excavated and maintained by wind erosion which removes unconsolidated material and commonly leaves a rim of resistant material surrounding the depression. Unlike a blowout, a deflation basin does not include adjacent deposits derived from the basin. Compare - blowout.

depression - Any relatively sunken part of the Earth's surface; especially a low-lying area surrounded by higher ground. A closed depression has no natural outlet for surface drainage (e.g. a sinkhole). An open depression has a natural outlet for surface drainage. Compare - closed depression, open depression.

desert pavement - A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments, mantling a desert surface. It is formed where wind action and sheetwash have removed all smaller particles or where coarse fragments have migrated upward through sediments to the surface. It usually protects the underlying, finer-grained material from further deflation. The coarse fragments commonly are cemented by mineral matter. Compare - erosion pavement, stone line.

dike - A tabular igneous intrusion that cuts across the bedding or foliation of the country rock. Compare - sill.

dip - A geomorphic component (characteristic piece) of flat plains (e.g., lake plain, low coastal plain, low-relief till plain) consisting of a shallow and typically closed depression that tends to be an area of focused groundwater recharge but not a permanent water body and that lies slightly lower and is wetter than the adjacent talf, and favors the accumulation of fine sediments and organic materials.

ditch - An open and usually unpaved (unlined), channel or trench excavated to convey water for drainage (removal) or irrigation (addition) to or from a landscape; smaller than a canal; some ditches are modified natural waterways.

divide - (a) The line of separation; (b) The summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins; it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction. Compare - interfluve.

dome - (a) An uplift or anticlinal structure, either circular or elliptical in outline, in which the rocks dip gently away in all directions. A dome may be small (e.g. a salt dome) or many kilometers in diameter. (b) A smoothly rounded landform of rock mass such as a rock-capped mountain summit, that roughly resembles the dome of a building. (e.g. the rounded granite peaks of Yosemite, CA).

drainageway - (a) A general term for a course or channel along which water moves in draining an area. (b) a term restricted to relatively small, roughly linear or arcuate depressions that move concentrated water at some time, and either lack a defined channel (e.g. head slope, swale) or have a small, defined channel (e.g. low order streams).

draw - A small, natural watercourse cut in unconsolidated materials, generally more open with a broader floor and more gently sloping sides than an arroyo, ravine or gulch, and whose present stream channel may appear inadequate to have cut the drainageway that it occupies.

dune - A low mound, ridge, bank or hill of loose, windblown, subaerially deposited granular material (generally sand), either barren and capable of movement from place to place, or covered and stabilized with vegetation, but retaining its characteristic shape. (See barchan dune, parabolic dune, parna dune, shrub-coppice dune, seif dune, transverse dune).

dune field - An assemblage of moving and/or stabilized dunes, together with sand plains, interdune areas, and the ponds, lakes, or swamps produced by the blocking of streams by the sand. See dune lake.

earthflow - The process, associated sediments (earthflow deposit) or resultant landforms characterized by slow to rapid types of flow dominated by downslope movement of soil, rock, and mud (more than 50% of the particles are < 2 mm), and whether saturated or comparatively dry, behaves as a viscous fluid when moving. Compare - debris flow (coarser, less fluid), mudflow (finer, more fluid).

olian deposit - Sand, silt or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess. Conventionally, primary volcanic deposits (e.g. tephra) are handled separately. Compare - loess, parna, beach sands.

olian sands - Sand-sized, clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sand sheet. Compare - beach sands.

ephemeral stream - Generally a small stream, or upper reach of a stream, that flows only in direct response to precipitation. It receives no protracted water supply from melting snow or other sources and its channel is above the water table at all times. Compare - arroyo, intermittent stream, perennial stream.

eroded fan remnant - All, or a portion of an alluvial fan that is much more extensively eroded and dissected than a fan remnant; sometimes called an *erosional fan remnant*. It consists primarily of a) eroded and highly dissected sides (*eroded fan-remnant sideslopes*) dominated by hillslope positions (shoulder, backslope, etc.), and b) to a lesser extent an intact, relatively planar, relict alluvial fan "summit" area best described as a tread.

eroded fan-remnant sideslope - A rough or broken margin of an *eroded fan remnant* highly dissected by ravines and gullies that can be just a fringe or make up a large part of an eroded alluvial fan; its bounding escarpments (risers), originally formed by inset channels, have become highly dissected and irregular such that terrace components (tread and riser) have been consumed or modified and replaced by hillslope positions and components (shoulder, backslope, footslope, etc.); sometimes referred to as *fan remnant sideslopes*. Compare - eroded fan remnant.

escarpment - A continuous, steep slope or cliff produced by erosion or faulting and that topographically interrupts or breaks the general continuity of more gently sloping land surfaces. The term is most commonly applied to cliffs produced by differential erosion. Synonym = scarp.

falling dune - An accumulation of sand that is formed as sand is blown off a mesa top or over a cliff face or steep slope, forming a solid wall, sloping at the angle of repose of dry sand, or a fan extending downward from a re-entrant in the mesa wall. Compare - climbing dune, sand ramp.

fan - (a) A gently sloping, fan-shaped mass of detritus forming a section of a low-angle cone commonly at a place where there is a notable decrease in gradient; specifically an alluvial fan (not preferred – use alluvial fan). Compare - alluvial fan, alluvial cone. (b) A fan-shaped mass of congealed lava that formed on a steep slope by the continually changing direction of flow.

fan apron - A sheet-like mantle of relatively young alluvium and soils covering part of an older fan piedmont (and occasionally alluvial fan) surface, commonly thicker and further down slope (e.g., mid-fan or mid-fan piedmont) than a fan collar. It somewhere

buries an older soil that can be traced to the edge of the fan apron where the older soil emerges as the land surface, or relict soil. No buried soils should occur within a fan-apron mantle itself. Compare - fan collar.

fan collar - A landform comprised of a thin, short, relatively young mantle of alluvium along the very upper margin (near the proximal end or apex) of a major alluvial fan. The young mantle somewhere buries an older soil that can be traced to the edge of the collar where the older soil emerges at the land surface as a relict soil. Compare - fan apron.

fan remnant - A general term for landforms that are the remaining parts of older fan-landforms, such as alluvial fans, fan aprons, inset fans, and fan skirts, that either have been dissected (erosional fan-remnants) or partially buried (nonburied fan-remnants). An erosional fan remnant must have a relatively flat summit that is a relict fan-surface. A nonburied fan-remnant is a relict surface in its entirety. Compare - eroded fan remnant, ballena.

fan skirt - The zone of smooth, laterally-coalescing, small alluvial fans that issue from gullies cut into the fan piedmont of a basin or that are coalescing extensions of the inset fans of the fan piedmont, and that merge with the basin floor at their toeslopes. These are generally younger fans which onlap older fan surfaces.

fault-line scarp - (a) A steep slope or cliff formed by differential erosion along a fault line, as by the more rapid erosion of soft rock on the side of a fault as compared to that of more resistant rock on the other side; e.g. the east face of the Sierra Nevada in California. (b) (not recommended) A fault scarp that has been modified by erosion. This usage is not recommended because the scarp is usually not located on the fault line.

fen - Waterlogged, spongy ground containing alkaline decaying vegetation, characterized by reeds, that develops into peat. It sometimes occurs in sinkholes of karst regions. Compare - bog, marsh, swamp.

finger ridge - One in a group of small, tertiary spur ridges that form crudely palmate extensions of erosional remnants along the flanks or nose of larger ridges. Compare - ballena, rib.

flat - (a) (adjective) Said of an area characterized by a continuous surface or stretch of land that is smooth, even, or horizontal, or nearly so, and that lacks any significant curvature, slope, elevations, or depressions. (b) (noun) An informal, generic term for a level or nearly level surface or small area of land marked by little or no local relief. Compare - mud flat. (c) (not recommended) A nearly level region that visibly displays less relief than its surroundings.

flood plain - The nearly level plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the streams.

foothills - A steeply sloping upland composed of hills with relief of 30 up to 300 meters and fringes a mountain range or high-plateau escarpment. Compare - hill, mountain, plateau. SW &

footslope - The hillslope profile position that forms the concave surface at the base of a hillslope. It is a transition zone between upslope sites of erosion and transport (shoulder, backslope) and downslope sites of deposition (toeslope). Compare - summit, shoulder, backslope, and toeslope.

free face - A geomorphic component of hills and mountains consisting of an outcrop of bare rock that sheds rock fragments and other sediments to, and commonly stands more steeply than the angle of repose of, the colluvial slope immediately below; most commonly found on shoulder and backslope positions, and can comprise part or all of a nose slope or side slope. Compare - interfluvial, crest, nose slope, side slope, head slope, base slope.

gorge - (a) A narrow, deep valley with nearly vertical, rocky walls, smaller than a canyon, and more steep-sided than a ravine; especially a restricted, steep-walled part of a canyon. (b) A narrow defile or passage between hills or mountains.

graben - An elongate trough or basin bounded on both sides by high-angle, normal faults that dip towards the interior of the trough. It is a structural form that may or may not be geomorphically expressed as a rift valley. Compare - horst.

gravel pit - A depression, ditch or pit excavated to furnish gravel for roads or other construction purposes; a type of borrow pit.

ground soil - Any soil at the present-day land surface and actively undergoing pedogenesis,

gulch - (colloquial: western US.; not preferred - refer to ravine) A small stream channel, narrow and steep-sided in cross section, and larger than a gully, cut in unconsolidated materials. General synonym - ravine. Compare - arroyo, draw, gully, wash.

gully - A small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water usually during and immediately following heavy rains or ice / snow melt. A gully generally is an obstacle to wheeled vehicles and too deep (e.g., > 0.5 m) to be obliterated by ordinary tillage; (a rill is of lesser depth and can be smoothed over by ordinary tillage). Compare - rill, ravine, arroyo, swale, draw.

hanging valley - A tributary valley whose floor at the lower end is notably higher than the floor of the main valley in the area of junction.

head slope - A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway, resulting in converging overland water flow (e.g. sheet wash); head slopes are dominated by colluvium and slope wash sediments (e.g., slope alluvium); contour lines form concave curves. Slope complexity (downslope shape) can range from simple to complex. Headslopes are comparatively moister portions of hillslopes and tend to accumulate sediments (e.g., cummulic profiles) where they are not directly contributing materials to channel flow. Compare - side slope, nose slope, free face, interfluvium, crest, base slope.

headwall - A steep slope at the head of a valley; e.g. the rock cliff at the back of a cirque. Compare - cirque headwall.

high hill - A generic name for an elevated, generally rounded land surface with high local relief, rising between 90 meters (approx. 300 ft.) to as much as 300 m (approx. 1000 ft.) above surrounding lowlands. Compare - low hill, hill, hillock.

hill - A generic term for an elevated area of the land surface, rising at least 30 m (100 ft.) to as much as 300 meters (approx. 1000 ft.) above surrounding lowlands, usually with a nominal summit area relative to bounding slopes, a well-defined, rounded outline and slopes that generally exceed 15 percent. A hill can occur as a single, isolated mass or in a group. A hill can be further specified based on the magnitude of local relief: *low hill* (30 - 90 m) or *high hill* (90 - 300 m). Informal distinctions between a hill and a mountain are often arbitrary and dependent on local convention. Compare - hillock, plateau, mountain, foothills, hills.

hillock - A generic name for a small, low hill, generally between 3 - 30 m in height and slopes between 5 and 50% (e.g., bigger than a mound but smaller than a hill); commonly considered a microfeature. Compare - mound, hill.

hillslope - A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of the hill. Compare - mountain slope.

hogback - A sharp-crested, symmetric (homoclinal) ridge formed by highly tilted resistant rock layers; produced by differential erosion of interlayered resistant and weak rocks with dips greater than about 25 degrees (45 percent). Compare - cuesta.

hoodoo - A bizarrely shaped column, pinnacle, or pillar of rock produced by differential weathering or erosion in a region of sporadically heavy rainfall. Formation is facilitated by joints and layers of varying hardness. Compare - earth pillar.

horst - An elongate block that is bounded on both sides by normal faults that dip away from the interior of the horst. It is a structural form and may or may not be expressed geomorphically.

hummock - (a) (not preferred - see hillock). An imprecise, general term for a rounded or conical mound or other small elevation. (b) (not preferred) A slight rise of ground above a level surface.

impact crater - a) A generally circular or elliptical depression formed by hypervelocity impact of an experimental projectile or ordinance into earthy or rock material. Compare - caldera, crater, meteorite crater. SW; b) (not recommended - use meteorite crater) A generally circular crater formed by the impact of an interplanetary body (projectile) on a planetary surface.

inset fan - (colloquial; western US) The flood plain of an ephemeral stream that is confined between fan remnants, ballenas, basin-floor remnants, or closely-opposed fan toeslopes of a basin.

interdune - The relatively flat surface, whether sand-free or sand-covered, between dunes. GG

interfluvium - A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways. Compare - divide.

intermittent stream - A stream, or reach of a stream, that does not flow year-round (commonly dry for 3 or more months out of 12) and whose channel is generally below the local water table; it flows only when it receives a) base flow (i.e. solely during wet periods),

or b) ground-water discharge or protracted contributions from melting snow or other erratic surface and shallow subsurface sources. Compare - ephemeral stream.

island - (a) Land completely surrounded by water; (b) An elevated area of land surrounded by swamp, or marsh, or isolated at high water or during floods. Compare - barrier island.

knob - (a) A rounded eminence, a small hill or mountain; especially a prominent or isolated hill with steep sides, commonly found in the Southern United States. (b) A peak or other projection from the top of a hill or mountain. Also, a boulder or group of boulders or an area of resistant rocks protruding from the side of a hill or mountain. Compare - stack.

knoll - A small, low, rounded hill rising above adjacent landforms.

lake - An inland body of permanent standing water, fresh or saline, occupying a depression, generally of appreciable size (larger than a pond) and too deep to permit vegetation (excluding subaqueous vegetation) to take not completely across the expanse of water.

lakebed - (a) The flat to gently undulating ground underlain or composed of fine-grained sediments deposited in a former lake. (b) The bottom of a lake; a lake basin.

lakeshore - The narrow strip of land in contact with or bordering a lake; especially a beach.

landslide - A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials, caused by gravitational forces and which may or may not involve saturated materials. Names of landslide types generally reflect the dominant process and/or the resultant landform. The main operational categories of mass movement are *fall* (rockfall, soil fall, topple), *slide* (rotational landslide, block glide, debris slide, lateral spread), *flow* [rock fragment flow (especially rockfall avalanche), debris avalanche, debris flow (e.g., lahar), earthflow, (creep, mudflow)], and *complex landslides*. Compare - solifluction.

ledge - (a) A narrow shelf or projection of rock, much longer than wide, formed on a rock wall or cliff face, as along a coast by differential wave action on softer rocks; erosion is by combined biological and chemical weathering. (b) A rocky outcrop; solid rock. (c) A shelf-like quarry exposure or natural rock outcrop. Compare - structural bench.

levee - An artificial or natural embankment built along the margin of a watercourse or an arm of the sea, to protect land from inundation or to confine streamflow to its channel. Compare artificial levee, natural levee.

longitudinal dune - A long, narrow sand dune, usually symmetrical in cross profile, oriented parallel to the prevailing wind direction ; it is wider and steeper on the windward side but tapers to a point on the lee side. It commonly forms behind an obstacle in an area where sand is abundant and the wind is strong and constant. Such dunes can be a few meters high and up to 100 km long. Compare - seif dune, transverse dune.

low hill - A generic name for an elevated, generally rounded land surface with low local relief, rising between 30 meters (100 ft.) to as much as 90 m (approx. 300 ft.) above surrounding lowlands. Compare - high hill, hill, hillock.

lowland - (a) A generic, imprecise term for low-lying land or an extensive region of low-lying land, especially near a coast and including the extended plains or country lying not far above tide level. (b) (not preferred) A generic, imprecise term for a landscape of low, comparatively level ground of a region or local area, in contrast with the adjacent higher country. (c) (not recommended - use valley, bolson, etc.) A generic term for a large valley. Compare - upland.

marsh - Periodically wet or continually flooded areas with the surface not deeply submerged. Covered dominantly with sedges, cattails, rushes, or other hydrophytic plants. Compare - salt marsh, swamp, bog, fen.

meander belt - The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops. Landform components of the meander-belt surface are produced by a combination of gradual (lateral and down-valley) migration of meander loops and avulsive channel shifts causing abrupt cut-offs of loop segments. Landforms flanking the sinuous stream channel include: point bars, abandoned meanders, meander scrolls, oxbow lakes, natural levees, and flood-plain splays. Meander belts may not exhibit prominent natural levee or splay forms. Flood plains of broad valleys may contain one or more abandoned meander belts in addition to the zone flanking the active stream channel.

meander scar - (a) A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream which impinged upon and undercut the bluff; if it's no longer adjacent to the modern stream channel it indicates an

abandoned route of the stream; (b) (not recommended - refer to oxbow) An abandoned meander, commonly filled in by deposition and vegetation, but still discernable.

meander scroll - (a) One of a series of long, parallel, close fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank. Compare - meander belt, point bar. (b) (not recommended; refer to oxbow lake) - A small, elongate lake on a flood plain in a well-defined part of an abandoned stream channel.

mesa - A broad, nearly flat-topped, and usually isolated landmass bounded by steep slopes or precipitous cliff and capped by layers of resistant, nearly horizontal, rocky summit width greater than the height of bounding escarpments. (Colloquial: western US; not preferred) Also used to designate broad structural benches and alluvial terraces that occupy intermediate levels in stepped sequences of platforms bordering canyons and valleys. Compare - butte, plateau, cuesta.

monocline - (a) A unit of folded strata that dips from the horizontal in one direction only, is not part of an anticline or syncline, and occurs at the earth's surface. This structure is typically present in plateau areas where nearly flat strata locally assume steep dips caused by differential vertical movements without faulting. Compare - anticline, syncline, fold. (b) - A local steepening in an otherwise uniform gentle dip.

mountain - A generic term for an elevated area of the land surface, rising more than 300 meters above surrounding lowlands, usually with a nominal summit area relative to bounding slopes and generally with steep sides (greater than 25 percent slope) with or without considerable bare-rock exposed. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by tectonic activity and/or volcanic action and secondarily by differential erosion. Compare - hill, hillock, plateau, foothills, mountains.

natural levee - A long, broad low ridge or embankment of sand and coarse silt, built by a stream on its flood plain and along both sides of its channel, especially in time of flood when water overflowing the normal banks is forced to deposit the coarsest part of its load. It has a gentle slope away from the river and toward the surrounding floodplain, and its highest elevation is closest to the river bank. Compare - levee, artificial levee, meander belt.

open depression - A generic name for any enclosed or low area that has a surface drainage outlet whereby surface water can leave the enclosure; an area of lower ground indicated on a topographic map by contour lines forming an incomplete loop or basin indicating at least one surface exit. Compare - closed basin.

overbank deposit - Fine-grained sediments (silt and clay) deposited from suspension on a flood plain by floodwaters that cannot be contained within the stream channel.

overflow stream channel - A watercourse that is generally dry but conducts flood waters that have overflowed the banks of a river, commonly from large storms or annual meltwater.

oxbow - A closely looping stream meander having an extreme curvature such that only a neck of land is left between the two parts of the stream. (colloquial: northeastern A.) the land enclosed, or partly enclosed, within an oxbow. Compare - meander belt, oxbow lake, bayou.

oxbow lake - The crescent-shaped, often ephemeral body of standing water situated by the side of a stream in the abandoned channel (oxbow) of a meander after the stream formed a neck cutoff and the ends of the original bend were silted up. Compare - meander belt, oxbow.

parabolic dune - A sand dune with a long, scoop-shaped form, convex in the downwind direction so that its horns point upwind, whose ground plan, when perfectly developed, approximates the form of a parabola.

peak - Sharp or rugged upward extension of a ridge chain, usually at the junction of two or more ridges; the prominent highest point of a summit area.

pediment - A gently sloping erosional surface at the foot of a receding hill or mountain slope. The surface may be essentially bare, exposing earth material that extends beneath adjacent uplands; or it may be thinly mantled with alluvium and colluvium, ultimately in transit from upland front to basin or valley lowland. In hill-foot slope terrain the mantle is designated "pedis sediment." The term has been used in several geomorphic contexts: Pediments may be classed with respect to (a) landscape positions, for example, intermontane-basin piedmont or valley-border footslope surfaces (respectively, apron and terrace pediments); (b) type of material eroded, bedrock or regolith; or (c) combinations of the above. Compare - Piedmont slope.

perennial stream - A stream or reach of a stream that flows continuously throughout the year and whose surface is generally lower than the water table adjacent to the region adjoining the stream. Compare - Ephemeral stream, Intermittent stream.

piedmont - (adjective) Lying or formed at the base of a mountain or mountain range; e.g., a piedmont terrace or a piedmont pediment. (noun) An area, plain, slope, glacier, or other feature at the base of a mountain; e.g., a foothill or a bajada. In the United States, the Piedmont is a low plateau extending from New Jersey to Alabama and lying east of the Appalachian Mountains.

piedmont slope - (colloquial - western US) The dominant gentle slope at the foot of a mountain; generally used in terms of intermontane-basin terrain in arid to subhumid regions. Main components include: (a) An erosional surface on bedrock adjacent to the receding mountain front (pediment, rock pediment); (b) A constructional surface comprising individual alluvial fans and interfan valleys, also near the mountain front; and (c) A distal complex of coalescent fans (bajada), and alluvial slopes without fan form. Piedmont slopes grade to basin-floor depressions with alluvial and temporary lake plains or to surfaces associated with through drainage (e.g., axial streams). Compare - bolson, fan piedmont.

plain - A general term referring to any flat, lowland area, large or small, at a low elevation. Specifically, any extensive region of comparatively smooth and level gently undulating land. A plain has few or no prominent hills or valleys but sometimes has considerable slope, and usually occurs at low elevation relative to surrounding areas. Where dissected, remnants of a plain can form the local uplands. A plain may be forested or bare of trees and may be formed by deposition or erosion. Compare - lowland, plateau.

plateau - A comparatively flat area of great extent and elevation; specifically an extensive land region considerably elevated (more than 100 meters) above adjacent lower-lying terrain, and is commonly limited on at least one side by an abrupt descent, has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level. Compare - hill, foothill, mountain, mesa, plain.

playa - The usually dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those occurring on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation-runoff events. Playa deposits are fine grained and may or may not have high water table and saline conditions.

point bar - One of a series of low, arcuate ridges of sand and gravel developed on the inside of a growing meander by the slow addition of individual accretions accompanying migration of the channel toward the outer bank. Compare - meander scroll.

pond - (a) A natural body of standing fresh water occupying a small surface depression, usually smaller than a lake and larger than a pool. (b) A small artificial body of water, used as a source of water. Compare - salt pond.

pool - A small, natural body of standing water, usually fresh; e.g. a stagnant body of water in a marsh, or a transient puddle in a depression following a rain.

quarry - Excavation areas, open to the sky, usually for the extraction of stone.

ravine - A small stream channel; narrow, steep-sided, commonly V-shaped in cross section and larger than a gully, cut in unconsolidated materials. General synonym (not preferred) - gulch. Compare - arroyo, draw, gully.

reef - (a) A ridge-like or mound-like structure, layered or massive, built by sedentary calcareous organisms, especially corals, and consisting mostly of their remains; it is wave-resistant and stands above the surrounding contemporaneously deposited sediment. Also, such a structure built in the geologic past and now enclosed in rock, commonly of differing lithology. (b) A mass or ridge of rocks, especially coral and sometimes sand, gravel, or shells, rising above the surrounding sea or lake bottom to or nearly to the surface, and dangerous to navigation; specifically such a feature at 10 fathoms (18.3 m) or less, formerly 6 fathoms (11 m).

ridge - A long, narrow elevation of the land, usually sharp crested with steep sides and forming an extended upland between valleys. The term is used in areas of both hill and mountain relief.

rill - A very small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water, usually during and immediately following moderate rains or after ice/snow melt. Generally, a rill is not an obstacle to wheeled vehicles and is shallow enough to be obliterated by ordinary tillage. Compare - gully.

rim - The border, margin, edge, or face of a landform, such as the curved brim surrounding the top part of a crater or caldera; specifically the rimrock of a plateau or canyon.

rise - (refer to lake plain) (a) A general term for a slight increase in slope and elevation of the land surface, usually with a broad summit and gently sloping sides. (b) same as (a) but the term is restricted to microfeatures in areas of very low relief such as lake plains or coastal plains.

river - (a) A general term for a natural, freshwater surface stream of considerable volume and generally with a permanent base flow, moving in a defined channel toward a larger river, lake, or sea. (b) (not recommended: colloquial - New England, US) A small watercourse which elsewhere in the US is known as a *creek*. Compare - stream.

river valley - an elongate depression of the Earth's surface; carved by a river during the course of its development. Compare - valley side, valley floor.

rockfall - The process, associated sediments (rockfall deposit) or resultant landform characterized by a very rapid type of *fall* dominated by downslope movement of detached rock bodies which fall freely through the air or by leaps and bounds (lacks an underlying slip face); also spelled rock fall. Compare - debris fall, soil fall, landslide.

rock pediment - An erosion surface of low relief, cut directly into and across bedrock and composed of either bare rock or thinly veneered pediment or residuum (e.g. < 1.5 m) over bedrock; it occurs along the flanks of mountain fronts, or at the base of mountains or high hills. Its surface grades to the backwearing mountain slopes or hillslopes above, and generally grades down to and merges with a lower-lying alluvial plain, piedmont slope or valley floor below.

rotational slide - The process, associated sediments (rotational landslide deposit) or resultant landforms characterized by an extremely slow to moderately rapid type of slide, composed of comparatively dry and largely soil-rock materials, portions of which remain largely intact and in which movement occurs along a well-defined, concave shear surface and resulting in a backward rotation of the displaced mass. The landform may be single, successive (repeated up and down slope), or multiple (as the number of slide components increase). Compare - rotational debris slide, rotational earth slide, rotational rock slide, translational slide, lateral spread, landslide.

rubble - An accumulation of loose angular rock fragments, commonly overlying outcropping rock; the unconsolidated equivalent of a breccia. Compare - scree, talus.

saddle - A low point on a ridge or interfluvium, generally a divide (pass, col) between the heads of streams flowing in opposite directions. Compare - summit, crest.

sandhills - A region of semi-stabilized sand dunes or sandy hills, either covered with vegetation or bare, as in north-central Nebraska and the midlands of the Carolinas.

sand plain - (a) A sand-covered plain which may originate by deflation of sand dunes, and whose lower limit of erosion is governed by the ground-water level. Also spelled *sandplain*. (b) (not preferred - refer to *sandy* outwash plain) A small outwash plain composed chiefly of sand deposited by meltwater streams flowing from a glacier.

sand ramp - A sand sheet blown up onto the lower slopes of a bedrock hill or mountain and forming an inclined plane, sometimes filling small mountain-side valleys and even crossing low passes. Compare - climbing dune, sand sheet.

sand sheet - A large, irregularly shaped, commonly thin, surficial mantle of eolian sand, lacking the discernible slip faces that are common on dunes.

scarp - An escarpment, cliff, or steep slope of some extent along the margin of a plateau, mesa, terrace, or structural bench. A scarp may be of any height. Compare - escarpment.

scarp slope - The relatively steeper face of a cuesta, facing in a direction opposite to the dip of the strata. Compare - dip slope.

scree - A collective term for an accumulation of coarse rock debris or a sheet of coarse debris mantling a slope. Scree is not a synonym of talus, as scree includes loose, coarse fragment material on slopes without cliffs. Compare - talus, colluvium, mass movement.

scree slope - A portion of a hillside or mountainslope mantled by scree and lacking an up-slope rockfall source (i.e. cliff). Compare - talus slope, scree, talus.

seep - (noun) An area, generally small, where water or oil percolates slowly to the land surface. For water, it may be considered as a seepage spring, but it is used by some for flows too small to be considered as springs.

shoulder - The hillslope profile position that forms the convex, erosional surface near the top of a hillslope. If present, it comprises the transition zone from summit to backslope. Compare - summit, crest, backslope, footslope, and toeslope.

shrub-coppice dune - A small, streamlined dune that forms around brush and clump vegetation.

side slope - A laterally planar area of a hillside, resulting in predominantly parallel overland water flow (e.g., sheet wash); contour lines generally form straight lines. Side slopes are dominated by colluvium and slope wash sediments. Slope complexity (downslope shape) can range from simple to complex. Compare - head slope, nose slope, free face, interfluvium, crest, base slope. The slope bounding a drainageway and lying between the drainageway and the adjacent interfluvium. It is generally linear along the slope width.

slide - (a) Mass movement processes, associated sediments (slide deposit) or resultant landforms (e.g., rotational, translational, and snow slide) characterized by a failure of earth, snow, or rock under shear stress along one or several surfaces that are either visible or may reasonably be inferred. The moving mass may or may not be greatly deformed, and movement may be rotational (rotational slide) or planar (translational slide). A slide can result from lateral erosion, lateral pressure, weight of overlying material, accumulation of moisture, earthquakes, expansion owing to freeze-thaw of water in cracks, regional tilting, undermining, fire, and human agencies. Compare -fall, topple, lateral spread, flow, complex landslide. (b) The track of bare rock or furrowed earth left by a slide. (c) The mass of material moved by or deposited by a slide.

slip face - The steeply sloping surface of a dune, standing at or near the angle of repose of loose sand, and advancing downwind by a succession of slides wherever that angle is exceeded.

slope - (also called slope gradient or gradient) The inclination of the land surface from the horizontal. Percent slope is the vertical distance divided by the horizontal distance, then multiplied by 100.

slope alluvium - Sediment gradually transported down mountain or hill slopes primarily by non-channel alluvial processes (i.e., slope wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of coarse fragments and may be separated by stone lines. Sorting of pebbles or cobbles and burnished peds distinguish these materials from unsorted colluvial deposits. Compare - colluvium, slope wash.

slope wash - A collective term for non-fluvial, incipient alluvial processes (e.g. overland flow, minor rills) that detach, transport, and deposit sediments down hill and mountain slopes. Related sediments (*slope alluvium*) exhibit nominal sorting or rounding of particles, peds, etc., and lateral sorting downslope on long slopes; stratification is crude and intermittent and readily destroyed by pedoturbation and frost action. Also called *slope wash processes*. Compare - slope alluvium, colluvium, valley-side alluvium.

slot canyon - A long, narrow, deep and tortuous channel or drainageway with sheer rock walls eroded into sandstone or other sedimentary rocks, especially in the semi-arid western US (e.g. Colorado Plateau); subject to flash flood events; depth to width ratios exceed 10:1 over most of its length and can approach 100:1; commonly containing unique ecological communities distinct from the adjacent, drier uplands.

strath terrace - A type of stream terrace, formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

stream - (a) A body of running water that moves under gravity to progressively lower levels, in a relatively narrow but clearly defined channel on the ground surface, in a subterranean cavern, or beneath or in a glacier. It is a mixture of water and dissolved, suspended, or entrained matter. (b) A term used in quantitative geomorphology interchangeably with channel. Compare - river.

stream terrace - One or a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream, and representing the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition (i.e., currently very rarely or never floods; inactive cut and fill and/or scour and fill processes). Erosional surfaces cut into bedrock and thinly mantled with stream deposits (alluvium) are called "strath terraces." Remnants of constructional valley floors thickly mantled with alluvium are called alluvial terraces. Compare - alluvial terrace, flood-plain step, strath terrace, terrace.

strike valley - A subsequent valley eroded in, and developed parallel to the strike of, underlying weak strata; such as a cuesta; a valley that often, but not necessarily contains a strike valley.

structural bench - A platform-like, nearly level to gently inclined erosional surface developed on resistant strata in areas where valleys are cut in alternating strong and weak layers with an essentially horizontal attitude. Structural benches are bedrock controlled,

and in contrast to stream terraces, have no geomorphic implication of former, partial erosion cycles and base-level controls, nor do they represent a stage of flood-plain development following an episode of valley trenching. Compare - pediment, ledge; see scarp.

summit - (a) The topographically highest position of a hillslope profile with a nearly level (planar or only slightly convex) surface. Compare - shoulder, backslope, footslope, and toeslope, crest. (b) A general term for the top, or highest area of a landform such as a hill, mountain, or tableland. It usually refers to a high interfluvial area of relatively gentle slope that is flanked by steeper slopes, e.g., mountain fronts or tableland escarpments.

swale - (a) A shallow, open depression in unconsolidated materials which lacks a defined channel but can funnel overland or subsurface flow into a drainageway. Soils in swales tend to be more moist and thicker (cummulic) compared to surrounding soils. (b) A small, shallow, typically closed depression in an undulating ground moraine formed by uneven glacial deposition; Compare - swell-and-swale topography. (c) (not preferred; refer to interdune) A long, narrow, generally shallow, trough-like depression between two beach ridges, and aligned roughly parallel to the coastline.

syncline - (a) A unit of folded strata that is concave upward whose core contains the stratigraphically younger rocks, and occurs at the earth's surface. In a single syncline, beds forming the opposing limbs of the fold dip toward its axial plane. Compare - monocline, syncline, fold. (b) A fold, at any depth, generally concave upward whose core contains the stratigraphically younger rocks.

tableland - A term for a broad upland with an extensive, nearly level or undulating summit area and steep side slopes descending to surrounding lowlands. Compare - plateau, mesa, cuesta.

talus - Rock fragments of any size or shape (usually coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of loose broken rock formed chiefly by falling, rolling, or sliding. Compare - talus slope, colluvium, mass movement, scree.

talus cone - A small, steep, cone-shaped landform at the base of a cliff or escarpment, that heads in a relatively small declivity or ravine, and composed of poorly sorted rock and soil debris that has accumulated primarily by episodic rockfall or, to a lesser degree, by slope wash. Not to be confused with an *alluvial cone*; a similar feature but of fluvial origin, composed of better stratified and more sorted material, and that tapers up into a more extensive drainageway. Compare - alluvial cone, beveled base, talus slope.

talus slope - a portion of a hillslope or mountainslope mantled by talus and lying below a rockfall source (e.g. cliff). Compare - scree slope, scree, talus. Compare - beveled base.

tank - (colloquial: southwestern US) A natural depression or cavity in impervious rocks in which water collects and remains for the greater part of the year.

terrace - A step-like surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, or lake or sea shore. The term is usually applied to both the relatively flat summit surface (tread), cut or built by stream or wave action, and the steeper slope (scarp, riser), descending to a lower base level. Compare - stream terrace, flood-plain step. Practically, terraces are considered to be generally flat alluvial areas above the 100 yr. flood stage.

terraces - Small, irregular step-like forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock such as sheep or cattle. Synonyms (not preferred) - catstep, sheep or cattle track.

toeslope - The hillslope position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear, and are constructional surfaces forming the lower part of a hill-slope continuum that grades to valley or closed-depression floors. Compare - summit, shoulder, backslope, footslope, valley floor.

translational slide - A category of mass movement processes, associated sediments (translational slide deposit) or resultant landforms characterized by the extremely slow to moderately rapid downslope displacement of comparatively dry soil-rock material on a surface (slip face) that is roughly parallel to the general ground surface, in contrast to falls, topples, and rotational slides. The term includes such diverse *slide* types as translational debris slides, translational earth slide, translational rock slide, block glides, and slab or flake slides. Compare - rotational slide, slide, landslide.

transverse dune - A very asymmetric sand dune elongated perpendicular to the prevailing wind direction, having a gentle windward slope and a steep leeward slope standing at or near the angle of repose of sand; it generally forms in areas of sparse vegetation. Compare - longitudinal dune.

valley - An elongate, relatively large, externally drained depression of the Earth's surface that is primarily developed by stream erosion or glacial activity. Compare - basin.

valley floor - A general term for the nearly level to gently sloping, lowest surface of a valley. Landforms include axial stream channels, the flood plain, flood-plain steps, and, in some areas, low terrace surfaces. Compare - flood-plain landforms, meander, braided channel, valley side.

valley side - The sloping to very steep surfaces between the valley floor and summits of adjacent uplands. Well-defined, steep valley sides have been termed valley walls (not recommended). Note: Scale, relief, and perspective may require use of closely related terms such as hill slope or mountain slope.

wash (dry wash) - (colloquial: western US.) The broad, flat- floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in alluvium. Note: When channels reach intersect zones of ground-water discharge they are more properly classed as "intermittent stream" channels. Synonym - arroyo. Compare - gully.

zibar - A small, low-relief sand dune that lacks discernible slip faces and commonly occurs on sand sheets, in interdune areas, or in corridors between larger dunes. Zibar spacing can range from 50-400 m with local relief < 10 m. Unlike coppice dunes, zibars are unrelated to deposition around vegetation. Generally dominated by coarse sand. Compare - dune, coppice dune.

CONSIDERATIONS FOR PLANNING

Planning for the day:

1. Safety and sustenance: Plenty of food, water, first-aid kit, raingear, sunscreen.
2. Field communications:
 - a. Develop a plan with team-mate for check-in time.
 - b. Does park staff know the area in which you will be working?
3. Make sure you have the right maps and photos.
4. Check your GPS receiver (Datum set to NAD83? WAAS on? Needs new batteries?).
5. Plan the day's mission before departing using a) USGS quads, b) aerial photos, c) Park/BLM/FS maps.
6. Considerations for mission planning:
 - a. Plan travel based on topography, best access routes, density and complexity of vegetation (more time for forest and woodland sites, less for herbaceous and shrub).
 - b. Plan data collection based on priority needs; new types get higher priority.
 - c. Communicate to make sure you aren't duplicating effort when unnecessary.

Planning for the Week (do this on the first day of the trip)

1. Do you have all appropriate maps, photos?
2. Develop a reasonable estimate of the number of plots for each team broken up by day and based on an estimate of individual team's travel logistics for the week.
3. Develop plan of attack for the week to capture all essential associations in the work area.
4. Balance points two and three above with the expected work schedule of the teams and ensure adequate time-off and reduce over-time concerns.
5. Do you have all necessary information and backups for the week's planning? E.g., blank field forms, film, plenty of batteries.

Wrapup

1. Clean, recharge and repair equipment.
2. Hold brief meeting to discuss data collection issues, things that came up during the day/week, and plan for next days activities.
3. Edit field forms and file them systematically.
4. Re-file the aerial photos and maps.
5. Download flashcards.
6. Key unknown plants.
7. Enter edited data into database.

Communicate among teams / Topics for wrap-up meetings.

1. What were your questions about the sites visited daily/weekly?
2. Do you have any questions about the forms or fields?
3. What was accomplished, what was not accomplished?
4. Pass on developments and questions, e.g., were there problems with interpreting the aerial photos, or are there personnel issues, problems in consistency in interpreting the forms, or with park-related logistics?

Materials Checklist

- Site research permit
- Topo maps
- Site maps for general navigation
- Digital orthophoto for easy reference
- Geology map
- Aerial photos
- Compass with adjustable declination
- Clinometer
- GPS receiver
- Plenty of AA batteries for GPS receivers, walkie talkies, etc.
- Radio or walkie talkie and/or cell phone
- Digital camera and flash cards
- Baggies for temporary storage of unknown plants, and masking tape for labeling
- Plant press & paper
- Plant Keys / Flora(s)
- Pens / sharpies
- Forms: observation point
- Clipboard/forms holder
- Pens, pencils, pencil lead, slate board, chalk, and chalkboard eraser
- Most recent version of provisional classification of the park
- All ancillary information (cheat sheet, species list, floras, main sampling protocol).
- First aid kit, personal gear (food, water, rain gear, etc.)

**BIOLOGICAL SURVEY
ATTACHMENT B**

DESCRIPTION OF FEDERALLY LISTED SPECIES

Black-footed Ferret (*Mustela nigripes*)

Hudspeth County

The black-footed ferret was listed as a federally endangered species on March 11, 1967.

Distribution: The black-footed ferret is found in shortgrass prairies. Historically, the black-footed ferret was found in the Trans-Pecos region of Texas, as well as other regions of Texas; however, it has not been observed in Texas since 1963.

Natural History

This carnivore is shaped like a mink, but the dorsal color is yellowish brown or buff, with a brownish wash on the back; belly is slightly paler; tail tip and feet are black or at least dark; the face has a dark mask around the eyes, with white on the face above and below the mask [Whitaker 1996] (NatureServe).

Black-footed ferrets rely on prairie dogs for food and shelter. Prairie dogs make up 90 percent of their diet. Ferrets hunt mostly at night. They live in burrows made by prairie dogs. Approximately 100 acres of prairie dog colony are needed to support one ferret family (a female and her young).

Habitat: Shortgrass prairies are ideal habitat for black-footed ferrets.

Threats: The primary threat to black-footed ferrets is habitat loss due to agriculture. In addition, their main prey, the prairie dog, has been severely reduced through trapping and hunting to protect grasslands for livestock.

NatureServe. 2007. Black-footed ferret Ecology. Accessed on-line at: www.natureserve.org

Hinkley's Oak (*Quercus hinkleyi*)

Presidio County

Hinkley's oak was listed as a federally threatened species on August 26, 1988.

Distribution: Hinkley's oak is found in the Trans-Pecos region of west Texas.

Natural History

Hinkley's oak is a dwarf, evergreen, multi-branched shrub that forms thickets about 1.2 meters tall. It has small, waxy, gray-green leaves less than approximately 15 centimeters long. The leaves are round or oval with wavy margins and coarse, spiny teeth.

This unique shrub produces small acorns in the fall. The acorns are solitary or paired, oval, brown, and about 1.5 centimeters wide. Reasons for the decline of this species include limited distribution, climate change, and low reproduction.

Habitat: Hinkley's oak grows on dry, rocky limestone slopes in desert scrub communities of west Texas.

Threats: Hinkley's oak has declined within its range due to limited distribution, climate change, and low reproduction.

Texas Parks and Wildlife Department. Accessed on-line at:

<http://www.tpwd.state.tx.us/huntwild/wild/species/hinkley/>

Gray Wolf (*Canis lupus*)

Hudspeth County

The gray wolf was listed as federally endangered on March 11, 1967.

Distribution: Currently extirpated from Texas.

Natural History

The gray wolf is a close relative of domestic dogs. Its thick fur ranges in color from creamy white to reddish-brown and shades of gray and black. Gray wolves are the largest species of wolf and may be 22–40 kilograms in weight and about 1.2–1.5 meters long. Adult males are larger than adult females.

Gray wolves breed once a year. They mate in late winter, and pups are born in the spring. Dens are usually ground burrows excavated in slopes where rocks will function to support the roof of the tunnel and burrow. Both parents and other pack members, if present, will bring food to the young, which average about five pups in a litter. The bond between mated wolves is very strong and commonly lasts their lifetime. Gray wolves can live up to 15 years.

Gray wolves are carnivores that prey on large herbivores such as deer and Pronghorn antelope, but they will also eat rabbits, ground squirrels, and mice. The decline of the gray wolf has been attributed mostly to predator control by humans. In the late 1800s and early 1900s, ranchers killed wolves to prevent loss of livestock and wild ungulates such as deer. In those days, even people living in the towns and cities feared wolves and applauded their demise. Predator control was so successful that few individuals remained. Reintroduction efforts of captive-bred individuals have been difficult to initiate due to residual fears for livestock and people, as well as a lack of large, remote tracts of suitable habitat.

Habitat: Gray wolves are found in forests, brushlands, or grasslands where suitable cover and denning sites are available.

Threats: The primary reasons that the gray wolf was extirpated from its range was loss of habitat and widespread hunting, both for sport and to protect livestock.

Texas Parks and Wildlife Department. 2007. *Gray Wolf Species Profile*. Accessed on-line at: <http://www.tpwd.state.tx.us/huntwild/wild/species/graywolf/>

Interior Least tern (*Sterna antillarum athalassos*)

Hudspeth County

The interior population of the least tern was listed as endangered on June 27, 1985.

Distribution: The historic breeding range of the least tern included the Mississippi and Red Rivers and the Rio Grande. The breeding range extended from Texas to Montana and from eastern Colorado and New Mexico to southern Indiana. Currently, the least tern maintains breeding grounds on all these river systems, although suitable habitat has dwindled. In Texas, populations have been observed on the Red River system and along the Texas/Oklahoma border as far east as Burkburnett, Texas. Least terns have been observed on three reservoirs (including Amistad Reservoir in Val Verde County) along the Rio Grande and along the Pecos River at the Bitter Lake National Wildlife Refuge, New Mexico (USFWS 1990).

Natural History

Habitat: Along river systems such as the Rio Grande, least terns nest on sparsely vegetated sand and gravel bars along a wide, unobstructed river channel or salt flats along lake shorelines. Least terns also have been observed to nest on artificial habitats such as sand and gravel pits and dredge islands (USFWS 1990).

Breeding: Least terns reside on the breeding grounds for 4–5 months arriving from late April to early June. Nests are shallow depressions in open, sandy areas, gravelly patches, or exposed flats. The tern nests in colonies. Clutch size is usually two or three eggs, which are laid by late May. Incubation lasts 20–25 days, and fledging occurs after three weeks. Parental attention continues until migration at the end of the breeding season (USFWS 1990).

Diet: The least tern is a fish eater that hunts in the shallow waters of rivers, streams, and lakes. Fish prey is small-sized and include the following genera: *Fundulus*, *Notropis*, *Campostoma*, *Pimephales*, *Gambusia*, *Blonesox*, *Morone*, *Dorosoma*, *Lepomis* and *Carpionides*. They usually hunt near their nesting sites (USFWS 1990).

Threats: The taming of wild river systems for irrigation, navigation, hydroelectric power, and recreation has altered the river channels that the least tern depends on for breeding grounds. Stabilized river systems eliminate most of the sandbars that terns utilize for breeding grounds by channeling wide, braided rivers into single, narrow navigation channels.

U.S. Fish and Wildlife Service. 1990. *Recovery Plan for the Interior Population of the Least Tern (Sterna Antillarum)*. U.S. Fish and Wildlife Service, Twin Cities, Minnesota. 90 pp.

**Greater Long-Nosed Bat (Also called Mexican Long-Nosed Bat)
(Leptonycteris nivalis)**

Presidio County

The Mexican long-nosed bat was designated as a federally endangered species on March 30, 1988.

Distribution: The range of the Mexican long-nosed bat includes medium to high elevations in northern and central Mexico, southwestern Texas (southern Brewster and Presidio counties), and southwestern New Mexico. They typically exist at elevations of approximately 500 to 3,000 meters.

In Texas, the species is known from the Big Bend National Park and Chinati Mountain area. The only colonial roost in the United States is a cave at Emory Peak, at an elevation of 2,290 meters in the Chisos Mountains, Texas (NatureServe).

Natural History

Habitat: Habitats include desert scrub, open conifer-oak woodlands, and pine forests in the Upper Sonoran and Transition Life Zones, generally arid areas where agave plants are present (USFWS 1994). Colonies roost in caves (or similar mines and tunnels), sometimes in culverts, hollow trees, or unused buildings. Roosting habitat requirements are not well known.

Breeding: Litter size normally is 1. Young are born apparently in spring (April-June) in Mexico before females arrive in Texas; no records exist of pregnant females from Texas. In Texas, lactating females have been observed in June-July, flying juveniles in late June. Weaned in July or August (NatureServe).

Diet: THE MEXICAN LONG-NOSED BAT MAINLY EATS nectar and pollen of saguaro and organ pipe cacti, and paniculate agaves. They also eat insects associated with flowers, and probably some fruits, especially in the south.

In Texas, nectar of the mescal and Chisos agave flowers probably are the main food. This bat emerges to feed relatively late in the evening.

Threats: Although the Mexican long-nosed bat is widely distributed in southern Texas, southwestern New Mexico, and Mexico, it is declining; however, population trends are not well documented. They are threatened primarily by the disturbance of roosts and loss/degradation of foraging habitat (NatureServe).

NatureServe. 2007. Mexican Long-Nosed Bat. Accessed on-line at www.natureserve.org.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

Hudspeth and Presidio County

The southwest willow flycatcher was designated as a federally endangered species on March 29, 1995.

Natural History

Habitat: The southwestern willow flycatcher occurs in dense riparian habitats along streams, rivers, and other wetlands. At low elevations, the flycatcher breeds in stands of dense cottonwood, willow, and tamarisk thickets, as well as other lush woodland areas near water

Breeding: The southwestern willow flycatcher is present on breeding grounds by mid-May. By late May, nests are built, usually in a branched tree fork near the water. Typically, three eggs are laid and then incubated for 12–13 days. Breeding success is heavily affected by predation and brown-headed cowbird parasitism.

Diet: The southwestern willow flycatcher is an insectivore, taking insects from the air, or picking them from the foliage.

Threats: Populations throughout its range are severely impacted by the destruction and loss of riparian habitats through development.

Northern Aplomado Falcon (*Falco femoralis septentrionalis*)

Hudspeth County

The northern aplomado falcon was designated as a federally endangered species on March 27, 1986.

Distribution: The geographic distribution of the northern aplomado falcon includes most of South America from Tierra del Fuego to Ecuador, and from sea level to 3,000 meters in the Andes. The falcon also inhabits areas in most of Latin America. The historic range includes areas of Texas, New Mexico, and Arizona. In Texas, they are still observed in south Texas and the Trans-Pecos region (USFWS 1990).

Natural History

Habitat: In populations found in the United States, northern aplomado falcons inhabited yucca-covered sand ridges in coastal prairies, riparian woodlands in open grasslands, and in desert grasslands with scattered mesquite (*Hilaria belangeri*) and yucca. They do not construct their own stick platform nests and must use abandoned nests of other species, including the Swainson's hawk (*Buteo swainsoni*), crested caracara (*Caracara cheriway*), and the Chihuahuan raven (*Corvus cryptoleucus*) (USFWS 1990).

Breeding: Most clutches are laid during April and May with a clutch size of 2–3 eggs. The incubation period is 31–32 days. The nestlings fledge at 32–40 days and are dependent on their parents for an additional four weeks after fledging (USFWS 1990).

Diet: Northern aplomado falcons prey on a variety of small birds, insects, rodents, and reptiles. Preferred bird species include doves, cuckoos, woodpeckers, blackbirds, flycatchers, thrushes, and other fringillids that feed in trees. Common insect species include grasshoppers, beetles, dragonflies, cicadas, crickets, butterflies, moths, wasps, and bees (USFWS 1990).

Threats: Populations in the United States experienced a severe decline due to loss of habitat from over-grazing and encroachment of agricultural lands on traditional northern aplomado falcon habitat. The use of DDT during the 1970s also caused a decline in populations due to the inability of falcons to produce viable eggs. Overall, the greatest threat to populations in the United States is habitat loss through development (USFWS 1990).

U.S. Fish and Wildlife Service. 1990. *Northern Aplomado Falcon Recovery Plan*. U.S. Fish and Wildlife Service. Albuquerque, New Mexico. 56 pp.

Mexican Spotted Owl (*Strix occidentalis lucida*)

Hudspeth County

The Mexican spotted owl was designated as a federally threatened species on March 16, 1993. In the state of Texas, it is also designated as a threatened species.

Distribution: In Texas, Mexican spotted owls occur in the Guadalupe Mountains near the New Mexico border. In 1990, it was estimated that the Mexican spotted owl population for the southwestern United States was 2,160 birds, extremely rare and local in Texas.

Natural History: Mexican spotted owls have dark eyes. They are an ashy-chestnut brown color with white and brown spots on their abdomen, back, and head. Their brown tails are marked with thin white bands.

Woodrats, mice, pocket gophers, birds, and insects make up the Mexican spotted owl's diet. These owls hunt at night, moving from tree to tree, pausing to look and listen for prey. Their nests consist of stick platforms made by other birds, in tree cavities, and on cliff ledges, and they lay 1 to 3 eggs during March or April. Most owlets (baby owls) leave the nest in June, about 35 days after hatching. Owlets are unable to fly very well when they first leave the nest, and their parents continue to feed them until they become fully independent, usually by October. The owls prefer the coolest part of the forest, often choosing nest trees on the northern or eastern-facing slopes. Nests on cliffs in Texas are at 5,000 to 7,000 feet elevation in deep, cool canyons.

Threats: The Mexican spotted owl has declined because of habitat loss and alteration. Harvest of old-growth timber stands, even-aged timber harvest systems, and wildfires have contributed to loss of habitat.

Rio Grande silvery minnow (*Hybognathus amarus*)

Maverick County

The Rio Grande silvery minnow was listed as a federally endangered fish on July 20, 1994.

Distribution: Historically the Rio Grande silvery minnow occurred in the Rio Grande and Pecos River systems in Texas, New Mexico, and Mexico. The range of the Rio Grande silvery minnow is currently drastically reduced and occurs only in perennial sections of the Rio Grande in New Mexico (NatureServe 2007).

Natural History

Habitat: The Rio Grande silvery minnow prefers large freshwater streams with slow to moderate current over mud, sand, or gravel bottoms, perennial sections of the Rio Grande, and irrigation canals [Sublette et al. 1990]. It spawns probably in still waters over sandy-silt bottoms [Sublette et al. 1990] (NatureServe 2007).

Diet: The diet of the Rio Grande silvery minnow is assumed to be the same as others in the Genus *Hybognathus*: diatoms, algae, larval insect skins, and plant material scraped from ooze in bottom sediment [Sublette et al. 1990] (NatureServe 2007).

Threats: Survival continues to be threatened by habitat degradation and flow modifications, introduction of non-native fishes, and lack of adequate refugia during periods of low or no flow (NatureServe).

NatureServe. 2007. Rio Grande silvery minnow. Accessed on-line at:
<http://www.natureserve.org>

U.S. Fish and Wildlife Service. 2007. *Draft Revised Recovery Plan*. Accessed on-line at: http://ecos.fws.gov/docs/recovery_plan/070118a.pdf

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**BIOLOGICAL SURVEY
ATTACHMENT C**

GIS PRODUCTS

GIS PRODUCTS

GIS Interactice File

Access Database for PF225

GIS Layer: Vegetation Database

Maps Including Vegetation Layer

Field Photographs

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**BIOLOGICAL SURVEY
ATTACHMENT D**

NO EFFECT DETERMINATION

Listed Species/Habitat No Effect Determination

Construction, Maintenance, and Operation of Tactical Infrastructure for:

- L-1 Neely's Crossing, Sierra Blanca Station, fence
- L-1A Presidio POE to 3.2 mi E of POE, Presidio Station, fence
- L1-B Presidio POE to 3.2 mi W of POE, Presidio Station, fence

Hudspeth and Presidio Counties, Texas

December 31, 2007

U.S. Department of Homeland Security
U.S. Customs and Border Protection
U.S. Border Patrol Marfa Sector
Sierra Blanca Station
Presidio Station

U.S. Customs and Border Protection and the USBP are planning to install and operate tactical infrastructure consisting of pedestrian fence and associated patrol roads, access roads, and lights along three segments along the U.S./Mexico international border in Hudspeth and Presidio Counties, Texas.

The following federally listed species and habitats are known to occur within 25 miles of the international border in Hudspeth County:

SPECIES	LISTING STATUS	DETERMINATION
Least tern, <i>Sterna antillarum</i>	endangered	no effect
Whooping crane, <i>Grus Americana</i>	endangered	no effect
Whooping crane, critical habitat	designated	no effect
Piping plover, <i>Charadrius melodus</i>	endangered	no effect
Piping plover, critical habitat	designated	no effect
Northern aplomado falcon, <i>Falco femoralis septentrionalis</i>	endangered	no effect
Southwestern willow flycatcher, <i>Empidonax trailii extimus</i>	endangered	no effect
Southwestern willow flycatcher, critical habitat	proposed	no effect
Mexican spotted owl, <i>Strix occidentalis lucida</i>	threatened	no effect

The following federally listed species and habitats are known to occur within 25 miles of the international border in Presidio County:

SPECIES	LISTING STATUS	DETERMINATION
Northern aplomado falcon, <i>Falco femoralis septentrionalis</i>	endangered	no effect
Whooping crane, <i>Grus Americana</i>	endangered	no effect
Whooping crane, critical habitat	designated	no effect
Piping plover, <i>Charadrius melodus</i>	endangered	no effect
Piping plover, critical habitat	designated	no effect
Least tern, <i>Sterna antillarum</i>	endangered	no effect
Southwestern willow flycatcher, <i>Empidonax trailii extimus</i>	endangered	no effect
Southwestern willow flycatcher, critical habitat	proposed	no effect
Mexican long-nosed bat, <i>Leptonycteris nivalis</i>	endangered	no effect
Hinckley oak, <i>Quercus hinckleyi</i>	threatened	no effect
Lloyd's Mariposa cactus, <i>Sclerocactus mariposensis</i>	threatened	no effect

Determination

The Service identified species that are listed under the ESA that occur in Hudspeth and Presidio Counties, Texas. These species are: least tern, Northern aplomado falcon, southwestern willow flycatcher, piping plover, whooping crane, Mexican spotted owl, Mexican long-nosed bat, Lloyd's Mariposa cactus, and Hinckley oak. Documented below are anticipated effects to listed species if the Project is implemented.

The species listed above are known to occur in the area; however, the location of the fencing in the Marfa Project, Sections L-1, L-1A, L-1B, will be on an existing levee. Prior construction of this levee resulted in the loss of any potential habitat for these species in the project area. In addition, the levee has ongoing maintenance and operations disturbances that prevent restoration of any habitat in the area, and there is an existing road on the top of the levee where the fence will be placed. The levee is subject to frequent border patrolling, and any disturbance from this activity is not expected to increase disturbances to the species beyond those already occurring.

Based on the information above and the description of the Project as follows, we have determined that there will be no effect to the species listed in Hudspeth and Presidio Counties, Texas for the Marfa Sector.

Project Description

The Project includes the construction and operation of tactical infrastructure, including primary pedestrian fence and associated access and patrol roads, along approximately 10.73 miles of the U.S./Mexico international border in Hudspeth and Presidio Counties, Texas. The Project will be implemented in three distinct segments, ranging from approximately 2.9 miles to 4.63 miles in length. The proposed corridor will impact approximately 60 feet and includes the fence and patrol roads. Vegetation will be cleared and grading will occur as necessary. A permanent impact area of 78 acres will occur.

Design criteria based on USBP operational needs specify that, at a minimum, any fencing must meet the following requirements:

- Built 15 to 18 feet high and extending below ground
- Capable of withstanding vandalism, cutting, or various types of penetration
- Semi transparent, as dictated by operational need
- Designed to survive extreme climate changes
- Designed to reduce or minimize impacts on small animal movements
- Engineered to not impede the natural flow of surface water
- Aesthetically pleasing to the extent possible.

For Section L-1, the fence construction will be a "bollard floating" fence and placed atop the levee. For Sections L-1A and L-1B, the fencing will include the

construction of new levee retaining wall on the side of the existing levee facing the Rio Grande. There will be a break in the fence at Cibolo Creek. A patrol road will be inserted that will run around the perimeter of the creek crossing at a suitable point.

**BIOLOGICAL SURVEY
ATTACHMENT E**

MARFA SECTOR SPECIES LISTS

Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status
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Order Didelphimorphia (opossum and allies)

Family Didelphidae (opossums)

<i>Didelphis virginiana</i>	Virginia Opossum	G5/S5		
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Order Insectivora (shrews and moles)

Family Soricidae (shrews)

<i>Notiosorex crawfordi</i>	Desert Shrew	G5		
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Family Talpidae (moles)

<i>Scalopus aquaticus</i>	Eastern Mole	G5		
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Order Chiroptera (bats)

Family Mormoopidae (mormoopid bats)

<i>Mormoops megalophylla</i>	Ghost-faced Bat	G4		
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Family Phyllostomidae (leaf-nosed bats)

<i>Choeronycteris mexicana</i>	Mexican Long-tongued Bat	G4		
<i>Leptonycteris nivalis</i>	Mexican Long-nosed Bat	G3	E	E

Family Vespertilionidae (vespertilionid bats)

<i>Antrozous pallidus</i>	Pallid Bat	G5		
<i>Eptesicus fuscus</i>	Big Brown Bat	G5		
<i>Lasionycteris noctivagans</i>	Silver-haired Bat	G5		
<i>Lasiurus blossevillii</i>	Western Red Bat	G5		
<i>Lasiurus borealis</i>	Eastern Red Bat	G5		

Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status
<i>Lasiurus cinereus</i>	Hoary Bat	G5		
<i>Myotis californicus</i>	California Myotis	G5		
<i>Myotis ciliolabrum</i>	Western Small-footed Myotis	G5		
<i>Myotis thysanodes</i>	Fringed Myotis	G4G5		
<i>Myotis velifer</i>	Cave Myotis	G5		
<i>Myotis volans</i>	Long-legged Myotis	G5		
<i>Myotis yumanensis</i>	Yuma Myotis	G5		
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat	G5		
<i>Pipistrellus hesperus</i>	Western Pipistrelle	G5		
<i>Plecotus townsendii</i>	Townsend's Big-eared Bat	No NS Record		
Family Molossidae (free-tailed bats)				
<i>Eumops perotis</i>	Western Mastiff Bat	G5		
<i>Tadarida brasiliensis</i>	Brazilian Free-tailed Bat	G5		
Order Lagomorpha (hares and rabbits)				
Family Leporidae (hares and rabbits)				
<i>Lepus californicus</i>	Black-tailed Jackrabbit	G5		
<i>Sylvilagus audubonii</i>	Desert Cottontail	G5		
<i>Sylvilagus floridanus</i>	Eastern Cottontail	G5		
<i>Sylvilagus robustus</i>	Eastern Cottontail	G3		
Order Rodentia (rodents)				
Family Sciuridae (squirrels and allies)				
<i>Ammospermophilus interpres</i>	Texas Antelope Squirrel	G4G5		
<i>Cynomys ludovicianus</i>	Black-tailed Prairie Dog	G4		

Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status
<i>Neotamias canipes</i>	Gray-footed Chipmunk	G4		
<i>Spermophilus mexicanus</i>	Mexican Ground Squirrel	G5		
<i>Spermophilus spilosoma</i>	Spotted Ground Squirrel	G5		
<i>Spermophilus variegatus</i>	Rock Squirrel	G5		
Family Geomyidae (pocket gophers)				
<i>Cratogeomys castanops</i>	Yellow-faced Pocket Gopher	G5		
<i>Geomys arenarius</i>	Desert Pocket Gopher	G3		
<i>Geomys personatus</i>	Texas Pocket Gopher	G4		
<i>Thomomys bottae</i>	Botta's Pocket Gopher	G5		
Family Heteromyidae (pocket mice and kangaroo rats)				
<i>Chaetodipus eremicus</i>	Chihuahuan Desert pocket mouse	G5		
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse	G5		
<i>Chaetodipus intermedius</i>	Rock Pocket Mouse	G5		
<i>Chaetodipus nelsoni</i>	Nelson's Pocket Mouse	G5		
<i>Chaetodipus penicillatus</i>	Desert Pocket Mouse	No NS Record		
<i>Dipodomys elator</i>	Texas Kangaroo Rat	G2	T	
<i>Dipodomys merriami</i>	Merriam's Kangaroo Rat	G5		
<i>Dipodomys ordii</i>	Ord's Kangaroo Rat	G5		
<i>Dipodomys spectabilis</i>	Banner-tailed Kangaroo Rat	G5		
<i>Perognathus flavus</i>	Silky Pocket Mouse	G5		
<i>Perognathus merriami</i>	Merriam's Pocket Mouse	G5		
Family Castoridae (beavers)				
<i>Castor canadensis</i>	American Beaver	G5		

Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status
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Family Muridae (mice and rats)

<i>Mus musculus</i>	House Mouse	G5		
<i>Neotoma albigula</i>	White-throated Woodrat			
<i>Neotoma leucodon</i>	White-toothed Woodrat	G5		
<i>Neotoma mexicana</i>	Mexican Woodrat	G5		
<i>Neotoma micropus</i>	Southern Plains Woodrat	G5		
<i>Ondatra zibethicus</i>	Common Muskrat	G5		
<i>Onychomys arenicola</i>	Mearns' Grasshopper Mouse	G4G5		
<i>Onychomys leucogaster</i>	Northern Grasshopper Mouse	G5		
<i>Peromyscus boylii</i>	Brush Mouse	G5		
<i>Peromyscus eremicus</i>	Cactus Mouse	G5		
<i>Peromyscus leucopus</i>	White-footed Mouse	G5		
<i>Peromyscus maniculatus</i>	Deer Mouse	G5		
<i>Peromyscus nasutus</i>	Northern Rock Mouse	G5		
<i>Peromyscus pectoralis</i>	White-ankled Mouse	G5		
<i>Rattus norvegicus</i>	Norway Rat	G5		
<i>Rattus rattus</i>	Roof Rat	G5		
<i>Reithrodontomys fulvescens</i>	Fulvous Harvest Mouse	G5		
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	G5		
<i>Reithrodontomys montanus</i>	Plains Harvest Mouse	G5		
<i>Sigmodon hispidus</i>	Hispid Cotton Rat	G5		
<i>Sigmodon ochrognathus</i>	Yellow-nosed Cotton Rat	G4G5		

Family Erethizontidae (New World porcupines)

<i>Erethizon dorsatum</i>	Porcupine	G5		
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Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status
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Order Carnivora (carnivores)

Family Canidae (canids)

<i>Canis latrans</i>	Coyote	G5		
<i>Vulpes velox</i>	Swift or Kit Fox	G3		
<i>Urocyon cinereoargenteus</i>	Common Gray Fox	G5		

Family Ursidae (bears)

<i>Ursus americanus</i>	Black Bear	G5	T	
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Family Procyonidae (procyonids)

<i>Bassariscus astutus</i>	Ringtail	G5		
<i>Procyon lotor</i>	Common Raccoon	G5		

Family Mustelidae (mustelids)

<i>Conepatus mesoleucus</i>	Common Hog-nosed Skunk			
<i>Mephitis macroura</i>	Hooded Skunk	G5		
<i>Mephitis mephitis</i>	Striped Skunk	G5		
<i>Spilogale gracilis</i>	Western Spotted Skunk	G5		
<i>Taxidea taxus</i>	American Badger	G5		

Family Felidae (cats)

<i>Felis concolor</i>	Mountain Lion	G5		
<i>Lynx rufus</i>	Bobcat	G5		

Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status
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Order Artiodactyla (even-toed ungulates)

Family Suidae (pigs)

<i>Sus scrofa</i>	Feral Hog	G5		
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Family Dicotylidae (peccaries)

<i>Tayassu tajacu</i>	Collared Peccary	No NS Record		
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Family Cervidae (cervids)

<i>Cervus elaphus/canadensis</i>	Wapiti or Elk	G5		
<i>Odocoileus hemionus</i>	Mule Deer	G5		
<i>Odocoileus virginianus</i>	White-tailed Deer	G5		

Family Antilocapridae (pronghorn)

<i>Antilocapra americana</i>	Pronghorn	G5		
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Family Bovidae (bovids)

<i>Ammotragus lervia</i>	Barbary Sheep	G5		
<i>Antilope cervicapra</i>	Blackbrush Antelope	G3G4		
<i>Boselaphus tragocamelus</i>	Nilgai	G3G4		

Source: <http://www.nsrl.ttu.edu/tmot1/distribu.htm>

Key:

E = Endangered

T = Threatened

G2 = NatureServe Ranking; Imperiled

Mammals

Scientific Name	Common Name	Rankings	State Status	Federal Status
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G3 = NatureServe Ranking; Vulnerable to Exterpation or Extinction

G4 = NatureServe Ranking; Apparently Secure

G5 = NatureServe Ranking; Demonstratably Widespread, Abundant and Secure

S5 = NatureServe Ranking; State of Texas Demonstratably Widespread, Abundant and Secure

No NS Record = No record found in NatureServe Database

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Accipitridae				

<i>Accipiter cooperii</i>	Cooper's Hawk	G5/S4		
<i>Accipiter gentilis</i>	Northern Goshawk	G5		
<i>Accipiter striatus</i>	Sharp-shinned Hawk	G5/S2		
<i>Aquila chrysaetos</i>	Golden Eagle	G5/S3		
<i>Asturina (Buteo) nitidus</i>	Gray Hawk	G5/S2		
<i>Buteo albicaudatus</i>	White-tailed Hawk	G4G5/S4	T	
<i>Buteo albonotatus</i>	Zone-tailed Hawk	G4/S3	T	
<i>Buteo jamaicensis</i>	Red-tailed Hawk	G5/S5		
<i>Buteo lagopus</i>	Rough-legged Hawk	G5		
<i>Buteo lineatus</i>	Red-shouldered Hawk	G5/S4		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
<i>Buteo playpterus</i>	Broad-winged Hawk	G5/S3		
<i>Buteo regalis</i>	Ferruginous Hawk	G4/S2		
<i>Buteo swainsoni</i>	Swainson's Hawk	G5/S4		
<i>Buteogallus anthracinus</i>	Common Black-Hawk	G4G5/S2	T	
<i>Circus cyaneus</i>	Northern Harrier	G5/S2		
<i>Elanoides forficatus</i>	Swallow-tailed Kite	G5/S2	T	
<i>Elanus leucurus</i>	White-tailed Kite	G5/S4		
<i>Haliaeetus leucocephalus</i>	Bald Eagle	G5/S3	T	
<i>Ictinia mississippiensis</i>	Mississippi Kite	G5/S4		
<i>Pandion haliaetus</i>	Osprey	G5/S4		
<i>Parabuteo unicinctus</i>	Harris's Hawk	G5/S3		

Aegithalidae

Psaltriparus minimus

Alaudidae

Eremophila alpestris

Alcedinidae

Ceryle (Megaceryle) torquata

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
<i>Ceryle (Megaceryle) alcyon</i>	Belted Kingfisher	G5/S5		
<i>Chloroceryle Americana</i>	Green Kingfisher	G5/S4		
Anatidae				
<i>Aix sponsa</i>				
<i>Anas acuta</i>	Northern Pintail	G5/S3		
<i>Anas Americana</i>	American Wigeon	G5/S3		
<i>Anas clypeata</i>	Northern Shoveler	G5/S3		
<i>Anas crecca</i>	Green-winged Teal	G5/S2		
<i>Anas cyanoptera</i>	Cinnamon Teal	G5/S3		
<i>Anas discors</i>	Blue-winged Teal	G5/S3		
<i>Anas fulvigula</i>	Mottled Duck	G4/S4		
<i>Anas Penelope</i>	Eurasian Wigeon	G5/No TX	Record	
<i>Anas platyrhynchos</i>	Mallard	G5/S3		
<i>Anas querquedula</i>	Garganey	G5		
<i>Anas strepera</i>	Gadwall	G5/S3		
<i>Anser albifrons</i>	Greater White-fronted Goose	G5/S5		
<i>Aythya affinis</i>	Lesser Scaup	G5/S3		
<i>Aythya Americana</i>	Redhead	G5/S3		
<i>Aythya collaris</i>	Ring-necked Duck	G5/No TX	Record	

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
<i>Aythya marila</i>	Greater Scaup	G5/No TX Record		
<i>Aythya valisineria</i>	Canvasback	G5/S4		
<i>Branta Canadensis</i>	Canada Goose	G5/S5		
<i>Bucephala albeola</i>	Bufflehead	G5/No TX Record		
<i>Bucephala clangula</i>	Common Goldeneye	G5/No TX Record		
<i>Bucephala islandica</i>	Barrow's Goldeneye	G5		
<i>Chen caerulescens</i>	Snow Goose	G5/S5		
<i>Chen rossii</i>	Ross' Goose	G4/S3		
<i>Clangula hyemalis</i>	Long-tailed Duck	G5/No TX Record		
<i>Cygnus columbianus</i>	Tundra Swan	G5/No TX Record		
<i>Dendrocygna autumnalis</i>	Black-bellied Whistling-Duck	G5/S5		
<i>Dendrocygna bicolor</i>	Fulvous Whistling- Duck	G5/S4		
<i>Lophodytes cucullatus</i>	Hooded Merganser	G5/S3		
<i>Melanitta fusca</i>	White-winged Scoter	G5/No TX Record		
<i>Melanitta nigra</i>	Black Scoter	G5		
<i>Melanitta perspicillata</i>	Surf Scoter	G5/No TX Record		
<i>Mergus merganser</i>	Common Merganser	G5/No TX Record		
<i>Mergus serrator</i>	Red-breasted Merganser	G5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
<i>Nomonyx dominicus</i>	Masked Duck	G5/S3		
<i>Oxyura jamaicensis</i>	Ruddy Duck	G5/S3		
Anhingidae				
<i>Anhinga anhinga</i>				
Apodidae				
<i>Aeronautes saxatalis</i>				
<i>Chaetura pelagica</i>	Chimney Swift	G5/S3		
<i>Cypseloides niger</i>	Black Swift	G4		
Ardeidae				
<i>Ardea albus</i>	Great Egret	G5/S5		
<i>Ardea herodias</i>	Great Blue Heron	G5/S5		
<i>Botaurus lentiginosus</i>	American Bittern	G4/S3		
<i>Bubulcus ibis</i>	Cattle Egret	G5/Exotic		
<i>Butorides virescens</i>	Green Heron	G5/S5		
<i>Egretta caerulea</i>	Little Blue Heron	G5/S5		
<i>Egretta rufescens</i>	Reddish Egret	G4/S3	T	
<i>Egretta thula</i>	Snowy Egret	G5/S5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
<i>Egretta tricolor</i>	Tricolored Heron	G5/S5		
<i>Ixobrychus exilis</i>	Least Bittern	G5/S4		
<i>Nyctanassa violacea</i>	Yellow-crowned Night-Heron	G5/S4		
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	G5/S4		
Bombycillidae				
<i>Bombycilla cedrorum</i>	Cedar Waxwing	G5/N5		
Caprimulgidae				
<i>Caprimulgus carolinensis</i>	Chuck-will's-widdow	G5/S3		
<i>Caprimulgus vociferous</i>	Whip-poor-will	G5/S4		
<i>Chordeiles acutipennis</i>	Lesser Nighthawk	G5/S4		
<i>Chordeiles minor</i>	Common Nighthawk	G5/S4		
<i>Phalaenoptilus nuttallii</i>	Common Poorwill	G5/S4		
Cardinalidae				
<i>Cardinalis cardinalis</i>	Northern Cardinal	G5/S5		
<i>Cardinalis sinuatus</i>	Pyrrhuloxia	G5/S4		
<i>Passerina amoena</i>	Lazuli Bunting	G5/S3		
<i>Passerina caerulea</i>	Blue Grosbeak	G5/S4		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
<i>Passerina ciris</i>	Painted Bunting	G5/S4		
<i>Passerina cyanea</i>	Indigo Bunting	G5/S5		
<i>Passerina versicolor</i>	Varied Bunting	G5/S4		
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	G5/S4		
<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak	G5/S4		
<i>Spiza Americana</i>	Dickcissel	G5/S4		
Cathartidae				
<i>Cathartes aura</i>	Turkey Vulture	G5/S5		
<i>Coragyps atratus</i>	Black Vulture	G5/S5		
Certhiidae				
<i>Certhia Americana</i>	Brown Creeper	G5/S4		
Charadriidae				
<i>Charadrius alexandrius</i>	Snowy Plover	G4/S3		
<i>Charadrius melodus</i>	Piping Plover	G3/S2	T	T
<i>Charadrius montanus</i>	Mountain Plover	G2/S2		
<i>Charadrius semipalmatus</i>	Semipalmated Plover	G5/S4		
<i>Charadrius vociferous</i>	Killdeer	G5/S5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
<i>Pluvialis dominicus</i>	American Golden-Plover	G5/S3		
<i>Pluvialis squatarola</i>	Black-bellied Plover	G5/S4		
Ciconiidae				
<i>Mycteria Americana</i>	Wood Stork	G4/SH	T	
Cinclidae				
<i>Cinclus mexicanus</i>	American Dipper	G5		
Columbidae				
<i>Columba livia</i>	Rock Dove	G5/Exotic		
<i>Columbina inca</i>	Inca Dove	G5/S5		
<i>Columbina passerine</i>	Common Ground-Dove	G5/S4		
<i>Columbina talpacoti</i>	Ruddy Ground-Dove	G5/No TX Record		
<i>Leptotila verreauxi</i>	White-tipped Dove	G5/S4		
<i>Streptopelia decaucto</i>	Eurasian Collared-Dove	G5/Exotic		
<i>Zenaida asiatica</i>				
<i>Zenaida macroura</i>	Mourning Dove	G5/S5		
<i>Patagioenas fasciata</i>	Band-tailed Pigeon	G4		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
Corvidae				
<i>Corvus cryptoleucus</i>	Chihuahuan Raven	G5/S4		
<i>Cyanocitta cristata</i>	Blue Jay	G5/S5		
<i>Cyanocitta stelleri</i>	Steller's Jay	G5		
<i>Cyanocorax yncas</i>	Green Jay	G5/No TX Record		
<i>Aphelocoma californica</i>	Western Scrub-Jay	G5		
<i>Aphelocoma ultramarina</i>	Mexican Jay	G5		
<i>Gymnorhinus cyanocephalus</i>				
<i>Nucifraga columbiana</i>	Clark's Nutcracker	G5		
<i>Pica hudsonia</i>	Black-billed Magpie	G5		
Cuculidae				
<i>Coccyzus Americanus</i>	Yellow-billed Cuckoo	G5/S4		
<i>Coccyzus erythrophthalmus</i>				
<i>Crotophaga sulcirostris</i>	Groove-billed Ani	G5/S4		
<i>Geococcyx Californianus</i>	Greater Roadrunner	G5/S4		
Emberizidae				
<i>Aimophila botterii</i>	Botteri's Sparrow	G4/S3		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
<i>Aimophila cassinii</i>	Cassin's Sparrow	G5/S4		
<i>Aimophila ruficeps</i>	Rufous-crowned Sparrow	G5/S4		
<i>Ammodramus bairdi</i>	Baird's Sparrow	G4/S2		
<i>Ammodramus leconteii</i>	Le Conte's Sparrow	G4		
<i>Ammodramus nelsoni</i>	Nelson's Sharp-tailed Sparrow	G5/No TX Record		
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	G5/S3		
<i>Amphispiza belli</i>	Sage Sparrow	G5		
<i>Amphispiza bilineata</i>	Black-throated Sparrow	G5/S4		
<i>Arremonops rufivirgatus</i>	Olive Sparrow	G5/S4		
<i>Calamospiza melanocorys</i>	Lark Bunting	G5/S4		
<i>Calcarius lapponicus</i>	Lapland Longspur	G5		
<i>Calcarius mccownii</i>	McCown's Longspur	G4		
<i>Calcarius ornatus</i>	Chestnut-collared Longspur	G5/S3		
<i>Calcarius pictus</i>	Smith's Longspur	G5		
<i>Chondestes grammacus</i>	Lark Sparrow	G5/S4		
<i>Junco hyemalis</i>	Dark-eyed Junco	G5/S5		
<i>Junco phaeonotus</i>	Yellow-eyed Junco	G5		
<i>Melospiza Georgiana</i>	Swamp Sparrow	G5/S4		
<i>Melospiza lincolnii</i>	Lincoln's Sparrow	G5/S5		
<i>Melospiza melodia</i>	Song Sparrow	G5/S5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
<i>Passerella iliaca</i>	Fox Sparrow	G5		
<i>Passerculus sandwichensis</i>	Savannah Sparrow	G5/S4		
<i>Pipilo arcticus</i>	Spotted Towhee	No NS Record		
<i>Pipilo chlorurus</i>	Green-tailed Towhee	G5/S4		
<i>Pipilo erythrophthalmus</i>	Eastern Towhee	G5/S2		
<i>Pipilo fuscus</i>	Canyon Towhee	G5 G5/No TX		
<i>Plectrophenax nivalis</i>	Snow Bunting	Record		
<i>Pooecetes gramineus</i>	Vesper Sparrow	G5/S5		
<i>Spizella arborea</i>	American Tree Sparrow	G5/No TX Record		
<i>Spizella atrogularis</i>	Black-chinned Sparrow	G5		
<i>Spizella breweri</i>	Brewer's Sparrow	G5/S4		
<i>Spizella pallida</i>	Clay-colored Sparrow	G5/S4		
<i>Spizella passerine</i>	Chipping Sparrow	G5/S4		
<i>Spizella pusilla</i>	Field Sparrow	G5/S5		
<i>Zonotrichia albicollis</i>	White-throated Sparrow	G5		
<i>Zonotrichia atricapilla</i>				
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	G5/S5		
<i>Zonotrichia querula</i>	Harris's Sparrow	G5/S4		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Falconidae				
<i>Caracara plancus</i>	Crested Caracara	G5/S4 G5/No NS Record		
<i>Falco columbarius</i>	Merlin			
<i>Falco femoralis</i>	Aplomado Falcon	G4/S1	E	E
<i>Falco mexicanus</i>				
<i>Falco peregrinus</i>	Peregrine Falcon	G4/S3	E, T	
<i>Falco sparverius</i>	American Kestrel	G5/S4		
Fringillidae				
<i>Carduelis flammea</i>	Common Redpoll	G5/No TX Record No NS		
<i>Carduelis lawrencii</i>	Lawrence's Goldfinch	Record		
<i>Carduelis pinus</i>	Pine Siskin	G5/S2		
<i>Carduelis psaltria</i>	Lesser Goldfinch	G5/S5		
<i>Carduelis tristis</i>	American Goldfinch	G5/S2		
<i>Carpodacus cassinii</i>	Cassin's Finch	G5		
<i>Carpodacus mexicanus</i>	House Finch	G5/S5		
<i>Carpodacus purpureus</i>	Purple Finch	G5/S4		
<i>Coccothraustes vespertinus</i>				
<i>Loxia curvirostra</i>	Red Crossbill	G5/S3		
<i>Pinicola enucleator</i>	Pine Grosbeak	G5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Gaviidae				
<i>Gavia adamsii</i>	Yellow-billed Loon	G4/No Tx Record		
<i>Gavia immer</i>				
<i>Gavia pacifica</i>	Pacific Loon	G5/No Tx Record		
<i>Gavia stellata</i>	Red-throated Loon	G5		
Gruidae				
<i>Grus Americana</i>	Whooping Crane	G1/S1	E	E
<i>Grus Canadensis</i>	Sandhill Crane	G5/S5		
Hirundinidae				
<i>Hirundo rustica</i>	Barn Swallow	G5/S5		
<i>Petrochelidon fulva</i>	Cave Swallow	G5/S4		
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow	G5/S4		
<i>Progne subis</i>	Purple Martin	G5/S5		
<i>Riparia riparia</i>	Bank Swallow	G5/S2		
<i>Stelgidopteryx serripennis</i>				
<i>Tachycineta bicolor</i>	Tree Swallow	G5/S3		
<i>Tachycineta thalassina</i>	Violet-green Swallow	G5/S4		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Icteridae				
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	G5/S5		
<i>Dolichonyx oryzivorus</i>	Bobolink	G5/S3		
<i>Euphagus carolinus</i>	Rusty Blackbird	G4/S3		
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird	G5/S5		
<i>Icterus bullockii</i>	Bullock's Oriole	G5/S4		
<i>Icterus cucullatus</i>	Hooded Oriole	G5/S4		
<i>Icterus galbula</i>	Baltimore Oriole	G5/S4		
<i>Icterus graduacauda</i>	Audubon's Oriole	G5/S4		
<i>Icterus gularis</i>	Altamira Oriole	G5/S3		
<i>Icterus parisorum</i>	Scott's Oriole	G5/S3		
<i>Icterus spurius</i>	Orchard Oriole	G5/S4		
<i>Icterus wagleri</i>	Black-vented Oriole	No NS Record		
<i>Molothrus aeneus</i>	Bronzed Cowbird	G5/S5		
<i>Molothrus ater</i>	Brown-headed Cowbird	G5/S5		
<i>Quiscalus mexicanus</i>	Great-tailed Grackle	G5/S5		
<i>Quiscalus quiscula</i>	Common Grackle	G5/S5		
<i>Sturnella magna</i>				
<i>Sturnella neglecta</i>	Western Meadowlark	G5/S5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird	G5/S3		
Jacanidae				
<i>Jacana spinosa</i>	Northern Jacana		No NS Record	
Laniidae				
<i>Lanius excubitor</i>	Northern Shrike	G5		
<i>Lanius ludovicianus</i>	Loggerhead Shrike	G4/S4		
Laridae				
<i>Chlidonias niger</i>	Black Tern	G4/S3		
<i>Larus argentatus</i>	Herring Gull	G5/S5		
<i>Larus atricilla</i>	Laughing Gull	G5/S5		
<i>Larus Californicus</i>	California Gull	G5/No TX Record		
<i>Larus canus</i>	Mew Gull	G5		
<i>Larus Delawarensis</i>	Ring-billed Gull	G5/S5		
<i>Larus fuscus</i>	Lesser Black-backed Gull	G5/No TX Record		
<i>Larus heermanni</i>	Heermann's Gull	G4		
<i>Larus hyperboreus</i>	Glaucous Gull	G5/No TX Record		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
<i>Larus minutus</i>	Little Gull	G5 G5/No TX		
<i>Larus occidentalis</i>	Western Gull	Record		
<i>Larus Philadelphia</i>	Bonaparte's Gull	G5/S4		
<i>Larus pipixcan</i>	Franklin's Gull	G4G5/S2 G5/No TX		
<i>Larus thayeri</i>	Thayer's Gull	Record G5/No TX		
<i>Rissa tridactyla</i>	Black-legged Kittiwake	Record		
<i>Rynchops niger</i>	Black Skimmer	G5/S4 G5/No TX		
<i>Stercorarius longicaudus</i>	Long-tailed Jaeger	Record G5/No TX		
<i>Stercorarius parasiticus</i>	Parasitic Jaeger	Record No NS		
<i>Sterna antillarum</i>	Least Tern	Record No NS	E	E
<i>Sterna caspia</i>	Caspian Tern	Record		
<i>Sterna forsteri</i>				
<i>Sterna fuscata</i>	Sooty Tern	No NS Record	T	
<i>Sterna hirundo</i>	Common Tern	G5/S1		
<i>Sterna paradisaea</i>	Arctic Tern	G5		
<i>Thalasseus elegans</i>	Elegant Tern	G2 G5/No TX		
<i>Xema sabini</i>	Sabine's Gull	Record		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Mimidae				
<i>Dumetella carolinensis</i>	Gray Catbird	G5/S4		
<i>Mimus polyglottos</i>				
<i>Oreoscoptes montanus</i>	Sage Thrasher	G5/No NS Record		
<i>Toxostoma crissale</i>	Crissal Thrasher	G5		
<i>Toxostoma curvirostre</i>	Curve-billed Thrasher	G5/S4		
<i>Toxostoma longirostre</i>				
<i>Toxostoma rufum</i>	Brown Thrasher	G5/S4		
Motacillidae				
<i>Anthus rubescens</i>	American Pipit	G5/S4		
<i>Anthus spragueii</i>	Sprague's Pipit	G4/No TX Record		
Odontophoridae				
<i>Callipepla gambelii</i>	Gambel's Quail	G5		
<i>Callipepla squamata</i>	Scaled Quail	G5/S4		
<i>Colinus virginianus</i>	Northern Bobwhite	G5/S4		
<i>Cyrtonyx montezumae</i>	Montezuma Quail	G4G5		
Paridae				

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
<i>Baeolophus atricristatus</i>	Black-crested Titmouse	G5/S5		
<i>Baeolophus ridgwayi</i>	Juniper Titmouse	G5		
<i>Parus (Poecile) carolinensis</i>	Carolina Chickadee	G5/S5		
<i>Poecile atricapillus</i>	Black-capped Chickadee	G5		
<i>Poecile gambeli</i>	Mountain Chickadee	G5		
Parulidae				
<i>Basileuterus rufifrons</i>	Rufous-capped Warbler	No NS Record G5/No TX		
<i>Cardellina rubrifrons</i>	Red-faced Warbler	Record		
<i>Dendroica caerulescens</i>	Black-throated Blue Warbler	G5/S3		
<i>Dendroica castanea</i>	Bay-breasted Warbler	G5/S4		
<i>Dendroica cerulean</i>	Cerulean Warbler	G4/SH		
<i>Dendroica chrysoparia</i>	Golden-cheeked Warbler	G2/S2	E	E
<i>Dendroica coronata</i>	Yellow-rumped Warbler	G5		
<i>Dendroica discolor</i>	Prairie Warbler	G5/S3		
<i>Dendroica dominica</i>	Yellow-throated Warbler	G5/S4		
<i>Dendroica fusca</i>	Blackburnian Warbler	G5/S3		
<i>Dendroica graciae</i>	Grace's Warbler	G5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
<i>Dendroica magnolia</i>	Magnolia Warbler	G5/S4		
<i>Dendroica nigrescens</i>	Black-throated Gray Warbler	G5/SH		
<i>Dendroica occidentalis</i>	Hermit Warbler	G4G5/S3		
<i>Dendroica palmarum</i>	Palm Warbler	G5/S3		
<i>Dendroica pensylvanica</i>	Chestnut-sided Warbler	G5/No TX Record		
<i>Dendroica petechia</i>	Yellow Warbler	G5/S2		
<i>Dendroica pinus</i>	Pine Warbler	G5/S5		
<i>Dendroica striata</i>	Blackpoll Warbler	G5/S3		
<i>Dendroica tigrina</i>	Cape May Warbler	G5/S2		
<i>Dendroica townsendi</i>	Townsend's Warbler	G5/S4		
<i>Dendroica virens</i>	Black-throated Green Warbler	G5/S4		
<i>Geothlypis trichas</i>	Common Yellowthroat	G5/S5		
<i>Helmitheros vermivorus</i>	Worm-eating Warbler	G5/S3		
<i>Icteria virens</i>	Yellow-breasted Chat	G5/S5		
<i>Limnothlypis swainsonii</i>	Swainson's Warbler	G4/S3		
<i>Mniotilta varia</i>	Black-and-white Warbler	G5/S4		
<i>Myioborus miniatus</i>	Slate-throated Redstart	No NS Record		
<i>Myioborus pictus</i>	Painted Redstart	G5/S3		
<i>Oporornis formosus</i>	Kentucky Warbler	G5/S3		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
<i>Oporornis Philadelphia</i>	Mourning Warbler	G5/S4		
<i>Oporornis tolmiei</i>	MacGillivray's Warbler	G5/S4		
<i>Parula Americana</i>	Northern Parula	G5/S4		
<i>Parula pitiayumi</i>	Tropical Parula	G5/S3	T	
<i>Parula superciliosa</i>	Crescent-chested Warbler	No NS Record		
<i>Protonotaria citrea</i>	Prothonotary Warbler	G5/S3		
<i>Seiurus aurocapillus</i>	Ovenbird	G5/S4		
<i>Seiurus motacilla</i>	Louisiana Waterthrush	G5/S3		
<i>Seiurus noveboracensis</i>	Northern Waterthrush	G5/S4		
<i>Setophaga ruticilla</i>	American Redstart	G5/S2		
<i>Vermivora celata</i>	Orange-crowned Warbler	G5/S4		
<i>Vermivora chrysoptera</i>	Golden-winged Warbler	G4/S3		
<i>Vermivora crissalis</i>	Colima Warbler	G3G4/S3		
<i>Vermivora luciae</i>	Lucy's Warbler	G5		
<i>Vermivora peregrine</i>	Tennessee Warbler	G5/S4		
<i>Vermivora pinus</i>				
<i>Vermivora ruficapilla</i>	Nashville Warbler	G5/S5		
<i>Vermivora virginiae</i>	Virginia's Warbler	G5/S3		
<i>Wilsonia Canadensis</i>				
<i>Wilsonia citrine</i>	Hooded Warbler	G5/S5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
<i>Wilsonia pusilla</i>	Wilson's Warbler	G5/S4		
Passeridae				
<i>Passer domesticus</i>	House Sparrow	G5/Exotic		
Pelecanidae				
<i>Pelecanus erythrorhynchos</i>	American White Pelican	G3/S2		
<i>Pelecanus occidentalis</i>	Brown Pelican	G4/S3	E	E
Peucedramidae				
<i>Peucedramus taeniatus</i>	Olive Warbler	G5		
Phalacrocoracidae				
<i>Phalacrocorax auritus</i>				
<i>Phalacrocorax brasilianus</i>	Neotropic Cormorant	G5/S4		
Phasianidae				
<i>Meleagris gallopavo</i>	Wild Turkey	G5/S5		
<i>Phasianus colchicus</i>	Ring-necked Pheasant	G5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Picidae				
<i>Colaptes auratus</i>	Northern Flicker	G5/S3		
<i>Melanerpes aurifrons</i>	Golden-fronted Woodpecker	G5/S5		
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	G5/S3		
<i>Melanerpes formicivorus</i>	Acorn Woodpecker	G5/S4		
<i>Melanerpes lewis</i>	Lewis's Woodpecker	G4		
<i>Picoides pubescens</i>	Downy Woodpecker	G5/S4		
<i>Picoides scalaris</i>				
<i>Picoides villosus</i>	Hairy Woodpecker	G5		
<i>Sphyrapicus nuchalis</i>	Red-naped Sapsucker	G5/S3		
<i>Sphyrapicus ruber</i>	Red-breasted Sapsucker	G5		
<i>Sphyrapicus thyroideus</i>	Williamson's Sapsucker	G5		
<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker	G5/No TX Record		
Podicipedidae				
<i>Aechmophorus clarkii</i>	Clark's Grebe	G5		
<i>Aechmophorus occidentalis</i>				
<i>Podiceps auritus</i>	Horned Grebe	G5/No Tx Record		
<i>Podiceps grisegena</i>	Red-necked Grebe	G5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
<i>Podiceps nigricollis</i>				
<i>Podilymbus podiceps</i>	Pied-billed Grebe	G5/S5		
<i>Tachybaptus dominicus</i>	Least Grebe	G5/S3		
Psittacidae				
<i>Myiopsitta monachus</i>	Monk Parakeet	G5		
Ptilonotidae				
<i>Phainopepla nitens</i>	Phainopepla	G5/S4	No NS	
<i>Ptilonotus cinereus</i>	Gray Silky-flycatcher		Record	
Rallidae				
<i>Coturnicops noveboracensis</i>	Yellow Rail		G4/No TX	Record
<i>Fulica Americana</i>				
<i>Gallinula chloropus</i>	Common Moorhen	G5/S4		
<i>Porphyrio martinica</i>	Purple Gallinule	G5/S4		
<i>Porzana Carolina</i>	Sora	G5/S3		
<i>Rallus elegans</i>				
<i>Rallus limicola</i>	Virginia Rail	G5/S3		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
Recurvirostridae				
<i>Himantopus mexicanus</i>				
<i>Recurvirostra Americana</i>	American Avocet	G5/S4		
Regulidae				
<i>Regulus calendula</i>	Ruby-crowned Kinglet	G5/S5		
<i>Regulus satrapa</i>	Golden-crowned Kinglet	G5/No TX Record		
Remizidae				
<i>Auriparus flaviceps</i>	Verdin	G5/S4		
Scolopacidae				
<i>Actitis macularia</i>	Spotted Sandpiper	G5/S3		
<i>Arenaria interpres</i>	Ruddy Turnstone	G5/S5		
<i>Bartramia longicauda</i>	Upland Sandpiper	G5/S3		
<i>Calidris alba</i>	Sanderling	G5/S5		
<i>Calidris alpine</i>	Dunlin	G5/S4		
<i>Calidris bairdii</i>	Baird's Sandpiper	G5/S3		
<i>Calidris canutus</i>	Red Knot	G4/No TX Record		
<i>Calidris fuscicollis</i>	White-rumped Sandpiper	G5/S3		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
<i>Calidris himantopus</i>	Stilt Sandpiper	G5/S3		
<i>Calidris mauri</i>	Western Sandpiper	G5/S5		
<i>Calidris melanotos</i>	Pectoral Sandpiper	G5/S4		
<i>Calidris minutilla</i>	Least Sandpiper	G5/S5		
<i>Calidris pusilla</i>	Semipalmated Sandpiper	G5/S5		
<i>Calidris ruficollis</i>	Red-necked Stint	G5		
<i>Catoptrophorus semipalmatus</i>	Willet	G5/S5 No NS		
<i>Gallinago gallinago</i>	Common Snipe	Record		
<i>Limnodromus griseus</i>	Short-billed Dowitcher	G5/S3		
<i>Limnodromus scolopaceus</i>	Long-billed Dowitcher	G5/S4		
<i>Limosa fedoa</i>	Marbled Godwit	G5/S4		
<i>Limosa haemastica</i>	Hudsonian Godwit	G4/S2		
<i>Numenius Americanus</i>	Long-billed Curlew	G5/S3		
<i>Numenius borealis</i>	Eskimo Curlew	GH/SH	E	E
<i>Numenius phaeopus</i>	Whimbrel	G5/S4 G5/No TX		
<i>Phalaropus fulicarius</i>	Red Phalarope	Record		
<i>Phalaropus tricolor</i>	Wilson's Phalarope	G5/S3		
<i>Phalaropus lobatus</i>				
<i>Philomachus pugnax</i>	Ruff	G5/No TX Record		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
<i>Scolopax minor</i>	American Woodcock	G5/S2		
<i>Tringa flavipes</i>	Lesser Yellowlegs	G5/S5		
<i>Tringa melanoleuca</i>	Greater Yellowlegs	G5/S5		
<i>Tringa solitaria</i>				

Sittidae

<i>Sitta canadensis</i>				
<i>Sitta carolinensis</i>	White-breasted Nuthatch	G5		
<i>Sitta pygmaea</i>	Pygmy Nuthatch	G5		

Strigidae

<i>Asio flammeus</i>	Short-eared Owl	G5/No TX Record		
<i>Asio otus</i>	Long-eared Owl	G5/S2		
<i>Athene cunicularia</i>	Burrowing Owl	G4/S3		
<i>Bubo virginianus</i>	Great Horned Owl	G5/S5		
<i>Glaucidium brasilianum</i>	Ferruginous Pygmy-Owl	G5/S3		
<i>Glaucidium gnoma</i>	Northern Pygmy-Owl	G5		
<i>Micrathene whitneyi</i>	Elf Owl	G5/S4		
<i>Otus asio</i>	Eastern Screech-Owl	G5/S2		
<i>Otus flammeolus</i>	Flammulated Owl	G4/S3		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
<i>Strix occidentalis</i>	Spotted Owl	G3		
<i>Strix varia</i>				
<i>Aegolius acadicus</i>	Northern Saw-whet Owl	G5		
<i>Megascops kennicottii</i>	Western Screech-Owl	G5		
Sturnidae				
<i>Sturnus vulgaris</i>	European Starling	G5/Exotic		
Sylviidae				
<i>Polioptila caerulea</i>	Blue-gray Gnatcatcher	G5/S3		
<i>Polioptila melanura</i>	Black-tailed Gnatcatcher	G5/S4		
Tetraonidae				
<i>Tympanuchus pallidicinctus</i>	Lesser Prairie-chicken	G3		
Thraupidae				
<i>Piranga bidentata</i>	Flame-colored Tanager	No NS Record		
<i>Piranga flava</i>	Hepatic Tanager	G5/S4		
<i>Piranga ludoviciana</i>				

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
<i>Piranga olivacea</i>	Scarlet Tanager	G5/S4		
<i>Piranga rubra</i>	Summer Tanager	G5/S5		
Threskiornithidae				
<i>Eudocimus albus</i>	White Ibis	G5/S4		
<i>Platalea ajaja</i>				
<i>Plegadis chihi</i>	White-faced Ibis	G5/S4	T	
<i>Plegadis falcinellus</i>	Glossy Ibis	G5/S3		
Trochilidae				
<i>Amazilia beryllina</i>	Berylline Hummingbird	G4		
<i>Amazilia violiceps</i>	Violet-crowned Hummingbird	G5/No TX		
<i>Amazilia yucatanensis</i>	Buff-bellied Hummingbird	Record		
<i>Archilochus colubris</i>	Ruby-throated Hummingbird	G4/S3		
<i>Archilocus alexandri</i>	Black-chinned Hummingbird	G5/S4		
<i>Calothorax lucifer</i>	Lucifer Hummingbird	G5/S5		
<i>Calypte anna</i>	Anna's Hummingbird	G4G5		
<i>Calypte costae</i>	Costa's Hummingbird	G5/No TX		
<i>Cynanthus latirostris</i>	Broad-billed Hummingbird	Record		
		G5		
		G4/SH		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
<i>Eugenes fulgens</i>	Magnificent Hummingbird	G5		
<i>Hylocharis leucotis</i>	White-eared Hummingbird	G5/No TX Record		
<i>Lampornis clemenciae</i>	Blue-throated Hummingbird	G5/S3 G5/No TX Record		
<i>Sealsphorus rufus</i>	Rufous Hummingbird			
<i>Selasphorus platycercus</i>	Broad-tailed Hummingbird	G5/S3		
<i>Selasphorus sasin</i>				
<i>Stellula calliope</i>	Calliope Hummingbird	G5		
Troglodytidae				
<i>Campylorhynchus brunneicapillus</i>	Cactus Wren	G5/S4		
<i>Catherpes mexicanus</i>	Canyon Wren	G5		
<i>Cistothorus palustris</i>	Marsh Wren	G5/S4		
<i>Cistothorus platensis</i>	Sedge Wren	G5/S4		
<i>Salpinctes obsoletus</i>	Rock Wren	G5/S5		
<i>Thryomanes bewickii</i>	Bewick's Wren	G5/S5		
<i>Thryothorus ludovicianus</i>	Carolina Wren	G5/S5		
<i>Troglodytes aedon</i>				
<i>Troglodytes troglodytes</i>	Winter Wren	G5/No TX Record		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
Trogonidae				
<i>Trogon elegans</i>	Elegant Trogon	G5		
Turdidae				
<i>Catharus fuscescens</i>	Veery	G5/No TX Record		
<i>Catharus guttatus</i>	Hermit Thrush	G5/S4		
<i>Catharus minimus</i>	Gray-cheeked Thrush	G5/S4		
<i>Catharus ustulatus</i>	Swainson's Thrush	G5/S4		
<i>Hylocichla mustelina</i>	Wood Thrush	G5/S4		
<i>Ixoreus naevius</i>	Varied Thrush	G5/No TX Record		
<i>Myadestes townsendi</i>	Townsend's Solitaire	G5/No TX Record		
<i>Sialia currucoides</i>	Mountain Bluebird	G5/S3		
<i>Sialia mexicana</i>	Western Bluebird	G5		
<i>Sialia sialis</i>	Eastern Bluebird	G5/S5		
<i>Turdus migratorius</i>	American Robin	G5/S4		
Turdus rufopalliatus				
<i>Ridgwayia pinicola</i>	Aztec Thrush	No NS Record		
Tyrannidae				
<i>Camptostoma imberbe</i>	Northern Beardless-Tyrannulet	G5/S3	T	
<i>Contopus cooperi</i>	Olive-sided Flycatcher	G4/S3		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federa l Status
<i>Contopus pertinax</i>	Greater Pewee	G5/No TX Record		
<i>Contopus sordidulus</i>	Western Wood-Pewee	G5/S4		
<i>Contopus virens</i>	Eastern Wood-Pewee	G5/S4		
<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher	G5/No TX Record		
<i>Empidonax hammondii</i>	Hammond's Flycatcher	G5/S3		
<i>Empidonax minimus</i>	Least Flycatcher	G5/S5		
<i>Empidonax oberholseri</i>	Dusky Flycatcher	G5		
<i>Empidonax occidentalis</i>	Cordilleran Flycatcher	G5		
<i>Empidonax traillii</i>	Willow Flycatcher	G5/S1		
<i>Empidonax virescens</i>	Acadian Flycatcher	G5/S4		
<i>Empidonax wrightii</i>	Gray Flycatcher	G5 No NS		
<i>Legatus leucophaeus</i>	Piratic Flycatcher	Record		
<i>Myiarchus cinerascens</i>	Ash-throated Flycatcher	G5/S3		
<i>Myiarchus crinitus</i>	Great Crested Flycatcher	G5/S4		
<i>Myiarchus tuberculifer lawrencei</i>	Dusky-capped Flycatcher	G5/No TX Record		
<i>Myiarchus tyrannulus</i>	Brown-crested Flycatcher	G5/S4		
<i>Myiodynastes luteiventris</i>	Sulphur-bellied Flycatcher	G5/No TX Record		
<i>Pachyramphus aglaiae</i>	Rose-throated Becard	G4G5/No Tx Record	T	
<i>Pitangus sulphuratus</i>	Great Kiskadee	G5/S4		
<i>Pyrocephalus rubinus</i>	Vermilion Flycatcher	G5/S4		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
<i>Sayornis nigricans</i>	Black Phoebe	G5/S4		
<i>Sayornis phoebe</i>	Eastern Phoebe	G5/S4		
<i>Sayornis saya</i>	Say's Phoebe	G5/S4		
<i>Tyrannus couchii</i>	Couch's Kingbird	G5		
<i>Tyrannus crassirostris</i>	Thick-billed Kingbird	G5		
<i>Tyrannus forficatus</i>	Scissor-tailed Flycatcher	G5/S3		
<i>Tyrannus melancholicus</i>	Tropical Kingbird	G5/S1		
<i>Tyrannus tyrannus</i>	Eastern Kingbird	G5/S4		
<i>Tyrannus verticalis</i>	Western Kingbird	G5/S3		
<i>Tyrannus vociferans</i>				
<i>Mitrephanes phaeocercus</i>	Tufted Flycatcher	No NS Record		
Tytonidae				
<i>Tyto alba</i>	Barn Owl	G5/S5		
Vireonidae				
<i>Vireo atricapillus</i>	Black-capped Vireo	G2G3/S2	E	E
<i>Vireo bellii</i>	Bell's Vireo	G5/S3 G5/No TX		
<i>Vireo cassini</i>	Cassin's Vireo	Record		
<i>Vireo flavifrons</i>	Yellow-throated Vireo	G5/S4		
<i>Vireo flavoviridis</i>	Yellow-green Vireo	G5/S2		
<i>Vireo gilvus</i>	Warbling Vireo	G5/S3		
<i>Vireo griseus</i>	White-eyed Vireo	G5/S5		

Birds

Scientific Name	Common Name	Natureserve Rankings	State Status	Federal Status
<i>Vireo huttoni</i>	Hutton's Vireo	G5		
<i>Vireo olivaceus</i>	Red-eyed Vireo	G5/S5		
<i>Vireo philadelphicus</i>	Philadelphia Vireo	G5/S4		
<i>Vireo plumbeus</i>	Plumbeous Vireo	G5		
<i>Vireo solitarius</i>	Blue-headed Vireo			
<i>Vireo vicinior</i>	Gray Vireo	G4		

Source:

http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_bk_w7000_0809.pdf

Key:

E = Endangered

T = Threatened

SC = Special concern

SAT = Listed endangered or threatened because of similarity of appearance

G1 = NatureServe Ranking; Critically Imperiled

G2 = NatureServe Ranking; Imperiled

G3 = NatureServe Ranking; Vulnerable to Exterpation or Extinction

G4 = NatureServe Ranking; Apparently Secure

G5 = NatureServe Ranking; Demonstratably Widespread, Abundant and Secure

No NS Record = No record found in NatureServe Database

Reptiles

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
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TURTLES

Emydidae

<i>Terrapene ornata</i>	Western Box Turtle	G5		
<i>Trachemys gaigeae</i>	Mexican Plateau Slider	G3		

Kinosternidae

<i>Kinosternon flavescens</i>	Yellow Mud Turtle	G5		
<i>Kinosternon hirtipes</i>	Rough-footed Mud Turtle	G5		

Trionychidae

<i>Apalone spinifera</i>	Spiny Softshell Turtle	G5		
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LIZARDS

Crotaphytidae

<i>Crotaphytus collaris</i>	Eastern Collared Lizard	G5		
<i>Gambelia wislizenii</i>	Long-nosed Leopard Lizard	G5		

Reptiles

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
Gekkonidae				
<i>Coleonyx brevis</i>	Texas Banded Gecko	G5		
<i>Coleonyx reticulatus</i>	Reticulated Gecko	G3	T	
Phrynosomatidae				
<i>Cophosaurus texanus</i>	Greater Earless Lizard	G5		
<i>Holbrookia maculata</i>	Lesser Earless Lizard	G5		
<i>Sceloporus magister</i>	Desert Spiny Lizard	G5		
<i>Sceloporus merriami</i>	Canyon Lizard	G4		
<i>Sceloporus poinsettii</i>	Crevice Spiny Lizard	G5		
<i>Sceloporus serrifer</i>	Blue Spiny Lizard	G5		
<i>Sceloporus undulatus</i>	Fence/prairie/plateau Lizard	G5		
<i>Phrynosoma cornutum</i>	Texas Horned Lizard	G4G5	T	
<i>Phrynosoma hernandesi</i>	Mountain short-horned Lizard	G5	T	
<i>Phrynosoma modestum</i>	Round-tailed Horned Lizard	G5		
<i>Uta stansburiana</i>	Side-blotched Lizard	G5		
<i>Urosaurus ornatus</i>	Tree Lizard	G5		
Scincidae				
<i>Eumeces multivirgatus</i>	Many-lined Skink	G5		

Reptiles

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
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<i>Eumeces obsoletus</i>	Great Plains Skink	G5		
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<i>Eumeces tetragrammus</i>	Four-lined Skink	G5		
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Teiidae

<i>Aspidoscelis dixonii</i>	Gray-checked Whiptail	G3G4		
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<i>Aspidoscelis exsanguis</i>	Chihuahuan Spotted Whiptail	G5		
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<i>Aspidoscelis gularis</i>	Texas Spotted Whiptail	G5		
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<i>Aspidoscelis inornata</i>	Little Striped Whiptail	G5		
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<i>Aspidoscelis neomexicana</i>	New Mexico Whiptail	G5		
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<i>Aspidoscelis septemvittata</i>	Plateau Spotted Whiptail	G5		
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<i>Aspidoscelis tessellata</i>	Common Checkered Whiptail	G5		
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<i>Aspidoscelis tigris marmorata</i>	Western Marbled Whiptail	G5T5		
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SNAKES

Colubridae

<i>Arizona elegans</i>	Glossy Snake	G5		
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<i>Bogertophis subocularis</i>	Trans-pecos Snake	G4G5		E
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<i>Diadophis punctatus</i>	Ring-necked Snake	G5		
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<i>Elaphe guttata</i>	Red Cornsnake	G5		
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<i>Gyalopion canum</i>	Chihuahuan Hook-nosed Snake	G5		
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Reptiles

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
<i>Heterodon nasicus</i>	Western Hog-nosed Snake	G5		
<i>Hypsiglena torquata</i>	Nightsnake	G5		
<i>Lampropeltis alterna</i>	Gray-banded Kingsnake	G5		
<i>Lampropeltis getula</i>	Common Kingsnake	G5		
<i>Lampropeltis triangulum</i>	Milksnake	G5		
<i>Masticophis flagellum</i>	Coachwhip	G5		
<i>Masticophis taeniatus</i>	Striped Whipsnake	G5		
<i>Pituophis catenifer</i>	Gophersnake	G5		
<i>Rhinocheilus lecontei</i>	Long-nosed Snake	G5		
<i>Salvadora grahamiae</i>	Eastern Patch-nosed Snake	G5		
<i>Salvadora hexalepis deserticola</i>	Big Bend Patch-nosed Snake	G5T5		
<i>Sonora semiannulata</i>	Groundsnake	G5		
<i>Tantilla cucullata</i>	Trans-Pecos Black-headed Snake	G3		
<i>Tantilla hobartsmithi</i>	Smith's Black-headed Snake	G5		
<i>Tantilla nigriceps</i>	Plains Black-headed Snake	G5	T	
<i>Thamnophis cyrtopsis</i>	Black-necked Gartersnake	G5		
<i>Thamnophis marcianus</i>	Checkered Gartersnake	G5		
<i>Trimorphodon vilkinsonii</i>	Chihuahuan desert lyre snake	G4	T	
<i>Tropidoclonion lineatum</i>	Lined Snake	G5		

Leptotyphlopidae

Reptiles

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
<i>Leptotyphlops dulcis</i>	Texas Threadsnake	G5		
<i>Leptotyphlops humilis</i>	Western Threadsnake	G5		
Viperidae				
<i>Agkistrodon contortrix</i>	Copperhead	G5		
<i>Crotalus atrox</i>	Western Diamond-backed Rattlesnake	G5		
<i>Crotalus lepidus</i>	Rock Rattlesnake	G5		
<i>Crotalus molossus</i>	Black-tailed Rattlesnake	G5		
<i>Crotalus scutulatus</i>	Mohave Rattlesnake	G5		
<i>Crotalus viridis</i>	Prairie Rattlesnake	G5		

Source: http://wfscnet.tamu.edu/tcwc/Herps_online/CountyRecords.htm

Key:

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T = Threatened

DL = Delisted

G1 = NatureServe Ranking; Critically Imperiled

G2 = NatureServe Ranking; Imperiled

G3 = NatureServe Ranking; Vulnerable to Exterpation or Extinction

G4 = NatureServe Ranking; Apparently Secure

Reptiles

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
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G5 = NatureServe Ranking; Demonstrably Widespread, Abundant and Secure

S1 = NatureServe Ranking; State of Texas Critically Imperiled

No TX Record = No record found in NatureServe Database for State of Texas

No NS Record = No record found in NatureServe Database

Amphibians

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
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Ambystomatidae

<i>Ambystoma tigrinum</i>	Tiger Salamander	G5		
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Bufo

<i>Bufo cognatus</i>	Great Plains Toad	G5		
<i>Bufo debilis</i>	Green Toad	G5		
<i>Bufo punctatus</i>	Red-spotted Toad	G5		
<i>Bufo speciosus</i>	Texas Toad	G5		
<i>Bufo woodhousii</i>	Woodhouse's Toad	G5		

Hylidae

Amphibians

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status
<i>Hyla arenicolor</i>	Canyon Treefrog	G5		
Leptodactylidae				
<i>Eleutherodactylus guttilatus</i>	Spotted Chirping Frog	G4		
Microhylidae				
<i>Gastrophryne olivacea</i>	Great Plains Narrowmouth Toad	G5		
Ranidae				
<i>Rana berlandieri</i>	Rio Grande Leopard Frog	G5		
<i>Rana catesbeiana</i>	Bullfrog	G5		
Scaphiopodidae				
<i>Scaphiopus couchii</i>	Couch's Spadefoot	G5		
<i>Spea bombifrons</i>	Plains Spadefoot	G5		

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Key:

E = Endangered

Amphibians

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Butterflies

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
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Skippers (Hesperiidae)

Grass Skippers (Hesperiinae)

<i>Amblyscirtes aenus</i>	Bronze Roadside-skipper	G5			P
<i>Amblyscirtes eos</i>	Dotted Roadside-skipper	G5			P
<i>Amblyscirtes nereus</i>	Slaty Roadside-skipper	G4G5			H,P
<i>Amblyscirtes nysa</i>	Nysa Roadside-skipper	G5			P

Butterflies

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
<i>Amblyscirtes simius</i>	Simius Roadside-skipper	G4			H,P
<i>Amblyscirtes texanae</i>	Texas Roadside-skipper	G3G4			P
<i>Ancyloxypha arene</i>	Tropical Least Skipper	G5			H,P
<i>Atalopedes campestris</i>	Sachem	G5			H,P
<i>Atrytonopsis edwardsi</i>	Sheep Skipper	G3G4			P
<i>Atrytonopsis pittacus</i>	White-barred Skipper	G3G4			P
<i>Atrytonopsis vierecki</i>	Viereck's Skipper	G4			H,P
<i>Copaeodes aurantiaca</i>	Orange Skipperling	G5			P
<i>Hesperia pahaska</i>	Pahaska Skipper	G5			H,P
<i>Hesperia uncas</i>	Uncas Skipper	G5			P
<i>Hesperia viridis</i>	Green Skipper	G5			H,P
<i>Hesperia woodgatei</i>	Apache Skipper	G3G4			H,P
<i>Hylephila phyleus</i>	Fiery Skipper	G5			H,P
<i>Lerodea eufala</i>	Eufala Skipper	G5			H,P
<i>Nastra julia</i>	Julia's Skipper	G5			P
<i>Polites carus</i>	Carus Skipper	G4			H,P
<i>Stinga morrisoni</i>	Morrison's Skipper	G4G5			H,P
Giant-Skippers (Megathyminae)					
<i>Agathymus mariae</i>	Mary's Giant-skipper	G3G4			H,P
<i>Agathymus neumogeni</i>	Orange Giant-skipper	G4G5			H,P
<i>Megathymus ursus</i>	Ursine Giant-skipper	G4G5			P
<i>Megathymus yuccae</i>	Yucca Giant-skipper	G5			P

Butterflies

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
Spread-wing Skippers (Pyrginae)					
<i>Achalarus casica</i>	Desert Cloudywing	G5			H,P
<i>Celotes limpia</i>	Scarce Streaky-skipper	G2			H
<i>Celotes nessus</i>	Common Streaky-skipper	G5			H,P
<i>Cogia hippalus</i>	Acacia Skipper	G5			H,P
<i>Erynnis brizo</i>	Sleepy Duskywing	G5			H
<i>Erynnis funeralis</i>	Funereal Duskywing	G5			H,P
<i>Erynnis meridianus</i>	Meridian Duskywing	G5			H,P
<i>Erynnis tristis</i>	Mournful Duskywing	G5			P
<i>Heliopyrgus domicella</i>	Erichson's White-skipper	G5			H,P
<i>Hesperopsis alpheus</i>	Saltbush Sootywing	G4			H
<i>Pholisora catullus</i>	Common Sootywing	G5			H,P
<i>Pholisora mejicanus</i>	Mexican Sootywing	G5			P
<i>Pyrgus albescens</i>	White Checkered-skipper	G5			H
<i>Pyrgus philetas</i>	Desert Checkered-skipper	G5			H,P
<i>Pyrgus scriptura</i>	Small Checkered-skipper	G5			H
<i>Staphylus ceos</i>	Golden-headed Scallopwing	G5			H,P
<i>Systasea pulverulenta</i>	Texas Powdered-skipper	G5			H
<i>Systasea zampa</i>	Arizona Powdered-skipper	G5			P
<i>Thorybes pylades</i>	Northern Cloudywing	G5			H,P
Firetips (Pyrrhopyginae)					
<i>Apyrrothrix araxes</i>	Dull Firetip	G5			P

Butterflies

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
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Gossamer-wing Butterflies (Lycaenidae)

Blues (Polyommatainae)

<i>Brephidium exilis</i>	Western Pygmy-blue	G5			P
<i>Cupido (Everes) comyntas</i>	Eastern Tailed-blue	G5			H,P
<i>Echinargus isola</i>	Reakirt's Blue	G5			P
<i>Hemiargus ceraunus</i>	Ceraunus Blue	G5			H,P
<i>Leptotes marina</i>	Marine Blue	G5			H,P
<i>Plebejus lupini</i>	Lupine Blue	G5			P
<i>Zizula cyna</i>	Cyna Blue	G4G5			H,P

Hairstreaks (Theclinae)

<i>Atlides halesus</i>	Great Purple Hairstreak	G5			H,P
<i>Callophrys gryneus</i>	Juniper Hairstreak	G5			P
<i>Callophrys mcfarlandi</i>	Sandia Hairstreak	G4			H
<i>Callophrys spinetorum</i>	Thicket Hairstreak	G5		SC	H
<i>Ministrymon leda</i>	Leda Ministreak	G5			H,P
<i>Phaeostrymon alcestis</i>	Soapberry Hairstreak	G5			H
<i>Satyrium polingi</i>	Poling's Hairstreak	G2			P
<i>Strymon bebrycia</i>	Red-lined Scrub-Hairstreak	N/A			H
<i>Strymon melinus</i>	Gray Hairstreak	G5			P

Brush-footed Butterflies (Nymphalidae)

Emperors (Apaturinae)

Butterflies

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
<i>Asterocampa celtis</i>	Hackberry Emperor	G5			P
<i>Asterocampa clyton</i>	Tawny Emperor	G5			H,P
<i>Asterocampa leilia</i>	Empress Leilia	G5			H,P
<i>Anaea andria</i>	Goatweed Leafwing	G5			P
Milkweed Butterflies (Danainae)					
<i>Danaus gilippus</i>	Queen	G5			P
<i>Danaus plexippus</i>	Monarch	G5			P
Longwings (Heliconiinae)					
<i>Agraulis vanillae</i>	Gulf Fritillary	G5			P
<i>Euptoieta claudia</i>	Variegated Fritillary	G5			P
<i>Euptoieta hegesia</i>	Mexican Fritillary	N/A			P
Snouts (Libytheinae)					
<i>Libytheana carinenta</i>	American Snout	G5			P
Admirals and Relatives (Limenitidinae)					
<i>Adelpha bredowii</i>	California Sister	G5			P
<i>Historis acheronta</i>	Tailed Cecropian	N/A			H,P
<i>Limenitis archippus</i>	Viceroy	G5			H,P
<i>Limenitis arthemis</i>	White Admiral	G5			H,P
<i>Limenitis arthemis astyanax</i>	Red-spotted Purple	G5T5			H,P
<i>Marpesia petreus</i>	Ruddy Daggerwing	G5			P

Butterflies

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<i>Mestra amymone</i>	Common Mestra	G5			H,P
True Brushfoots (Nymphalinae)					
<i>Anthanassa texana</i>	Texan Crescent	G5			P
<i>Anthanassa tulcis</i>	Tulcis Crescent	G5			H
<i>Chlosyne acastus</i>	Acastus Checkerspot	G4G5			H
<i>Chlosyne definita</i>	Definite Patch	G3G4			H,P
<i>Chlosyne fulvia</i>	Fulvia Checkerspot	G5			H,P
<i>Chlosyne lacinia</i>	Bordered Patch	G5			P
<i>Chlosyne theona</i>	Theona Checkerspot	G5			H,P
<i>Dymasia dymas</i>	Tiny Checkerspot	G5			P
<i>Junonia coenia</i>	Common Buckeye	G5			H,P
<i>Nymphalis antiopa</i>	Mourning Cloak	G5			H,P
<i>Phyciodes graphica</i>	Graphic Crescent	G5			H,P
<i>Phyciodes mylitta</i>	Mylitta Crescent	G5			H
<i>Phyciodes phaon</i>	Phaon Crescent	G5			H,P
<i>Phyciodes picta</i>	Painted Crescent	G5			H,P
<i>Phyciodes tharos</i>	Pearl Crescent	G5			P
<i>Poladryas minuta</i>	Dotted Checkerspot	G5			P
<i>Polygonia interrogationis</i>	Question Mark	G5			H
<i>Siproeta stelenes</i>	Malachite	G5			H,P
<i>Texola elada</i>	Elada Checkerspot	G5			P
<i>Vanessa annabella</i>	West Coast Lady	G5			H
<i>Vanessa atalanta</i>	Red Admiral	G5			H,P

Butterflies

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<i>Vanessa cardui</i>	Painted Lady	G5			P
<i>Vanessa virginiensis</i>	American Lady	G5			P
Satyrs and Wood-Nymphs (Satyrinae)					
<i>Cercyonis meadii</i>	Mead's Wood-nymph	G5			P
<i>Cercyonis pegala</i>	Common Wood-nymph	G5			P
<i>Cyllopsis pertepida</i>	Canyonland Satyr	G5			H,P
<i>Gyrocheilus patrobas</i>	Red-bordered Satyr	G4			P
<i>Megisto rubricata</i>	Red Satyr	G5			P
Parnassians and Swallowtails (Papilionidae)					
Swallowtails (Papilioninae)					
<i>Battus philenor</i>	Pipevine Swallowtail	G5			P
<i>Papilio anchisiades</i>	Ruby-spotted Swallowtail	G5			H,P
<i>Papilio cresphontes</i>	Giant Swallowtail	G5			P
<i>Papilio multicaudata</i>	Two-tailed Swallowtail	G5			P
<i>Papilio ornythion</i>	Ornythion Swallowtail	N/A			H,P
<i>Papilio polyxenes</i>	Black Swallowtail	G5			P
<i>Papilio rutulus</i>	Western Tiger Swallowtail	N/A			H
Metalmarks (Riodinidae)					
<i>Apodemia duryi</i>	Mexican Metalmark	G3G4			P
<i>Apodemia palmerii</i>	Palmer's Metalmark	G5			P
<i>Calephelis nemesis</i>	Fatal Metalmark	G5			P

Butterflies

Scientific Name	Common Name	NatureServe Rankings	State Status	Federal Status	County
<i>Calephelis rawsoni</i>	Rawson's Metalmark	G4			H,P

Whites and Sulphurs (Pieridae)

Sulphurs (Coliadinae)

<i>Abaeis nicippe</i>	Sleepy Orange	G5			P
<i>Anteos clorinde</i>	White Angled-Sulphur	N/A			P
<i>Colias eurytheme</i>	Orange Sulphur	G5			P
<i>Eurema boisduvaliana</i>	Boisduval's Yellow	N/A			P
<i>Eurema mexicana</i>	Mexican Yellow	G5			P
<i>Kricogonia lyside</i>	Lyside Sulphur	G5			H,P
<i>Lerema accius</i>	Clouded Skipper	G5			P
<i>Nathalis iole</i>	Dainty Sulphur	G5			P
<i>Phoebis agarithe</i>	Large Orange Sulphur	G5			H,P
<i>Phoebis sennae</i>	Cloudless Sulphur	G5			P
<i>Pyrisitia lisa</i>	Little Yellow	G5			P
<i>Pyrisitia proterpia</i>	Tailed Orange	N/A			H
<i>Zerene cesonia</i>	Southern Dogface	G5			P

Whites (Pierinae)

<i>Anthocharis cethura</i>	Desert Orangetip	G4G5			H
<i>Anthocharis thoosa</i>	Southwestern Orangetip	G5			H
<i>Ascia monuste</i>	Great Southern White	G5			H
<i>Euchloe lotta</i>	Desert Marble	G4G5			H
<i>Pieris rapae</i>	Cabbage White	G5			H

Butterflies

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<i>Pontia protodice</i>	Checkered White	G4			H
<i>Pontia sisymbrii</i>	Spring White	G5			H

Source: <http://www.butterfliesandmoths.org/>

Key:

H = Hudspeth County

P = Presidio County

SC = State of Texas Species of Special Concern

G1 = NatureServe Ranking; Critically Imperiled

G2 = NatureServe Ranking; Imperiled

G3 = NatureServe Ranking; Vulnerable to Exterpation or Extinction

G4 = NatureServe Ranking; Apparently Secure

G5 = NatureServe Ranking; Demonstratably Widespread, Abundant and Secure

S1 = NatureServe Ranking; State of Texas Critically Imperiled

N/A = Not applicable (no record found)

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