



**US Department of the Interior
Bureau of Land Management**

Oklahoma Field Office
Amarillo Field Office

Bureau of Indian Affairs

Southern Plains Region
Eastern Oklahoma Region



Joint Environmental Impact Statement and
BLM Resource Management Plan and
BIA Integrated Resource Management Plan

May 2015

BIOLOGICAL BASELINE REPORT

BLM Mission Statement

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

BIA Mission Statement

The Bureau of Indian Affairs' mission is to enhance the quality of life, to promote economic opportunity, and to carry out the responsibility to protect and improve the trust assets of American Indians, Indian tribes, and Alaska Natives.

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ACRONYMS AND ABBREVIATIONS

Full Phrase

API	area of potential impact
APLIC	Avian Power Line Interaction Committee
BBS	breeding bird survey
BCC	USFWS Birds of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
BIA	Bureau of Indian Affairs
BLM	United States Department of the Interior, Bureau of Land Management
DOI	United States Department of the Interior
EIS	environmental impact statement
ESA	Endangered Species Act
FLPMA	Federal Land Policy and Management Act
MBTA	Migratory Bird Treaty Act
TPWD	Texas Parks and Wildlife Department
REA	Southern Great Plains Rapid Ecoregional Assessment
RMP	resource management plan
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Service

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CHAPTER I

INTRODUCTION AND PROJECT BACKGROUND

I.1 BACKGROUND

The United States Department of the Interior (DOI), Bureau of Land Management (BLM), Oklahoma Field Office, in collaboration with the US Department of the Interior, Bureau of Indian Affairs (BIA), is preparing an environmental impact statement (EIS). This document will also result in a BLM resource management plan (RMP) and a BIA Integrated RMP. The BLM RMP will guide the management of BLM-administered lands and federal mineral estate in Oklahoma, Kansas, and Texas. These lands are currently managed under the 1994 Oklahoma RMP (BLM 1994a), the 1991 Kansas RMP (BLM 1991), and the 1996 Texas RMP (BLM 1996a), as amended (BLM 1994b, 1996b, 2000, 2004, 2014).

The BIA Integrated RMP includes management direction for allotted and tribal surface mineral interests. These lands are administered by the BIA Eastern Oklahoma and Southern Plains Regional Offices in Oklahoma, Kansas, Texas, and Nebraska.

The BLM and BIA are the co-lead agencies preparing the joint EIS/BLM RMP and BIA Integrated RMP. Based on findings of the EIS, the BLM will sign a record of decision on the approved RMP for the lands it administers and for federal mineral estate. The BIA will sign two separate records of decision for management decisions for Indian mineral interests and lands administered by each of the regional offices.

This biological baseline report is intended to help inform preparation of the joint EIS/BLM RMP and BIA Integrated RMP.

Geographic Information System Data and Graphics

Data from geographic information systems (GIS) have been used in developing acreage calculations and for generating many of the figures. Most calculations in

this document are rounded to the nearest one hundred acres. Calculations are dependent upon the quality and availability of data. Given the scale of the analysis, the compatibility constraints between datasets, and lack of data for some resources, all calculations are approximate and serve for comparison and analytic purposes only. Likewise, the figures are provided for illustrative purposes and subject to the limitations discussed above. The BLM or BIA may receive additional GIS data; therefore, the acreages may be recalculated and revised at a later date.

I.2 PURPOSE OF THE BIOLOGICAL REPORT

The purpose of this biological baseline report is to identify and characterize the biological issues in the area that may be impacted by implementing the joint EIS/BLM RMP and BIA Integrated RMP. This report provides a general overview of the conditions in the decision area and will help to inform the EIS preparation and impact analysis; it is not intended to be a comprehensive project evaluation.

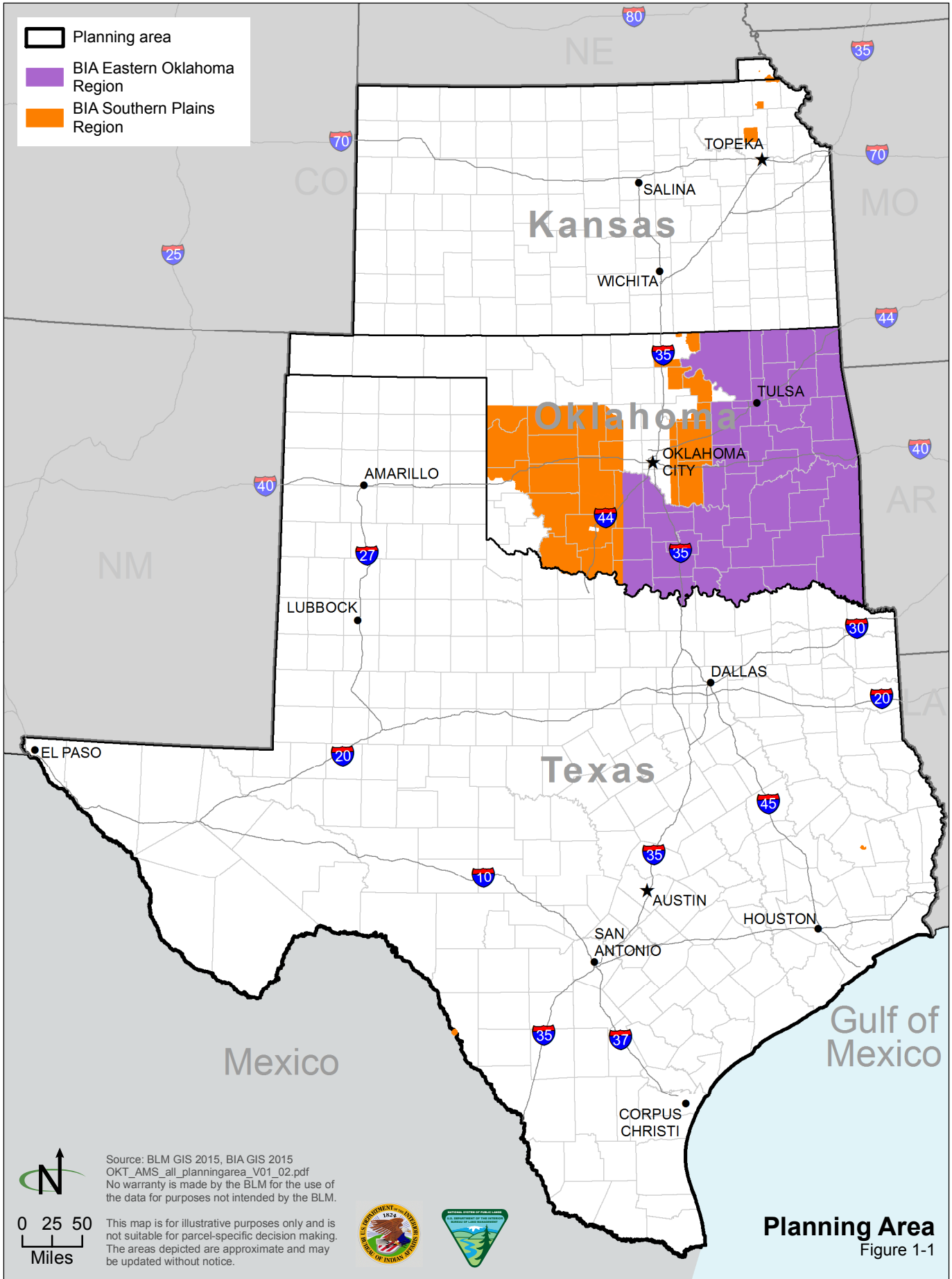
This report is composed of the following:

- A brief description of the project and the area of potential impact (API), specifically the area of potential *direct* impacts; a secondary API is also defined for the area of potential *indirect* impacts
- A summary of applicable laws and regulations that govern the management of biological resources in the API
- A brief description of fish and wildlife, including big game, migratory birds, raptors, and special status species in the API

I.3 DESCRIPTION OF THE PLANNING AREA

The planning area is Oklahoma, Kansas, and Texas, regardless of land ownership, and lands administered by the BIA Southern Plains Region in Richardson County, Nebraska (**Figure I-1**). The 269,650,000-acre planning area is composed of federal, tribal trust or restricted (BIA), allotted, state, and private lands. Federal lands are administered by the BLM; US Department of Agriculture (USDA), Forest Service (Forest Service); USDA, Agricultural Research Service; US Department of Justice, Federal Bureau of Prisons; US Department of Defense; US Department of Energy; US Army Corps of Engineers; International Boundary and Water Commission; and US Department of the Interior, National Park Service (NPS), Bureau of Reclamation, and USFWS. Individual trust lands are held in trust by the US government for the benefit of individual Indian allottees (or their heirs). The planning area encompasses 437 counties (105 in Kansas, 1 in Nebraska, 77 in Oklahoma, and 254 in Texas).

The decision area for the joint EIS/BLM RMP and BIA Integrated RMP is where there are federal, tribal, or allottee interests. The decision area covers only the BLM- and BIA-administered surface



lands and subsurface mineral estate in the planning area, with the exception of oil and gas mineral estate in Osage County. The BLM decision area is composed of approximately 46,900 acres of BLM-administered surface lands and 4,754,700 acres of federal mineral estate. This includes a study area buffer boundary along the Red River in Texas and Oklahoma. Federal mineral estate is composed of split-estate land (private surface over federal minerals, which totals approximately 576,000 acres) and lands managed by other federal agencies that are not covered under a land use plan (such as Forest Service) or congressionally withdrawn (National Park Service and many Fish and Wildlife refuges). The BLM decision area is limited to such lands and federal mineral estate in Oklahoma, Kansas, and Texas (BLM GIS 2015).

The BIA decision areas include approximately 394,200 surface acres and 4,754,700 mineral estate acres for BIA Eastern Oklahoma Regional Office. Additionally, approximately 1,442,000 acres of BIA Eastern Oklahoma Regional Office are limited to coal or other minerals within Osage County, and are included within the decision area. Oil and gas fluid minerals within Osage County are covered under a separate EIS effort, and are not included in the total acres of mineral estate within the BIA decision area for this project. The BIA decision area also includes 457,500 surface acres and 631,800 mineral estate acres for the BIA Southern Plains Regional Office. The BIA decision area includes such lands and mineral estate in Oklahoma, Kansas, and Texas and Richardson County, Nebraska (BIA GIS 2015).

For the purposes of this biological baseline report, the API includes all lands in the decision area. Potential indirect effects may occur outside of the API in the larger watershed.

I.4 APPLICABLE LAWS AND REGULATIONS

Clean Water Act

The Clean Water Act, as amended in 1977, established the basic framework for regulating discharges of pollutants into the waters of the United States, including wetlands. The US Army Corps of Engineers (USACE) regulates the discharge of dredged and fill material into Waters of the United States, including wetlands, in accordance with Section 404 of the Clean Water Act. Additionally, Executive Order 11990, Protection of Wetlands, requires federal agencies to avoid, to the extent possible, adverse impacts on wetlands.

The USACE describes wetlands as “those areas that are inundated or saturated by surface or groundwater 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.”

The USACE provides guidelines for determining the areas under Section 404 jurisdiction (Environmental Laboratory 1987). These guidelines require that at least one positive indicator for each of three criteria—hydrophytic vegetation, hydric soils, and wetland hydrology—exist in order to designate an area as a wetland. The numerous and varied indicators for each of the criteria are described in detail in the guidelines. If these areas meet the criteria necessary to define them as jurisdictional wetlands in accordance with Section 404, then certain activities, such as placing fill, in these areas would be subject to USACE regulation. The planning area encompasses three USACE divisions and five districts.

Federal Endangered Species Act

The federal Endangered Species Act (ESA; 16 US Code [USC], Section 1531 et seq.) establishes measures to protect plant and animal species that are federal-listed as threatened or endangered and conserves habitats that are critical to the continued existence of those species. Endangered means a species is in danger of extinction throughout all or a significant portion of its range; threatened means a species is likely to become endangered within the foreseeable future. For ESA-listed species, federal agencies are required to ensure that their actions do not jeopardize the continued existence of an endangered or threatened species or its designated critical habitat. The planning area encompasses seven USFWS Ecological Services Offices within both the Mountain-Prairie and Southwest Regions.

Migratory Bird Treaty Act of 1918

The Migratory Bird Treaty Act (MBTA) implements a series of international treaties that provide for migratory bird protection. Under the MBTA it is unlawful, except as permitted by regulations, “to pursue, take, or kill any migratory bird, or any part, nest or egg of any such bird” (16 USC, Section 703); however, the MBTA does not regulate habitat. The list of species protected by the MBTA was revised in March 2010 and includes almost all 1,007 bird species that are native to the United States.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA) prohibits the take, possession, sale, purchase, barter, offer to sell, purchase, or barter, transport, export or import of any eagle, alive or dead, including any part, nest, or egg, unless authorized by permit. Further, activities that would disturb an eagle are prohibited under the BGEPA. Disturb means to agitate or bother an eagle to a degree that causes, or is likely to cause, based on the best scientific information available any one of the following:

- Injury
- a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior

- Nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior

If a proposed project or action would occur in areas where eagles are nesting, feeding, or roosting, proponents of the project may need to take additional conservation measures to comply with BGEPA. New regulations (50 Code of Federal Regulations [CFR], Parts 22.26 and 22.27) allow the take of eagles and their nests to protect interests in a particular locality. However, project proponents are required to consult with the US Fish and Wildlife Service's (USFWS) Migratory Bird, Ecological Services, and Law Enforcement programs before that agency issues a permit for such take.

Federal Noxious Weed Act

The Federal Noxious Weed Act of 1974 provides for the control and management of nonindigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or public health. The act prohibits importing or moving any noxious weeds identified by the regulation and allows for inspection and quarantine to prevent their spread.

Executive Order 13112, Invasive Species

Signed in 1999, Executive Order 13112 directs federal agencies to prevent the introduction of invasive species, to provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause.

Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds

Signed on January 11, 2001, this executive order directs each federal agency taking actions that are likely to have a measureable effect on migratory bird populations to develop and implement a memorandum of understanding with the USFWS to conserve migratory bird populations. In accordance with the executive order, the BLM and USFWS signed a national-level memorandum of understanding in 2010 to strengthen migratory bird conservation efforts. Under the memorandum, the two agencies will identify and implement strategies to promote conservation and reduce or eliminate adverse impacts on migratory birds through enhanced collaboration.

Instruction Memorandum No. 2002-174, Oil and Gas Leasing Stipulations

In accordance with IM 2002-174, BLM state offices include the lease stipulation WO-ESA-7 on oil and gas leases where threatened, endangered, or other special status species or critical habitat is known or strongly suspected. The lease stipulation is as follows:

The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modifications to exploration and development proposals to further its

conservation and management objective to avoid BLM-approved activity that will contribute to a need to list such a species or their habitat. BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. BLM will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.C. § 1531 et seq., including completion of any required procedure for conference or consultation.

State Regulations—Endangered or Threatened Species

Oklahoma has an endangered species statute (Title 29 Game and Fish, Chapter I Oklahoma Wildlife Conservation Code, Article V Game, Part 4 Protected Game). It gives the State the authority to list a wildlife species as threatened or endangered in the Oklahoma. At present, four wildlife species are listed by the State as threatened or endangered.

State- and federal-listed species are protected in Kansas by the Kansas Nongame and Endangered Species Conservation Act of 1975. The act places the responsibility for identifying and undertaking appropriate conservation measures for listed species directly on the Department of Wildlife, Parks, and Tourism. This is enforced through Chapter 32 Article 9, Sections 32-957 through 32-963, 32-1009 through 32-1012, and 32-1033 and regulations. Regulations require the Department of Wildlife, Parks, and Tourism to issue special action permits for activities that affect species listed as threatened or endangered in Kansas.

Texas laws and regulations pertaining to state endangered or threatened animal species are contained in Texas Parks and Wildlife Department (TPWD) Code, Chapters 67 and 68, and Texas Administrative Code, Sections 65.171-65.176, of Title 31. Laws and regulations pertaining to endangered or threatened plant species are contained in Chapter 88 of the TPWD Code and Sections 69.01 through 69.9 of the Texas Administrative Code. These regulations prohibit the taking, possession, transportation, or sale of any of the animal species designated by state law as endangered or threatened without a permit.

The Nebraska Nongame and Endangered Species Conservation Act prohibits taking, possessing, transporting, exporting, processing or sale of state listed species without a permit. This Act is contained within Nebraska Revised Statutes of 1943, Chapter 37, Game and Parks Article 8.

State Regulations—Noxious Weeds

Title 2 of the Oklahoma Agricultural Code advises that controlling noxious weeds is the responsibility of every landowner or occupant. According to the Noxious Weed Laws and Rules of Oklahoma (OSDA 2000), every landowner and public, private, or corporate entities that maintain rights-of-way in Oklahoma is responsible for removing any thistle infestation in their jurisdiction. Noxious weeds in Oklahoma were listed by passage of House Bill 2277 (NRCS 2014a).

Article 13 of the Kansas Agricultural Statutes, the Kansas Noxious Weed Law (KDA 2013), defines noxious weeds in the state and outlines control and management actions. The Kansas Department of Agriculture listed noxious weeds in 2003 (NRCS 2014b).

Chapter 71, Subchapter D, of the Texas Agricultural Code requires the Texas Department of Agriculture to publish a list of noxious and invasive plant species. These species are listed in Subchapter T of the code (TDA 2005; NRCS 2014c).

The Nebraska Department of Agriculture's Noxious Weed Program regulates the Noxious Weed Control Act in Nebraska. The Act allows the direct to prepare, publish, and revise as necessary a list of noxious weeds (NRCS 2014d).

CHAPTER 2

VEGETATION AND LAND USE

2.1 DESCRIPTION OF GENERAL LANDSCAPE/ECOREGION AND LAND USES IN THE PLANNING AREA

2.1.1 Ecoregions within the Planning Area

The planning area is in portions of 19 US Environmental Protection Agency (EPA) Level III ecoregions (Woods et al. 2005; Chapman et al. 2001; Griffith et al. 2004; USEPA 2013). The number of acres of each ecoregion in the planning and decision area are summarized in **Table 2-1**; ecoregions in the planning area are shown in **Figure 2-1** and are briefly described below.

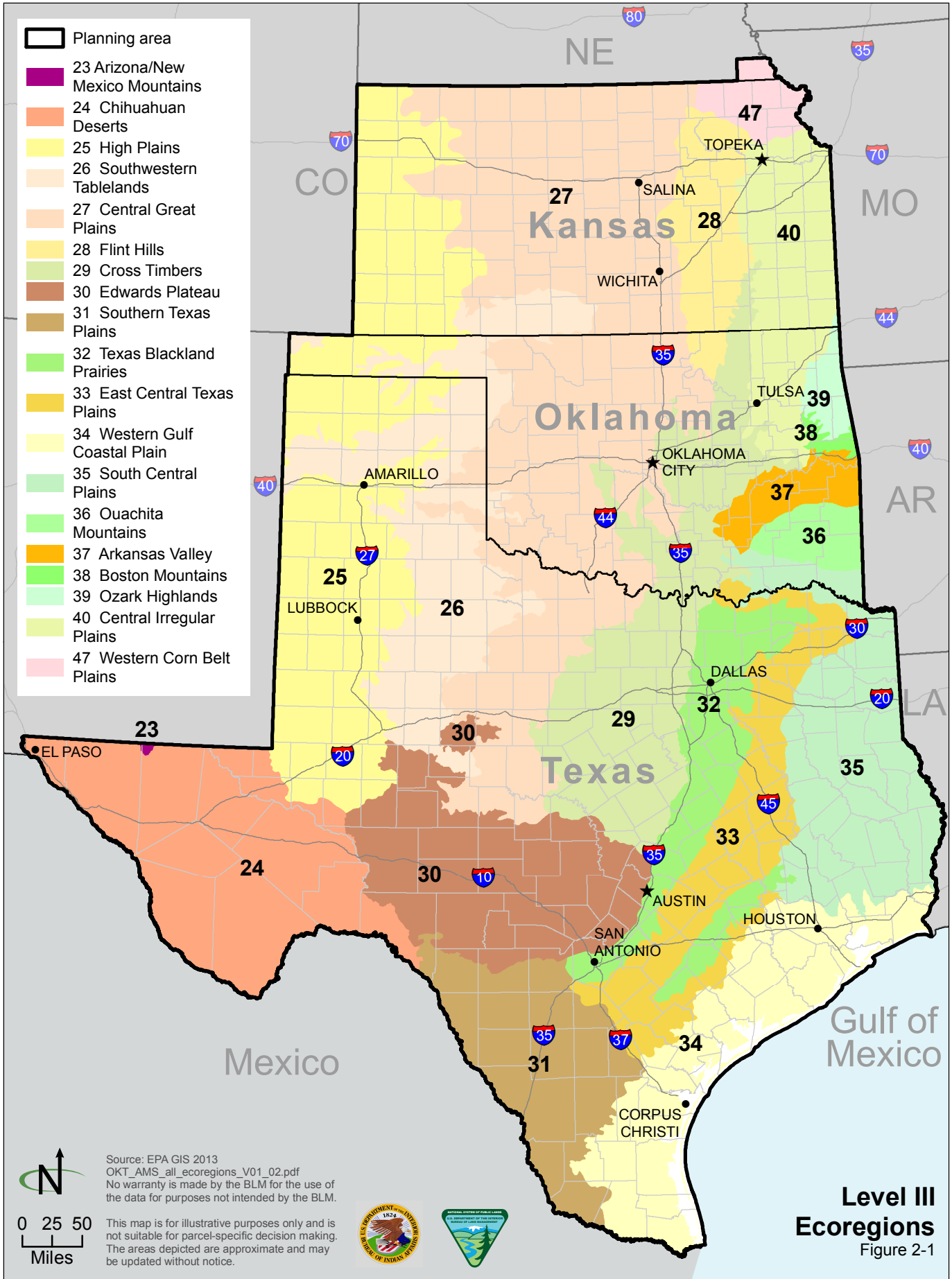
Arizona/New Mexico Mountains (23). The Arizona/New Mexico Mountains are distinguished from neighboring mountainous ecoregions by their lower elevations. Their associated vegetation is indicative of drier, warmer environments, due in part to the region's more southerly location. Forests of spruce (*Picea* spp.), fir (*Abies* spp.), and Douglas-fir (*Pseudotsuga menziesii*), common in the Southern Rockies (21) and the Wasatch and Uinta Mountains (19), are found only in limited areas at the highest elevations in this region. Chaparral is common at lower elevations in some areas, pinyon-juniper (*Pinus edulis-Juniperus* spp.) and oak (*Quercus* spp.) woodlands occur at lower and middle elevations. The higher elevations are mostly covered with open to dense ponderosa pine (*Pinus ponderosa*) forests. This ecoregion is limited in extent to a small area in western Texas, along the border with New Mexico.

Chihuahuan Deserts (24). This desert ecoregion extends from the Madrean Archipelago (79) in southeast Arizona to the Edwards Plateau (30) in south-central Texas. It is the northern portion of the southernmost desert in North America, which extends more than 500 miles south into Mexico. It is generally a continuation of basin and range terrain that is typical of the Mojave Basin and Range (14) and Sonoran Basin and Range (81) ecoregions to the west, although

Table 2-1
EPA Level III Ecoregions in the Joint EIS/BLM RMP and BIA Integrated RMP Planning Area
and Decision Area

Ecoregion (Identifying Number)	Planning Area	BLM- Administered Surface Lands	BLM- Administered Federal Mineral Estate	BIA- Administered Tribal and Allotted Lands	BIA- Administered Tribal and Allotted Subsurface Mineral Estate
Arizona/New Mexico Mountains (23)	52,400	—	—	—	—
Chihuahuan Deserts (24)	22,632,200	—	179,000	—	—
High Plains (25)	33,675,300	30	91,900	—	—
Southwestern Tablelands (26)	19,458,200	11,900	99,000	—	—
Central Great Plains (27)	53,137,200	34,700	672,900	381,200	643,500
Flint Hills (28)	6,902,200	—	232,300	53,200	517,200
Cross Timbers (29)	21,791,800	240	827,700	217,200	1,118,600
Edwards Plateau (30)	18,524,000	—	51,500	—	—
Southern Texas Plains (31)	13,201,000	—	97,300	130	100
Texas Blackland Prairies (32)	10,719,900	—	184,300	—	—
East Central Texas Plains (33)	13,776,800	—	131,900	600	3,300
Western Gulf Coastal Plain (34)	14,769,400	—	347,100	—	—
South Central Plains (35)	17,423,100	—	566,000	27,000	49,000
Ouachita Mountains (36)	2,589,300	—	95,000	21,100	35,600
Arkansas Valley (37)	3,077,300	70	635,000	42,600	91,700
Boston Mountains (38)	530,500	—	95,000	16,900	20,600
Ozark Highlands (39)	1,548,200	—	27,900	55,400	59,300
Central Irregular Plains (40)	10,722,600	—	349,100	15,700	56,800
Western Corn Belt Plains (47)	2,635,000	—	11,900	22,000	22,000

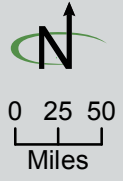
Source: EPA GIS 2013



- Planning area
- 23 Arizona/New Mexico Mountains
- 24 Chihuahuan Deserts
- 25 High Plains
- 26 Southwestern Tablelands
- 27 Central Great Plains
- 28 Flint Hills
- 29 Cross Timbers
- 30 Edwards Plateau
- 31 Southern Texas Plains
- 32 Texas Blackland Prairies
- 33 East Central Texas Plains
- 34 Western Gulf Coastal Plain
- 35 South Central Plains
- 36 Ouachita Mountains
- 37 Arkansas Valley
- 38 Boston Mountains
- 39 Ozark Highlands
- 40 Central Irregular Plains
- 47 Western Corn Belt Plains

Source: EPA GIS 2013
 OKT_AMS_all_ecoregions_V01_02.pdf
 No warranty is made by the BLM for the use of the data for purposes not intended by the BLM.

This map is for illustrative purposes only and is not suitable for parcel-specific decision making. The areas depicted are approximate and may be updated without notice.



Level III Ecoregions
 Figure 2-1

the pattern of alternating mountains and valleys is not as pronounced. Outside the major river drainages, such as the Rio Grande and Pecos River in New Mexico and Texas, the landscape is largely internally drained. Vegetation is predominantly desert grassland and arid shrubland, except for high elevation islands of oak, juniper, and pinyon pine woodland. In the planning area, this ecoregion is limited to southwest Texas.

High Plains (25). Much of the High Plains is characterized by smooth to slightly irregular plains, having a high percentage of cropland. This is because it is higher and drier than the Central Great Plains (27) to the east. The High Plains are in contrast to the irregular, mostly grassland or grazing land of the Northwestern Great Plains (43) to the north. Grama grass (*Bouteloua gracilis*)-buffalo grass (*B. dactyloides*) is the potential natural vegetation in this region. This is as compared to mostly wheatgrass (*Agropyron smithii*)-needlegrass (*Stipa* spp.) to the north, Trans-Pecos shrub savanna to the south, and taller grasses to the east. In the planning area, this ecoregion occupies the eastern portions of Oklahoma, Kansas, and Texas.

Southwestern Tablelands (26). The Southwestern Tablelands flank the High Plains (25) with red hued canyons, mesas, badlands, and dissected river breaks. Unlike most adjacent Great Plains ecological regions, little of the Southwestern Tablelands is in cropland. Much of this region is in sub-humid grassland and semiarid range land. The potential natural vegetation is grama-buffalo grass, with some mesquite (*Prosopis* spp.)-buffalo grass in the southeast, juniper-scrub oak (*Quercus gambellii*)-middle-grass savanna on escarpment bluffs, and shinnery (mid-grass prairie with open low and shrubs) along the Canadian River. In the planning area, this ecoregion occupies portions of the Oklahoma and Texas panhandles and a portion of southern-central Kansas.

Central Great Plains (27). The Central Great Plains are slightly lower, receive more precipitation, and are somewhat more irregular than the High Plains (25) to the west. Once a grassland with scattered low trees and shrubs in the south, much of this ecological region is now cropland. In the planning area, it occupies much of central Oklahoma and Kansas and a portion of north-central Texas.

Flint Hills (28). The Flint Hills is a region of rolling hills, with relatively narrow steep valleys. It is composed of shale and cherty limestone with rocky soils. In contrast to surrounding ecological regions that are mostly in cropland, most of the Flint Hills region is grazed by cattle. The Flint Hills mark the western edge of the tall-grass prairie and contain the largest remaining intact tall-grass prairie in the Great Plains. In the planning area, this ecoregion occupies a portion of eastern Kansas and a small area of northeast Oklahoma.

Cross Timbers (29). The Cross Timbers ecoregion is a transition area. It is between what was once prairie and is now winter wheat-growing regions to the

west and the forested low mountains or hills of eastern Oklahoma and Texas. Transitional “cross-timbers” (little bluestem [*Schizachyrium scoparium*] grassland with scattered blackjack oak [*Quercus marilandica*] and post oak [*Q. stellata*]) is the native vegetation. Rangeland and pastureland comprise the predominant land cover, with some areas of woodland. Oil extraction has been a major activity in this region for over eighty years. In the planning area, this ecoregion occupies a portion of central Oklahoma and north-central Texas and a small area in southeast Kansas.

Edwards Plateau (30). This ecoregion is largely a dissected limestone plateau that is hillier in the south and east, where it is easily distinguished from bordering ecological regions by a sharp fault line. The region contains a sparse network of perennial streams. Due to karst topography and resultant underground drainage, the streams are relatively clear and cool, compared to those of surrounding areas. Originally covered by juniper-oak savanna and mesquite-oak savanna, most of the region is used for grazing beef cattle, sheep, goats, and wildlife. This ecoregion is limited to south-central Texas.

Southern Texas Plains (31). This rolling to moderately dissected plain was once covered with grassland and savanna vegetation that varied during wet and dry cycles. Following long, continued grazing and fire suppression, thorny brush, such as mesquite, is now the predominant vegetation type. Also known as the Tamualipan thornscrub (or “the brush country,” as it is called locally), the sub-humid to dry region has its greatest extent in Mexico. It is generally lower in elevation and with warmer winters than the Chihuahuan Deserts (24) to the northwest. It contains a high and distinct diversity of plant and animal life. Oil and natural gas production are widespread. This ecoregion is limited to south-central Texas.

Texas Blackland Prairies (32). The Texas Blackland Prairies form a disjunct ecological region, distinguished from surrounding regions by its fine-textured, clayey soils and predominantly prairie potential natural vegetation. This region now contains a higher percentage of cropland than adjacent regions; pasture and forage production for livestock is common. Large areas of the region are being converted to urban and industrial uses. This ecoregion is limited to eastern Texas.

East-Central Texas Plains (33). Also called the Post Oak Savanna or the Claypan Area, this region of irregular plains was originally covered by post oak savanna vegetation. This is in contrast to the more open prairie-type regions to the north, south, and west and the pine forests to the east. Many areas have a dense, underlying clay pan, affecting water movement and available moisture for plant growth. The bulk of this ecoregion is now used for pasture and range. It is limited to eastern Texas and a small portion of southeast Oklahoma.

Western Gulf Coastal Plain (34). The principal distinguishing characteristics of the Western Gulf Coastal Plain are its relatively flat coastal plain topography and mainly grassland potential natural vegetation. Urban and industrial land uses have expanded greatly in recent decades, and oil and gas production is common. This ecoregion is limited to southern Texas.

South Central Plains (35). Locally termed the “piney woods,” this region of mostly irregular plains represents the western edge of the southern coniferous forest belt. Once blanketed by a mix of pine and hardwood forests, much of the region is now in loblolly (*Pinus taeda*) and shortleaf pine (*P. echinata*) plantations. Only about one sixth of the region is cropland, primarily in the Red River floodplain, while about two thirds of the region is forests and woodland. This ecoregion is limited to eastern Texas and a small portion of southeast Oklahoma.

Ouachita Mountains (36). The Ouachita Mountains ecological region is made up of sharply defined east-west trending ridges, formed through erosion of compressed sedimentary rock formations. The Ouachita Mountains are structurally different than the Boston Mountains (38), more folded and rugged than the lithologically distinct Ozark Highlands (39), and physiographically unlike the Arkansas Valley (37) and South Central Plains (35). Potential natural vegetation is oak-hickory (*Carya* spp.)-pine forest, which contrasts with the oak-hickory forest that dominates the Ozark Highlands (39) and the northern part of the Boston Mountains (38). Most of this region is now in loblolly and shortleaf pine plantations. This ecoregion is limited to southeastern Oklahoma.

Arkansas Valley (37). A region of mostly forested valleys and ridges, the physiography of the Arkansas Valley is much less irregular than that of the Boston Mountains (38) to the north and the Ouachita Mountains (36) to the south; it is more irregular than the ecological regions to the west and east. This ecoregion is limited to southeastern Oklahoma.

Boston Mountains (38). The Boston Mountains contrast with the nearby Ouachita Mountains (36) region, which is composed of folded and faulted linear ridges and is mostly covered by pine forests. The Boston Mountains ecological region consists of a deeply dissected sandstone and shale plateau, originally covered by oak-hickory forests. Red oak (*Quercus rubra*), white oak (*Q. alba*), and hickory remain the dominant vegetation in this region, although shortleaf pine and eastern red cedar are found in many of the lower areas and on some south- and west-facing slopes. This ecoregion is limited to eastern Oklahoma.

Ozark Highlands (39). The Ozark Highlands ecoregion has a more irregular physiography and is generally more forested than adjacent regions, with the exception of the Boston Mountains (38) to the south. Soils are mostly derived from cherty carbonate rocks. Karst features, including caves, springs, and spring-fed streams, are found throughout most of the Ozark Highlands. Most of the

region is forested; oak is the predominant forest type, but mixed stands of oak and pine are also common. This ecoregion is limited to northeast Oklahoma, with a very small portion in southeast Kansas.

Central Irregular Plains (40). The Central Irregular Plains have a mix of land use and are topographically more irregular than the Western Corn Belt Plains (47) to the north, where most of the land is in crops. The region, however, is less irregular and less forested than the ecoregions to the south and east. The potential natural vegetation of this ecological region is a grassland/forest mosaic, with wider forested strips along the streams, compared to the Western Corn Belt Plains (47) to the north. This ecoregion is limited to eastern Oklahoma and Kansas.

Western Corn Belt Plains (47). Once mostly covered with tall-grass prairie, over 80 percent of the Western Corn Belt Plains is now cropland, and much of the remainder is forage for livestock. Agricultural practices have contributed to environmental issues, including surface and groundwater contamination from fertilizer and pesticide applications, as well as concentrated livestock production. This ecoregion is limited to a portion of northeast Kansas and southeast Nebraska.

2.1.2 Draft Southern Great Plains Rapid Ecoregional Assessment

The Draft Southern Great Plains Rapid Ecoregional Assessment (REA; Assal et al. 2015) area encompasses nearly 180 million acres in the south-central United States, within portions of five states: the northern Texas panhandle, western Oklahoma, eastern New Mexico, eastern Colorado, and western Kansas. The area includes three ecoregions as defined by Omernik (1987), which coincide with the EPA level III ecoregions described above: the Central Great Plains, the High Plains or Western High Plains, and the Southwestern Tablelands.

The REA identifies 19 conservation elements, which are ecological resources of concern (Assal et al. 2015). This includes six ecological community conservation elements: mixed-grass prairie, short-grass prairie, riparian areas and wetlands, playas and saline lakes, lakes and reservoirs, and prairie streams and rivers. These conservation elements are described in detail in the draft REA.

2.2 DESCRIPTION OF HABITAT/VEGETATION TYPES

General habitats, which are those that are neither rare nor sensitive, in each state are described in the state wildlife action plan (ODWC 2005; Wasson et al. 2005; TPWD 2012). In Oklahoma, ODWC (2005) identifies broad regions and lists conservation landscapes in each region. In Kansas, Wasson et al. (2005) follows a similar convention and divides the state into broad conservation regions, listing general habitats in each conservation region. In Texas, TPWD (2012) describes natural communities that occur in the state, organized into broad habitat types, such as desert scrub, grassland, and forest. In Nebraska, the state wildlife action plan describes the various ecoregions within the state, and

identifies biologically unique landscapes within those regions (Schneider et al. 2011). Descriptions of general habitats can be found in the four states' plans.

2.2.1 Sensitive Habitat or Vegetation Communities in the Planning Area

In addition to the general habitats described in their wildlife action plans, each state designates high conservation priority or key (i.e., rare or sensitive) habitats or communities. These rare or sensitive habitat types are also described in each state's wildlife action plan or by their natural heritage inventories.

In Oklahoma, sensitive habitats are called key habitats, and several key habitats are described for each broad region in the state (ODWC 2005).

A similar convention exists in the Kansas plan (Wasson et al. 2005), whereby key habitats are described for each larger region in the state. Additionally, the Kansas Natural Heritage Inventory maintains a list of rare natural communities in the state (KNHI 2012a); rare natural communities are defined by the NatureServe conservation status system (NatureServe, n.d.).

In Texas, rare natural community types are also given a status ranking according to NatureServe (n.d.); approximately 200 rare natural communities are included in the TPWD (2012).

In Nebraska, biologically unique landscapes are identified, based on the occurrence of at-risk species and natural communities (Schneider et al. 2011).

Oklahoma

Oklahoma designates key habitats in its Comprehensive Wildlife Conservation Strategy (ODWC 2005). Key habitats were prioritized by considering the uniqueness of each in the wider ecological region (e.g., short-grass prairie region, tall-grass prairie region, and cross-timbers region). Another priority was the number, uniqueness, and endemism of species of greatest conservation need within each key habitat. Once evaluated, habitats were given a ranking of very high, high, or moderate to reflect conservation priority. Very high-ranked key habitats within each wider conservation region are briefly discussed below; full descriptions can be found in ODWC (2005), along with descriptions of high and moderate ranked habitats.

Short-Grass Prairie. This habitat is in the short-grass prairie region, where it is the most abundant habitat type; it is rated very high for conservation priority. Short-grass prairies are composed of the herbaceous plant associations of sideoats grama (*Bouteloua curtipendula*), blue grama, and buffalo grass on well-drained soils or rocky slopes; blue grama/hairy grama (*Bouteloua hirsuta*) on loamy or sandy soils; and blue grama and buffalo grass on clay soils. As much as 747,399 acres of short-grass prairie may remain in Oklahoma, but this is less than half of what was there historically. Much of the original short-grass prairie

has been converted to crop production, particularly dryland wheat or irrigated corn, soybeans, or alfalfa.

Mixed-Grass Prairie. Historically, this is the most widespread and common habitat type found in the mixed-grass prairie region, where it is rated very high for conservation priority. Mixed-grass prairie plant associations are little bluestem (*Schizachyrium scoparium*)/Indian grass (*Sorghastrum nutans*); little bluestem/sideoats grama/blue grama; little bluestem/big bluestem (*Andropogon gerardi*); and little bluestem/hairy grama. Much of the historic mixed-grass prairie in the region has been converted to other land uses, especially cropland and introduced pasture. Nearly four million acres of mixed-grass prairie is thought to remain, but this is less than 40 percent of the historic acreage. Mixed-grass prairie has been altered by fire suppression, heavy year-round grazing, introduced grasses and forbs, and Eastern redcedar (*Juniperus virginiana*) expansion.

Tall-Grass Prairie. This habitat occurs in the tall-grass prairie region where it is the most abundant habitat type; it is rated very high for conservation priority. Tall-grass prairies are herbaceous plant communities dominated by four common, tall grass species: big bluestem, Indian grass, switchgrass (*Panicum virgatum*), and little bluestem. The structure of this habitat type is maintained by natural fires that limit the growth of woody plant species and favor grasses and some forbs (flowering plants other than grass). All four of the dominant grass species are present in most tall-grass prairie sites; however, big bluestem and Indian grass tend to be most prevalent in mesic sites, while big bluestem and little bluestem are most common on drier sites. In mesic loamy soils, such as those found in floodplains and bottomlands, switchgrass and big bluestem are often the dominant grasses.

Shinnery Oak Shrubland. Shinnery oak shrubland habitat is unique to the mixed-grass prairie region, where it is rated very high for conservation priority. It occurs locally on sandy soils and stabilized dunes. Duck and Fletcher (1944) estimated that nearly 750,000 acres of shinnery oak shrublands historically occurred in Oklahoma. Peterson and Boyd (1998) estimated that more than 100,000 acres of this had been converted to other cover types, primarily crop fields and introduced pastures. Shinnery oak shrubland is a climax plant community in which shrubs and grasses are codominant. Harvard oak (*Quercus harvardii*), also known as shinnery oak, is the dominant shrub, though sand sagebrush (*Artemisia filifolia*), sand plum (*Prunus angustifolia*), and netleaf hackberry (*Celtis reticularia*) are also common. Dominant grasses are sand dropseed (*Sporobolus cryptandrus*) and little bluestem. Harvard (i.e., shinnery) oak is a low shrub usually less than six feet tall that develops a massive system of underground stems and a deep root system. A single individual may have over 100 aboveground stems, each appearing to be a single small shrub and spreading 10 to 50 feet in diameter (Muller 1951).

Sand Sagebrush/Bluestem Shrubland. Sand sagebrush shrublands are found locally in the mixed-grass prairie region, where they are ranked very high for conservation priority. They occur on deep sandy soils and stabilized dunes. Sand sagebrush is typically found growing in association with sand dropseed and little bluestem.

Pinyon Pine/Juniper Woodland or Savannah. In Oklahoma, this habitat type is unique to the short-grass prairie region, where it is rated very high for conservation priority. It is found on rocky soils in the Black Mesa area, in the northwestern corner of the Oklahoma panhandle. The dominant woody plants in this woodland community are one-seeded juniper (*Juniper monosperma*) and pinyon pine. The understory of this woodland is dominated by the short grasses sideoats grama, hairy grama, blue grama, and buffalo grass.

Shortleaf Pine/Oak Woodland or Savannah. This is an uncommon and locally occurring plant community that is typically found on slopes with a southern or western aspect in the Ouachita Mountains. The shortleaf pine savannah and woodland habitat type is a plant community that relies on frequent fire to suppress oaks and to reduce the density of pines. The understory in this habitat type is dominated by grasses and forbs, particularly little bluestem, narrowleaf woodoats (*Chasmanthium sessiliflorum*), panic grasses (*Dichanthelium* spp.), pale purple coneflower (*Echinacea pallida*), beebalm (*Monarda russeliana*), and elmleaf goldenrod (*Solidago ulmifolia*). Understory shrub density is related to fire frequency. Much of this habitat has changed, as a result of fire suppression and succession, to mixed shortleaf pine/oak forest or has been converted to industrial pine plantations.

Bottomland Hardwood Forest. This plant community is found locally in the floodplains of rivers and large streams. A large percentage of this habitat, possibly over 50 percent, has been either converted to agricultural uses (e.g., crop fields or introduced pasture) or is permanently inundated by the construction of reservoirs. Bottomland hardwood forests are diverse plant communities, and their species composition varies with soil conditions and flooding frequency and duration. Most bottomland hardwood forests are dominated by oak species, such as water oak (*Quercus nigra*), willow oak (*Q. phellos*), and Shumard oak (*Q. shumardii*). Other common deciduous trees are black gum (*Nyssa sylvatica*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubra*), and sugarberry (*Celtis laevigata*). Common understory vegetation is American hornbeam (*Carpinus caroliniana*), parsley hawthorn (*Crataegus marshallii*), deciduous holly (*Ilex decidua*), and spicebush (*Lindera benzoin*).

White Oak/Hickory Mesic Forest. White oak/hickory mesic forest is restricted to the Ouachita Mountains. It occurs locally on sites with favorable moisture and soil conditions, such as the north-facing slopes of the larger mountain ridges and in narrow sheltered ravines. This habitat is considered a late-successional forest type and is maintained by infrequent small-scale

disturbances, such as high winds and glaze storms (freezing rain storms). Mesic forests have a high diversity of tree species and often have well developed canopies, mid-stories, and understories. Dominant canopy trees are white oak, northern red oak, and mockernut hickory (*Carya tomentosa*).

Small and Large Rivers, Sloughs, and Ponds. Small rivers are rated very high for conservation priority in the tall-grass prairie region, where two small rivers occur, the Caney and Verdigris. Small rivers are also rated very high for conservation priority in the cross-timbers region. Small rivers in this region are all or a portion of four tributaries to the Red River (the Washita, Blue, Clear Boggy, and Muddy Boggy Rivers) and two tributaries in the Arkansas River system (the Little and Deep Fork Rivers). Each of these is a low-gradient river that meanders through a broad predominately forested floodplain and lacks the dynamic mosaic of ephemeral disturbance-maintained habitats associated with large rivers, such as sandbars, mudflats, scoured bends, and sandbar willow thickets.

Five small rivers are found in the Ouachita Mountains, Arkansas Valley, and the Western Gulf Mid Coastal Plain Region. Each river originates in the Ouachita Mountains. One then flows north to the Arkansas River (Poteau River) or south to eventually enter the Red River (the Kiamichi, Little, Glover, and Mountain Fork). Two additional small rivers in the Ozark region are also rated very high for conservation priority, the Spring and Illinois Rivers. Their upper reaches are relatively shallow, clear, and fast moving, with a channel substrate of cobble or bedrock. The lower reaches of these rivers are relatively turbid and slow moving and meander over a sandy or silty substrate in broad forested floodplains.

Large rivers are rated very high for conservation priority in the cross-timbers region. Portions of five large rivers pass through this region: the Arkansas, Cimarron, North Canadian, Canadian, and Red Rivers. Each has a seasonal period of high flow during the spring. This is followed by a period of much lower flow during the summer, which maintains a dynamic mosaic of ephemeral habitats, such as sandbars, mudflats, sandbar willow thickets, and marshy sloughs. These habitats are found along and within river channels that depend on periodic scouring flows.

Gypsum or Sandstone Canyonlands and Caves. This habitat type occurs on hilly dissected uplands where layers of brick-red shales, sandstones, and interbedded grayish gypsum are exposed at or near the earth's surface. The thin, dry, calcareous soils overlying these rock layers support a unique community of low stature, drought-tolerant prairie grasses and forbs, including little bluestem and hairy grama. Years of erosion have carved out canyons, buttes, and mesas, while groundwater movement has dissolved gypsum to create numerous caves.

Limestone Caves and Springs. Much of the Ozark Region in Oklahoma is underlain by the Springfield Plateau, a formation of porous limestone with deep fissures that is often referred to as karst. Slightly acidic groundwater moves through the fissures and cracks in the limestone, dissolving or eroding subterranean stream channels and caves. Because of its geology, the Ozark Region contains many complex systems of interconnected aquifers, caves, sinkholes, and springs; these systems in turn support diverse subterranean communities of salamanders, bats, Ozark cavefish, cave crayfish, and other cave- or aquifer-dwelling invertebrates. The distribution and biological composition of caves is poorly known and in need of further investigation.

Additional high-ranked conservation landscapes are described in ODWC (2005). These are sand plum, hawthorne, and sumac shrubland, sand sagebrush/bluestem shrubland, post oak/blackjack oak/hickory woodlands and forests, shortleaf pine woodland and forest, mesic loblolly pine/oak forest, herbaceous wetlands, and sandstone canyonlands. Conservation landscapes ranked as moderate are also discussed in ODWC (2005).

Kansas

Kansas also designates key habitats in its Comprehensive Wildlife Plan (Wasson et al. 2005). They are identified within each larger conservation region of the state (e.g., short-grass prairie, mixed-grass prairie, and tall-grass prairie conservation regions) and are based on the land cover types in the Final Report of the Kansas GAP Analysis Project (Wasson et al. 2005). Key habitats are discussed below.

Short-Grass Prairie. Short-grass prairie is found primarily in the western third of the state, in the larger short-grass prairie conservation region, where it is the dominant habitat type. This habitat type is described in detail above.

Mixed-Prairie. Mixed-prairie habitat is found primarily in the Smoky Hill and High Plains areas of the state, in the central mixed-grass prairie conservation region. This habitat type is described in detail above. Its quality and quantity are declining in the region.

Tall-Grass Prairie. Tall-grass prairie habitat is a core habitat in need of special emphasis in the eastern tall-grass prairie conservation region. The largest remaining undisturbed tracts of this habitat occur in the Flint Hill Uplands area. This habitat type is described in detail above. Its quality and quantity are declining in the region.

Sand Prairie. Sand prairie habitat is found in well-drained sand soils in the Arkansas River lowlands, the Red Hills, the Smoky Hills, and the Wellington-McPherson lowlands, which are in the central mixed grass prairie conservation region. Sand bluestem (*Andropogon hallii*) is the dominant grass. The quality and quantity of this habitat is declining in the region.

Sandsage Shrubland. Sandsage shrubland is found primarily in the southwestern portion of the state, within the larger short-grass prairie conservation region. Sandsage (*Artemisia filifolia*) is the dominant shrub. Additional dominant grasses are sand bluestem and sandreed grass (*Calamovilfa longifolia*). Sandsage shrubland is declining in both quantity and quality in the region.

Deciduous Forest. Deciduous forest habitat in the eastern tall-grass prairie conservation region is typically composed of sugar maple (*Acer saccharum*)-American basswood (*Tilia americana*) forest, white oak and chinkapin oak (*Quercus muehlenbergii*) forest, and other mixed deciduous trees, including cottonwood, black willow (*Salix nigra*), slippery elm (*Ulmus rubra*), Osage orange (*Maclura pomifera*), and honeylocust (*Gleditsia triacanthos*).

Herbaceous Wetland. Playa lakes are the dominant herbaceous wetlands of the short-grass prairie conservation region. Playa lakes are shallow, clay-lined, ephemeral wetlands. Because rainfall is the only source of water, playa lakes go through a wet-dry cycle each year. Herbaceous wetland habitat in the short-grass prairie conservation region is composed of several wetland alliances: blue mudplantain (*Heteranthera limosa*) or barnyard grass (*Echinochloa* spp.)-smartweed (*Polygonum* spp.) playa lakes, low or wet prairie cordgrass (*Spartina pectinata*) prairie, freshwater marsh dominated by cattail (*Typha* spp.), tules (*Scirpus* spp.), or rushes (*Juncus* spp.), and bulrush (*Scirpus pungens*) marsh.

The quality of herbaceous wetland habitat in the region is unknown and the quantity is declining. In the central mixed-grass prairie conservation region, herbaceous wetlands are composed of spikerush (*Eleocharis* spp.) and other playa lake habitats, low or wet prairie, and freshwater cattail marsh. The quality and quantity of this habitat are both declining. In the eastern tall-grass prairie conservation region, herbaceous wetlands are generally composed of low or wet prairie and freshwater and cattail marsh. Common wetland species are softstem bulrush (*Scirpus validus*), cattails, bulrushes, ragweeds (*Ambrosia* spp.), sorrels (*Rumex* spp.), prairie cordgrass, spikerushes, and sedges (*Carex* spp.). Wetlands are generally located in the floodplains along rivers and streams, in swales associated with rivers, or as margins of lakes and impoundments. These are mostly seasonal and permanent wetlands.

Riparian Corridor Complex. Riparian corridors in the short-grass and central mixed-grass prairie conservation regions typically depend on intermittent flows, due to the lowering water table and surface water withdrawal for human uses. These systems are found in rivers, streams, and tributaries in the Arkansas, Smoky Hill, Saline, Solomon, and Republican River basins in western Kansas. Dominant plant species are cottonwood (*Populus deltoides*), American elm (*Ulmus americana*), hackberry (*Celtis occidentalis*), maples, and willows. In the eastern portion of the state, these systems occur in the Neosho, Missouri, Verdigris, Eastern Arkansas, Kansas, and Marais des

Cygnus River basins. Deciduous floodplain (riparian) systems on these rivers are typically composed of pecan (*Carya illinoensis*), bur oak (*Quercus macrocarpa*), green ash (*Fraxinus pennsylvanica*), American elm, cottonwood, sugar maple, river birch (*Betula nigra*), and hackberry.

Texas

The Texas Rare Plant Community List defines 210 natural community types—152 upland types and 58 wetland types—which are declining throughout the state. The list was developed for Texas Parks and Wildlife Department’s revised Texas Conservation Action Plan (TPWD 2012). Communities are ranked using a conservation status system established by NatureServe (NatureServe, n.d.). Each community type possesses a global (range-wide) and state rank, based on their respective rarity. The conservation status of a plant community is designated by a number from one to five, preceded by a letter reflecting the appropriate geographic scale (G=Global, S=State). Numbers have the following meaning: 1—Critically imperiled, 2—Imperiled, 3—Vulnerable, 4—Apparently secure, and 5—Secure. Generally, those communities with a S3 (vulnerable in the state) ranking or lower are included on the rare plant community list.

Rare plant communities identified by TPWD (2012) are not included in this document due to the large number in the state. Instead, lists and descriptions of specific rare communities can be found in Texas’s plan (TPWD 2012). In general, priority habitats addressed in the Texas Conservation Action Plan include native grasslands, surface waters (rivers, streams, swamps, estuaries, and wetlands, including playas, springs, seeps, and bogs), groundwater, riparian and floodplains, and caves and karst.

Native grasslands, which are considered to be among the most vulnerable habitats in Texas, are highly fragmented, compromised in quality, or located in small dispersed patches. Native grasslands are highly desired for livestock grazing. Most are heavily impacted by conversion to crop agriculture, nonnative pasture, urban development, overgrazing, nonnative and native problematic plant invasion, and other threats.

Wetlands and springs support many special status and common plant and wildlife species across the state, and plant communities surrounding these features are highly specialized and unique. Springs are very sensitive to human and livestock disturbance and groundwater impacts. Wetlands are incredibly diverse habitats in Texas, and include desert cienegas (a swamp or marsh formed and fed by springs), plains playas, forested bottomlands, bogs and fens, and freshwater and saltwater marshes.

Wetlands at the highest risk may be those considered non-jurisdictional and isolated. These are not protected under any regulation and typically are some of the unique and most important wetlands, disconnected from river and stream systems as stand-alone features, such as playas, some bogs, and fens. Rare

riparian plant communities in Texas include woodlands and forests dominated by Fremont cottonwood (*Populus fremontii*), velvet ash, Goodding's willow (*Salix gooddingii*), netleaf hackberry, little walnut (*Juglans microcarpa*), American sycamore (*Platanus occidentalis*), and Edward's Plateau bald cypress (*Taxodium disticum*).

Nebraska

Within Nebraska, four biologically unique landscapes occur within Richardson County as described in the state wildlife action plan. Other biologically unique landscapes occur within the state of Nebraska; however, those which occur outside the planning area are not discussed.

Southeast Prairies. This landscape includes the rolling hills of western Richardson, Pawnee, southern Johnson, and southern Gage counties. The land cover is primarily cropland, but there are also many tall-grass prairie remnants dominated by big bluestem and Indian grass and reseeded native and exotic grasses.

Missouri River. This landscape include the Missouri River channel, floodplain, and bluffs from the Nebraska/Kansas border to the Nebraska/South Dakota border. The Missouri River drains approximately 529,350 square miles of land, including the entire state of Nebraska (Schneider et al. 2011).

Rulo Bluffs. The Rulo Bluffs landscape includes the steep bluffs of the Missouri River in Richardson County. The majority of the bluffs support eastern deciduous forest of oaks, hickories, and brasswood. Due to its location in extreme southeastern Nebraska, this landscape this landscape has a high diversity of eastern deciduous forest plant and animal species (Schneider et al. 2011).

Indian Cave Bluffs. This landscape includes the steep bluffs of the Missouri River in Nemaha and Richardson Counties. This area supports an eastern deciduous forest of oaks, hickories and brasswood. Tall-grass prairie remnants still occur on some bluff tops and south- and west-facing slopes. These have been greatly reduced in size and degraded over the years by shrub and tree encroachment resulting from lack of wildfires.

2.2.2 Noxious Weeds and Invasive Species

Both noxious and nonnative invasive plants have the potential to impact the ecological integrity of region. For this reason, both noxious and nonnative invasive plants are discussed in this section.

Noxious Weeds

Noxious weeds can directly or indirectly injure or damage crops, livestock, or other interests of agriculture, irrigation, navigation, natural resources, or public

health. Noxious weeds designated by Oklahoma, Kansas, Texas, and Nebraska are summarized in **Table 2-2** and are described below.

Table 2-2
Noxious Weeds Potentially in the Planning Area

Scientific Name (Synonym)	Common Name	Noxious in Oklahoma?	Noxious in Kansas?	Noxious in Texas?	Noxious in Nebraska?
<i>Acroptilon repens</i>	Russian knapweed	—	NW	—	—
<i>Alhagi maurorum</i> (A. camelorum)	Camelthorn	—	—	NP	—
<i>Alternanthera philoxeroides</i>	Alligatorweed	—	—	NP	—
<i>Ambrosia grayi</i>	Bur ragweed	—	NW	—	—
<i>Arundo donax</i>	Giant reed	—	—	NP	—
<i>Calystegia sepium</i>	Hedge bindweed	—	—	NP	—
<i>Cardaria draba</i>	Hoary cress	—	NW	—	—
<i>Cardiospermum halicacabum</i>	Balloonvine	—	—	NP	—
<i>Carduus acanthoides</i>	Plumeless thistle	—	—	—	NW
<i>Carduus nutans</i>	Musk thistle, nodding plumeless thistle	NW	NW	—	NW
<i>Centaurea biebersteinii</i>	Spotted knapweed	—	—	—	NW
<i>Centaurea diffusa</i>	Diffuse knapweed	—	—	—	NW
<i>Cirsium arvense</i>	Canada thistle	NW	NW	—	NW
<i>C. vulgare</i>	Bull thistle	—	CO	—	—
<i>Convolvulus arvensis</i>	Field bindweed	—	NW	NP	—
<i>Cuscuta japonica</i>	Japanese dodder	—	—	NP	—
<i>Eichhornia azurea</i>	Rooted water hyacinth	—	—	NP	—
<i>E. crassipes</i>	Floating water hyacinth	—	—	NP	—
<i>Elymus repens</i> (Agropyron r.)	Quackgrass	—	NW	—	—
<i>Euphorbia esula</i>	Leafy spurge	—	NW	—	NW
<i>Hoffmannseggia glauca</i>	Pignut, hog potato	—	NW	—	—
<i>Hydrilla verticillata</i>	Hydrilla	—	—	NP	—
<i>Ipomoea aquatica</i>	Water spinach	—	—	NP	—
<i>Lagarosiphon major</i>	Lagarosiphon	—	—	NP	—
<i>Landoltia punctata</i> (<i>Spirodelta oligorrhiza</i>)	Giant duckweed	—	—	NP	—
<i>Lespedeza cuneata</i>	Sericea lespedeza	—	NW	—	—
<i>Lythrum salicaria</i>	Purple loosestrife	—	—	NP	NW
<i>Melaleuca quinquenervia</i>	Paperbark	—	—	NP	—
<i>Myriophyllum spicatum</i>	Eurasian water milfoil	—	—	NP	—
<i>Nassella trichotoma</i>	Serrated tussock	—	—	NP	—

**Table 2-2
Noxious Weeds Potentially in the Planning Area**

Scientific Name (Synonym)	Common Name	Noxious in Oklahoma?	Noxious in Kansas?	Noxious in Texas?	Noxious in Nebraska?
<i>Onopordum acanthium</i>	Scotch thistle	NW	—	—	—
<i>Orobanche ramosa</i>	Branched broom rape	—	—	NP	—
<i>Panicum repens</i>	Torpedo grass	—	—	NP	—
<i>Pistia stratiotes</i>	Water lettuce	—	—	NP	—
<i>Pueraria lobata</i>	Kudzu	—	NW	NP	—
<i>Rosa multiflora</i>	Multiflora rose	—	CO	—	—
<i>Rottboellia cochinchinensis</i>	Itchgrass	—	—	NP	—
<i>Salvinia</i> spp.	Salvinia	—	—	NP	—
<i>Schinus terebinthifolus</i>	Brazilian peppertree	—	—	NP	—
<i>Solanum viarum</i>	Tropical soda apple	—	—	NP	—
<i>Sorghum halepense</i>	Johnson grass	—	NW	—	—
<i>Tamarix</i> spp.	Saltcedar	—	—	NP	NW
<i>Triadica sebifera</i> (<i>Sapium sebiferum</i>)	Chinese tallow tree	—	—	NP	—

Sources: NRCS 2014a, 2014b, 2014c, 2014d; KDA 2014; OSU 2012

Noxious Weed Codes:

NW—Oklahoma, Kansas, or Nebraska noxious weed

NP—Texas noxious plant

CO—Kansas county option (each county in the state has the option to list the weed as noxious).

Russian knapweed (*Acroptilon repens*), Kansas noxious weed. Russian knapweed is a perennial plant in the sunflower family that reproduces by vegetative shoots from rhizomes. Plants exhibit allelopathic effects (release of toxic substances to suppress other plant species) and are aggressively competitive, facilitating rapid colonization and development of dense stands. Infestations can be extremely long lived due to extensive root and rhizome systems. Russian knapweed is toxic to horses, causing chewing disease when sufficient quantities are consumed. Under most circumstances livestock avoid grazing Russian knapweed because of its bitter taste.

Camelthorn (*Alhagi maurorum* = *A. camelorum*), Texas noxious plant. Camelthorn is a perennial shrub in the pea family. It is deep rooted and rhizomatous, with roots that can extend six to seven feet into the ground. Reproduction is mostly by vegetative clones from rhizomes, or occasionally from seed. Camelthorn is unpalatable and injurious to some animals. It occurs principally in deep moist soil, but it also occurs in dry, rocky, or saline soils. The plant is especially abundant along riverbanks, canals, and irrigation ditches, where infestations can become extremely dense.

Alligatorweed (*Alternanthera philoxeroides*), Texas noxious plant. Alligatorweed is a perennial plant in the amaranth family. It is an emergent or rooted floating invasive that invades aquatic areas throughout the southern portions of the United States. Alligatorweed reproduces vegetatively (a form of asexual reproduction) from stolons; each node or fragment with a node is capable of producing a new plant. Plants are highly competitive and have rapid growth rates. The thick mats can displace native vegetation, clog waterways, restrict dissolved oxygen, increase sedimentation, interfere with irrigation, and prevent drainage.

Bur ragweed (*Ambrosia grayi*), Kansas noxious weed. Bur ragweed is a perennial plant in the sunflower family. It reproduces by underground rootstock and seed. New infestations result from portions of roots or seed transported by tilling machinery. The occurrence of new infestations of bur ragweed can be reduced by preventing the spread of rootstock and seeds.

Giant reed (*Arundo donax*), Texas noxious plant. Giant reed is a perennial woody grass in the grass family. Its fleshy, creeping rootstocks form compact masses from which tough, fibrous roots emerge that penetrate deeply into the soil. Giant reed can float miles downstream, where root and stem fragments may take root and initiate new infestations. Giant reed chokes riversides and stream channels, crowds out native plants, interferes with flood control, and reduces habitat for wildlife. The long, fibrous, interconnecting root mats of giant reed form a framework for debris dams behind bridges, culverts, and other structures that lead to damage. It ignites easily and can create intense fires.

Hedge bindweed (*Calystegia sepium*), Texas noxious plant. Hedge bindweed is a perennial vine in the morning glory family. It reproduces primarily by rhizomes and prefers moist soil, especially along river bottoms and coastal marshes, where it competes with the native plants for water, nutrients, and light. It can climb on and smother native vegetation.

Hoary cress (*Cardaria draba*), Kansas noxious weed. Hoary cress is a perennial plant in the mustard family. It reproduces from an extensive root system, rhizomes, and seeds. New infestations may be reduced by planting weed-free seed, using livestock feeding materials free of hoary cress seed, and cleaning machinery before leaving infested areas.

Balloonvine (*Cardiospermum halicacabum*), Texas noxious plant. Balloonvine is an annual or perennial vine in the soapberry family. It reproduces by seed, and the lightweight seedpods are dispersed by wind and water. Balloonvine is a weed of disturbed ground, especially in wetland areas or riparian corridors, where it can displace native vegetation and reduce habitat for wildlife.

Plumeless thistle (*Cardiospermum halicacabum*), Nebraska noxious weed. Plumeless thistle is an invasive broadleaf weed, which often colonizes overgrazed pastures, rangeland, and disturbed sites. Reproduction is by seed, and the plant relies on wind or pollinating insects for pollination.

Musk thistle (*Carduus nutans*), Oklahoma noxious weed, Kansas noxious weed, Nebraska noxious weed. Musk thistle, or nodding plumeless thistle, is a biennial or perennial plant in the sunflower family. It reproduces by seed; a single flower head may produce 1,200 seeds and a single plant up to 120,000 seeds, which may be windblown for miles. Seed may remain viable in the soil for over ten years, making it a difficult plant to control. Selective grazing leads to severe degradation of native meadows and grasslands; this is because wildlife focus their foraging on native plants, giving musk thistle a competitive advantage. Meadows, prairies, grassy balds (non-forested blunt mountain top areas), and other open areas are especially susceptible to invasion.

Spotted knapweed (*Centaurea biebersteinii*), Nebraska noxious weed. Spotted knapweed is a biennial or perennial plant which invades a variety of open habitats including open forests, shale, serpentine and other barrens, meadows, prairies, old fields and disturbed areas. Seeds are dispersed by wind.

Diffuse knapweed (*Centaurea diffusa*), Nebraska noxious weed. Diffuse knapweed is closely related to spotted knapweed, and has become well adapted to open habitats. Knapweeds contain chemicals which are undesirable to livestock and potentially reduce the growth of native vegetation.

Canada thistle (*Cirsium arvense*), Oklahoma noxious weed, Kansas noxious weed, Nebraska noxious weed. Canada thistle is a perennial plant in the sunflower family. It reproduces by seeds and by creeping underground shoots. New infestations result from portions of roots or seed transported by tilling machinery. The occurrence of new infestations of Canada thistle can be reduced by planting weed-free seed, using livestock feed free of Canada thistle seed, and cleaning equipment before leaving infested fields.

Bull thistle (*Cirsium vulgare*), Kansas county-option noxious weed. Bull thistle is a biennial plant in the sunflower family. The species reproduces solely by seed. Bull thistle is a problem in pastures because it competes with and decreases desirable forage and has no significant nutritive value for livestock. Sharp spines deter livestock, and presumably wildlife, from grazing. Seed production and seedling establishment are often enhanced under disturbed conditions.

Field bindweed (*Convolvulus arvensis*), Kansas noxious weed, Texas noxious plant. Field bindweed is a perennial plant in the morning glory family. It reproduces by seeds and rootstock. The root system is extensive, extending to a depth of 20 to 30 feet. Field bindweed is considered one of the most

noxious weeds of agricultural fields throughout temperate regions of the world. It may reduce crop yields, increase irrigation costs, and interfere with harvesting. Field bindweed is an excellent competitor for soil moisture and thrives in dry agricultural systems. New field bindweed infestations result from planting crop seed contaminated with bindweed seed or from portions of bindweed roots transported by tilling machinery. Seed is carried by birds, on the feet of animals, on wheels of machinery, and in drainage water.

Japanese dodder (*Cuscuta japonica*), Texas noxious plant. Japanese dodder is an annual parasitic vine in the dodder family. It reproduces by seeds and vegetatively through fragmentation and attachment to a new host plant. Japanese dodder parasitizes host plants by penetrating their vascular tissue with structures called haustoria. Severe infestations can kill host plants, and Japanese dodder also is a threat to such crops as alfalfa, asparagus, and tomatoes. A single plant can produce over 2,000 seeds, which can remain viable for up to 20 years.

Rooted water hyacinth (*Eichhornia azurea*) and floating water hyacinth (*Eichhornia crassipes*), Texas noxious plants. Water hyacinth is a perennial herb in the pickerelweed family. Reproduction is through cloning and also by seed; clone plants form on rhizomes and produce a dense bed. Plants are highly competitive and have rapid growth rates. The thick mats can displace native vegetation, clog waterways, restrict dissolved oxygen, increase sedimentation, interfere with irrigation, prevent drainage, and provide habitat for disease vectors, including mosquitos.

Quackgrass (*Elymus repens* = *Agropyron r.*), Kansas noxious weed. Quackgrass is a perennial rhizomatous grass. Reproduction is by seeds and rhizomes, which can grow at a rate of up to 10 feet per season. It is a highly competitive agricultural weed and can significantly reduce crop yields and contaminate seed grain crops. Quackgrass has allelopathic toxins that can allow it to outcompete the crops or native grasses in the area. Rhizomes are easily spread during cultivation and harvesting or by rhizome fragments on equipment.

Leafy spurge (*Euphorbia esula*), Kansas noxious weed, Nebraska noxious weed. Leafy spurge is a perennial herb in the spurge family. It reproduces readily by seed and vegetatively from root fragments. Seed can remain viable for at least seven years. Leafy spurge displaces native vegetation in prairie habitats and fields through shading, by usurping available water and nutrients, and through plant toxins that prevent the growth of other plants underneath it. Leafy spurge is an aggressive invader and once present can completely overtake large areas of open land.

Pignut (*Hoffmannseggia glauca*), Kansas noxious weed. Pignut, or hog potato, is a perennial herb in the pea family that spreads by seed and vegetatively by nut-like tubers on the roots. Pignut forms dense colonies, especially in bare or disturbed soils.

Hydrilla (*Hydrilla verticillata*), Texas noxious plant. Hydrilla is a perennial aquatic herb in the tape-grass family. It commonly reproduces from fragmented stems, which readily regrow, forming new clones of the original plant. Hydrilla generally roots on the bottom in depths of greater than 20 feet, where water clarity is good. It is found in lakes, rivers, reservoirs, ponds, and ditches. It tends to form monospecific stands that can cover hundreds of acres. Dense underwater stands of hydrilla raise water pH and temperature and lower dissolved oxygen. While this often increases the number of fish in general, large fish become rarer. Hydrilla promotes mosquito habitat and can affect power generation by clogging dams.

Water spinach (*Ipomoea aquatica*), Texas noxious plant. Water spinach, or swamp morning glory, is a perennial vine in the morning glory family. It may reproduce either vegetatively or by seed production. Nodes of existing stems can easily root and establish new plants. Both stem fragments and seeds are easily transported by water to become established in new areas. Water spinach can create a variety of problems for fishery management, navigation, irrigation, and ecology of native plants.

Lagarosiphon (*Lagarosiphon major*), Texas noxious plant. Lagarosiphon is a rhizomatous, perennial, submerged aquatic herb in the tape-grass family. It is fast growing and may totally fill the volume of a large shallow lake up to 10 feet deep. It can fill water control channels and can impair fishery management, navigation, and ecology of native plants. Under favorable conditions, dense growth of the plant can block light penetration into waterways, eliminating growth of native water plants and affecting associated populations of aquatic invertebrates and vertebrates. If it were to become widespread, control would be extremely difficult.

Giant duckweed (*Landoltia punctata* = *Spirodelta oligorrhiza*), Texas noxious plant. Giant duckweed is a perennial, aquatic floating herb in the duckweed family. Propagation is mainly through vegetative budding of daughter fronds from two pouches at the base of the frond. Ecological threats are currently not well known, but giant duckweed has the potential to become a serious nuisance due to its rapid colonization, easy distribution, and quick dispersal rate.

Sericea lespedeza (*Lespedeza cuneata*), Kansas noxious weed. Sericea lespedeza is a perennial subshrub in the pea family that reproduces by sprouting at the base of the previous year's growth and through seed. Sericea lespedeza is primarily a threat to open areas, such as meadows, prairies, open woodlands, wetland borders, and fields. Once it gains a foothold, it can crowd out native plants and develop an extensive seed bank in the soil, ensuring its long residence at a site. Established dense stands of lespedeza suppress native flora, and its high tannin content makes it unpalatable to native wildlife and livestock.

Purple loosestrife (*Lythrum salicaria*), Texas noxious plant, Nebraska noxious weed. Purple loosestrife is a perennial herb in the loosestrife family that reproduces through vast quantities of seed. A mature plant can produce up to two to three million minute seeds per year. Purple loosestrife also readily reproduces vegetatively through underground stems. Purple loosestrife adapts readily to natural and disturbed wetlands. As it becomes established and expands, it outcompetes and replaces native grasses, sedges, and other flowering plants that provide a higher quality source of nutrition for wildlife. The highly invasive nature of purple loosestrife allows it to form dense homogeneous stands that restrict native wetland plant species and reduce habitat for waterfowl.

Paperbark (*Melaleuca quinquenervia*), Texas noxious plant. Paperbark, or melaleuca, is an evergreen tree in the myrtle family. About three years after germination, paperbark trees begin to produce and store copious seeds in closed woody capsules. The seeds are stored until some form of stress, such as frost, fire, or human-induced injury, including herbicide, causes the capsules to open. A mature tree can produce more than a million seeds per year and store an estimated 20 million. Paperbark tree is an aggressive invader that spreads rapidly, converting native plant communities, such as sawgrass marshes, wet prairies, and aquatic sloughs, into impenetrable paperbark thickets. In a single year, one paperbark tree can produce a dense island hammock nearly 600 feet in diameter.

Eurasian water milfoil (*Myriophyllum spicatum*), Texas noxious plant. Eurasian water milfoil is a perennial herb in the water milfoil family. Most regeneration of Eurasian water milfoil is from rhizomes, fragmented stems, and axillary buds that develop throughout the year. Although seeds are usually viable, they are not an important means of dispersal. Eurasian milfoil can form large floating mats of vegetation on the surface of lakes, rivers, and other water bodies, preventing light penetration for native aquatic plants and impeding water traffic. The plant thrives in areas that have been subjected to various kinds of natural and man-made disturbance.

Serrated tussock (*Nassella trichotoma*), Texas noxious plant. Serrated tussock is a perennial tussock-forming grass. Serrated tussock is similar to several native grasses in general appearance, and its seeds are mainly spread by wind. Mature plants can produce more than 140,000 seeds per plant per year, and the very light seed head can be blown by wind over long distances. It can also be spread by humans or animals. It mainly causes problems in grazing lands with poor soil fertility and low rainfall, where the benefits of control are marginal. Serrated tussock has no grazing value because of its high fiber and low protein content. Infestations result in a significant loss in livestock production, and dense infestations may completely dominate pasture, making large areas incapable of supporting livestock.

Scotch thistle (*Onopordum acanthium*), Oklahoma noxious weed. Scotch thistle is a biennial herb in the sunflower family. It spreads by seed and generally inhabits moist sites or drainages in dry locations. Scotch thistle stands are dense and practically impenetrable due to the weed's spiny nature and large size. Scotch thistle is a weed problem on western rangeland and produces significant economic losses for ranchers.

Branched broomrape (*Orobanche ramosa*), Texas noxious plant. Branched broomrape is an annual parasitic herb in the broomrape family. It reproduces by seeds, which disperse with human activities, farm machinery, water, and wind. Branched broomrape is a worldwide noxious parasite of many crops and associated weeds. Heavy infestations can severely damage crops.

Torpedo grass (*Panicum repens*), Texas noxious plant. Torpedo grass is a perennial rhizomatous grass. Torpedo grass is stimulated in its spread by tilling and fertilization. It reproduces principally by rhizome extension and fragmentation. It quickly forms monocultures that displace native vegetation, particularly in or near shallow waters.

Water lettuce (*Pistia stratiotes*), Texas noxious plant. Water lettuce is a perennial herb in the arum family. It invades lakes, ponds, and slow-moving streams in tropical, subtropical, and warmer temperate regions. Severe infestations block light to the water ecosystem, reduce oxygen levels, increase siltation, reduce suitable fish spawning habitat, and restrict water flow and boating traffic.

Kudzu (*Pueraria lobata*), Kansas and Texas noxious plant. Kudzu is a perennial vine in the pea family. It reproduces primarily vegetatively by runners that root at the nodes. Kudzu kills or degrades other plants by smothering them under a solid blanket of leaves, by girdling woody stems and tree trunks, and by breaking branches or uprooting entire trees and shrubs through the sheer force of its weight. Once established, vines grow rapidly, extending as much as 60 feet per season at a rate of about one foot per day, up to 100 feet in length. As many as thirty vines may grow from a single root crown. There are multiple methods for chemical control of Kudzu; persistent eradication of all roots is the key to controlling it.

Multiflora rose (*Rosa multiflora*), Kansas county-option noxious weed. Multiflora rose is a perennial shrub in the rose family. Multiflora rose reproduces by seed and by forming new plants that root from the tips of arching canes that contact the ground. Fruits are readily sought after by birds, which are the primary dispersers of its seed. It has been estimated that an average multiflora rose plant may produce a million seeds per year, which may remain viable in the soil for up to twenty years. Germination of multiflora rose seeds is enhanced by passing through the digestive tract of birds. Multiflora rose is extremely prolific and can form impenetrable thickets that exclude native plant

species. This exotic rose readily invades open woodlands, forest edges, successional fields, savannas, and prairies that have been subjected to land disturbance.

Itchgrass (*Rottboellia cochinchinensis*), Texas noxious plant. Itchgrass is an annual grass that can grow to a height of over 12 feet. It reproduces by seeds and rhizomes; seed can be spread from infested areas to uninfested areas by birds, flood water, rodents, and farm machinery. Itchgrass is considered a serious agricultural weed in soybean, corn, cotton, peanut, upland rice, and sugarcane cultivation.

Salvinia (*Salvinia* spp.), Texas noxious plant. The genus *Salvinia* contains several weedy annual and perennial herbs in the water fern family. *Salvinia* is a rootless aquatic fern. While it may reproduce via spores as other ferns do, US populations more commonly reproduce via budding from both attached nodes or broken stems. Dense mats of *salvinia* shade out native aquatic species and reduce dissolved oxygen levels in the water. Agricultural water use is impacted as *salvinia* obstructs intake pipes for irrigation. Recreational fishing and boating may be hindered by dense mats. *Salvinia* thrives in slightly acidic, high nutrient, warm, slow-moving freshwater. The species is found in streams, lakes, ponds, ditches, and even rice fields. It is resistant to periods of low temperature, dewatering, and elevated pH levels.

Brazilian peppertree (*Schinus terebinthifolus*), Texas noxious plant. Brazilian peppertree is a perennial shrub or tree in the sumac family. Plants can mature three years after germination and produce a large amount of seeds. Brazilian peppertree will also propagate at the base of the plant via adventitious buds (buds that develop in places other than at the end of a twig) and from root sprouts. The Brazilian peppertree forms dense thickets, shading out native grasses and shrubs and taking over native pine forests.

Tropical soda apple (*Solanum viarum*), Texas noxious plant. Tropical soda apple is a perennial subshrub in the nightshade family. The sweet smell of the fruit attracts livestock and wildlife that eat and spread the seed. Each plant can produce approximately 50,000 seeds. It reproduces primarily by seed, but can also spread by roots. Tropical soda apple reduces biological diversity in natural areas by displacing native plants and disrupting ecological integrity. Plant prickles can restrict wildlife grazing and create a physical barrier to animals, preventing movement through infested areas. It contains solasodine, which is poisonous to humans. This invader also serves as a host for viruses that infect important vegetable crops.

Johnson grass (*Sorghum halepense*), Kansas noxious weed. Johnson grass is a perennial rhizomatous grass. Reproduction is through vigorous rhizomes and seed dispersal. It grows rapidly, is highly competitive with crops, and can be difficult to control. Infestations in crops can reduce harvest yields significantly.

Plants are highly variable, and many regional biotypes exist. Healthy plants can provide good forage for livestock. However, the foliage of Johnson grass and other sorghums can produce toxic amounts of hydrocyanic acid when exposed to frost, stressed by drought, or damaged by trampling or herbicides and may be poisonous to livestock when ingested.

Saltcedar (*Tamarix* spp.), Texas noxious plant, Nebraska noxious weed. Saltcedars, or tamarisk, are spreading shrubs or small trees in the tamarisk family. Saltcedar spreads vegetatively, by adventitious roots or submerged stems, and by seed. Each flower can produce thousands of tiny seeds that are contained in a small capsule usually adorned with a tuft of hair that aids in wind dispersal. Seeds can also be dispersed by water. Saltcedars are fire-adapted species and have long taproots that allow them to intercept deep water tables and interfere with natural aquatic systems. Saltcedar disrupts the structure and stability of native plant communities and degrades native wildlife habitat by outcompeting and replacing native plant species, monopolizing limited sources of moisture, and increasing the frequency, intensity, and effect of fires and floods. Although it provides some shelter, the foliage and flowers of saltcedar provide little food value for native wildlife species that depend on nutrient-rich native plant resources.

Chinese tallow tree (*Triadica sebifera* = *Sapium sebiferum*), Texas noxious plant. Chinese tallow tree is a deciduous tree in the spurge family. It reaches reproductive age in as little as three years and prolifically produces seeds, which are readily transported by water and birds; it also propagates via cuttings, stumps, and roots. Chinese tallow will transform native habitats into single-species tallow forests in the absence of land management practices. Chinese tallow alters light availability for other plant species. Fallen tallow leaves contain toxins that create unfavorable soil conditions for native plant species. Chinese tallow will outcompete native plant species, reducing habitat for wildlife and forage areas for livestock.

Nonnative Invasive Plants

In addition to noxious weeds, nonnative invasive plants can also be problematic where they are found. Many nonnative invasive plants were formerly recommended forage species that are now recognized as invasive (OkIPC 2014); as such, they are now widespread due to ranching and grazing. Many of these species have the ability to displace native plants (KNPS 2006) and have apparent, substantial, or severe ecological impacts (TIPPC 2011).

Table 2-3 summarizes nonnative invasive weeds that may occur in the planning area. Not all of the nonnative invasive species listed in the table necessarily occur in the planning area; nevertheless, all have the potential to occur in portions of the planning area, depending on local soil, disturbance, and hydrologic regimes and local current and past land uses.

The Oklahoma Invasive Plant Council (OkIPC) maintains a list of problem and watch list species that pose a potential threat of invasion in the state (OkIPC 2014). The list is based on a 2009 invasive plant audit for Oklahoma conducted by The Nature Conservancy (Pruett 2009). These nonnative invasive species are in addition to the state-listed noxious weeds described above.

OkIPC lists 32 problem species and 21 watch list species in the state (see **Table 2-3**). Additionally, OkIPC maintains a list of noxious and nonnative invasive species in states bordering Oklahoma—Kansas, Missouri, Arkansas, Texas, New Mexico, and Colorado—which can be found on the OkIPC invasive weed database (OkIPC 2014).

The Kansas Native Plant Society maintains an invasive plant list for the state (KNPS 2006). These nonnative invasive species are in addition to the state-listed noxious weeds summarized in **Table 2-3** and described above. The Kansas Native Plant Society lists 30 of the most invasive plant species in the state.

The Texas Invasive Plant Inventory (TIPPC 2011) categorizes nonnative invasive plants that threaten the state's wildlands. Categorization is based on an assessment of the ecological impacts of each plant. The inventory lists 29 species and assigns a ranking to each species based on the level of threat to the ecological health of wildlands presented by each species. Threat is determined by evaluating that species' ecological impact, its ability to invade natural vegetation communities, and the extent of its invasion. Moderate-rated species can have a substantial and apparent ecological impact on physical processes, plant and animal communities, and vegetation structure. High-rated species can have severe ecological impacts on these systems. Texas moderate- and high-rated nonnative invasive species are summarized in **Table 2-3**.

The Nebraska Weed Control Association developed an invasive plants watch list (Nebraska Weed Control Association 2014), which categorizes invasive plants as not in Nebraska yet, but pose a significant risk if introduced (Category 1), and species for top priority, where eradication is still possible for new and existing populations (Category 2). Only those species included in the Tallgrass Prairie ecoregion (which encompasses Richardson County) are included.

Table 2-3
Nonnative Invasive Weeds Potentially in the Planning Area

Scientific Name	Common Name	Status ¹
<i>Acer ginnala</i>	Amur maple	NE-2
<i>Acroptilon repens</i>	Russian knapweed	NE-2
<i>Ailanthus altissima</i>	Tree of heaven	OK-WL, TX-Mod
<i>Alliaria petiolata</i>	Common garlic-mustard	KS-Inv, NE-2
<i>Albizia julibrissin</i>	Mimosa, silk tree	OK-PS
<i>Alternanthera philoxeroides</i>	Alligator weed	OK-PS, TX-Mod

Table 2-3
Nonnative Invasive Weeds Potentially in the Planning Area

Scientific Name	Common Name	Status¹
<i>Arundo donax</i>	Giant reed	OK-WL, TX-High, NE-1
<i>Bothriochloa bladhii</i>	Caucasian bluestem	OK-PS, KS-Inv, NE-2
<i>B. ishaemum</i>	Yellow bluestem	OK-PS, KS-Inv, NE-2
<i>Bromus inermis</i>	Smooth brome	KS-Inv
<i>B. japonicus</i>	Japanese brome	OK-PS, KS-Inv
<i>B. racemosus</i>	Meadow brome	OK-PS
<i>B. tectorum</i>	Cheatgrass	OK-PS, KS-Inv
<i>Broussonetia papyrifera</i>	Paper mulberry	OK-WL, TX-Mod
<i>Carduus nutans</i>	Musk thistle, nodding plumeless thistle	OK-PS, KS-Inv
<i>Centaurea melitensis</i>	Malta star-thistle	TX-Mod
<i>C. moncktonii</i>	Black knapweed	NE-2
<i>C. solstitialis</i>	Yellow star-thistle	KS-Inv, NE-2
<i>Celastrus orbiculatus</i>	Oriental bittersweet	NE-1
<i>Cirsium arvense</i>	Canada thistle	OK-PS, KS-Inv
<i>C. vulgare</i>	Bull thistle	OK-PS
<i>Clematis terniflora</i>	Sweet autumn virgin's-bower	NE-2
<i>Colocasia esculenta</i>	Elephant ears	TX-Mod
<i>Conium maculatum</i>	Poison hemlock	OK-PS
<i>Convolvulus arvensis</i>	Field bindweed	OK-PS, KS-Inv
<i>Cryptostegia grandiflora</i>	Palay rubbervine	TX-High
<i>Cynodon dactylon</i>	Bermuda grass	TX-Mod
<i>Cynoglossum officinale</i>	Houndstongue	NE-2
<i>Cyperus rotundus</i>	Nut grass	OK-WL
<i>Dipsacus fullonum</i>	Fuller's teasel	KS-Inv
<i>D. laciniatus</i>	Cut-leaf teasel	KS-Inv, NE-2
<i>Egeria densa</i>	Brazilian water weed	OK-WL
<i>Eichhornia crassipes</i>	Water hyacinth	OK-WL, TX-High, NE-1
<i>Elaeagnus angustifolia</i>	Russian olive	OK-WL, KS-Inv
<i>E. pungens</i>	Thorny olive	OK-WL
<i>E. umbellatum</i>	Autumn olive	OK-WL, KS-Inv
<i>Erodium cicutarium</i>	Red stem stork's bill	OK-WL
<i>Euonymus fortune</i>	Chinese spindle-tree	KS-Inv
<i>Euphorbia esula</i>	Leafy spurge	KS-Inv
<i>Falcaria vulgaris</i>	Sickleweed	NE-2
<i>Firmiana simplex</i>	Chinese parasol tree	TX-Mod
<i>Galega officinalis</i>	Goat's-rue	NE-2
<i>Galium verum</i>	Yellow bedstraw	NE-2
<i>Hydrilla verticillata</i>	Hydrilla	OK-PS, TX-High, NE-1
<i>Hypericum perforatum</i>	St. John's wort	NE-2
<i>Imperata cylindrical</i>	Cogongrass	TX-High

Table 2-3
Nonnative Invasive Weeds Potentially in the Planning Area

Scientific Name	Common Name	Status¹
<i>Kochia scoparia</i>	Mexican fireweed	OK-PS
<i>Lespedeza cuneata</i>	Sericea lespedeza	OK-PS, KS-Inv
<i>Ligustrum japonicum</i>	Japanese privet	OK-WL, TX-Mod
<i>L. lucidum</i>	Glossy privet	TX-High
<i>L. sinense</i>	Chinese privet	OK-PS
<i>Lolium arundinaceum</i>	Tall fescue	OK-WL
<i>L. pretense</i>	Meadow ryegrass	OK-WL
<i>L. temulentum</i>	Darnel ryegrass	OK-WL
<i>Lonicera japonica</i>	Japanese honeysuckle	OK-PS, KS-Inv, NE-2
<i>L. mackii</i>	Bush honeysuckle	OK-WL, KS-Inv
<i>L. tatarica</i>	Tatarian honeysuckle	KS-Inv
<i>Lygodium japonicum</i>	Japanese climbing fern	OK-WL, TX-High
<i>Lythrum salicaria</i>	Purple loosestrife	OK-PS, KS-Inv
<i>Macfadyena unguis-cati</i>	Catclaw vine	TX-Mod
<i>Melia azedarach</i>	Chinaberry tree	OK-WL, TX-High
<i>Microstegium vimineum</i>	Nepalese browntop	OK-PS
<i>Mililotus officinalis</i>	Yellow sweet clover	OK-WL
<i>Myriophyllum aquaticum</i>	Parrot's feather	OK-PS, TX-High
<i>M. spicatum</i>	Eurasian water milfoil	OK-PS, KS-Inv, NE-2
<i>Najas minor</i>	Brittle naiad	NE-1
<i>Nandina domestica</i>	Heavenly bamboo	TX-Mod
<i>Paulownia tomentosa</i>	Princess tree	OK-WL
<i>Perilla frutescens</i>	Beefsteak plant	OK-PS
<i>Phyllostachys aurea</i>	Golden bamboo	TX-High
<i>Pistacia chinensis</i>	Chinese pistache	TX-Mod
<i>Potentilla recta</i>	Sulphur cinquefoil	OK-PS
<i>Pueraria lobata</i>	Kudzu	OK-PS, TX-High, NE-2
<i>Pyracantha coccinea</i>	Scarlet firethorn	TX-Mod
<i>Pyrus calleryana</i>	Callery pear	OK-WL
<i>Rapistrum rugosum</i>	Bastard cabbage	TX-High
<i>Rhamnus cathartica</i>	Common buckthorn	KS-Inv
<i>Rosa multiflora</i>	Multiflora rose	OK-PS, KS-Inv
<i>Saccharum ravennae</i>	Revenna grass	OK-PS
<i>Salsola tragus</i>	Russian thistle, tumbleweed	OK-PS
<i>Salvinia molesta</i>	Giant salvinia	NE-1
<i>Schedonorus arundinaceus</i>	Tall mountain-fescue	KS-Inv
<i>S. pratensis</i>	Meadow mountain-fescue	KS-Inv
<i>Securigera varia</i>	Common crown-vetch	KS-Inv, NE-2
<i>Sorghum halepense</i>	Johnson grass	OK-PS, KS-Inv, TX-High
<i>Tamarix chinensis</i>	Chinese salt cedar	OK-PS

Table 2-3
Nonnative Invasive Weeds Potentially in the Planning Area

Scientific Name	Common Name	Status¹
<i>T. parviflora</i>	Small-flowered tamarisk	OK-PS, KS-Inv
<i>T. ramosissima</i>	Saltcedar, tamarisk	OK-PS, KS-Inv, TX-High
<i>Triadica sebifera</i> (<i>Sapium sebiferum</i>)	Chinese tallow tree	TX-Mod
<i>Ulmus pumila</i>	Siberian elm	OK-WL
<i>Verbascum thapsus</i>	Common mullein	OK-PS

Sources: OkIPC 2014; KNPS 2006; TIPPC 2011; Nebraska Weed Control Association 2014

¹Status Codes:

OK-PS—Oklahoma problem species; OK-WL—Oklahoma watch list species

KS-Inv—Kansas invasive weed

TX-Mod—Texas moderate-rated; TX-High—Texas high-rated

NE-1—Plants not in Nebraska but pose a significant risk if introduced; NE-2—species for top priority

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CHAPTER 3

FISH AND WILDLIFE

3.1 GENERAL DISCUSSION OF FISH AND WILDLIFE AND THEIR HABITATS

3.1.1 Fisheries

The BLM manages subsurface minerals for reservoirs throughout Kansas, Oklahoma, and Texas and small isolated tracts of surface estate, which overlap or border fish-bearing streams. These lands contain a diverse assortment of game and nongame fish species. Common fish species found throughout the planning area are largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), spotted bass (*M. punctulatus*), striped bass (*Morone saxatilis*), white bass (*M. chrysops*), channel catfish (*Ictalurus punctatus*), blue catfish (*I. furcatus*), flathead catfish (*Pylodictis olivaris*), rainbow trout (*Salmo gairdneri*), walleye (*Stizostedion vitreum*), saugeye (*S. vitreum x canadense*), white crappie (*Pomoxis annularis*), black crappie (*P. nigromaculatus*), bluegill (*Lepomis macrochirus*), green sunfish (*L. cyanellus*), redear sunfish (*L. microlophus*), and paddlefish (*Polyodon spathula*).

Table 3-1 lists those lakes and reservoirs that contain BLM-administered subsurface and other surface ownership. These reservoirs contain important fish habitat, as well as habitat for other aquatic species. The BLM does not manage fish populations or habitat for reservoirs in the planning area; these are managed by the state wildlife departments, in coordination with the surface owner or land manager.

Table 3-1
Water Bodies with BLM-Administered Subsurface

Lake Name	Surface Managing Agency	Acres of BLM-Administered Subsurface Lands ¹
Addicks Dam	USACE	33,400
Aquilla Lake	USACE	12,500

**Table 3-1
Water Bodies with BLM-Administered Subsurface**

Lake Name	Surface Managing Agency	Acres of BLM-Administered Subsurface Lands¹
Bardwell Lake	USACE	12,500
Belton Lake	USACE	33,100
Benbrook Lake	USACE	11,900
Broken Bow Lake	USACE	24,700
Caddo Lake	USACE	13,100
Canton Lake	USACE	8,400
Canyon Lake	USACE	15,400
Clinton Lake	USACE	22,700
Copan Lake	USACE	16,900
Council Grove Lake	USACE	6,200
El Dorado Lake Conservation Pool	USACE	8,500
Elk City Lake	USACE	19,300
Eufaula Lake	USACE	148,100
Fall River Lake	USACE	12,500
Ferrells Bridge Dam - Lake O the Pines	USACE	48,200
Fort Gibson Lake	USACE	60,300
Georgetown Lake	USACE	6,000
Granger Dam and Lake	USACE	15,200
Grapevine Lake	USACE	18,200
Heyburn Lake	USACE	8,000
Hillsdale Lake	USACE	13,300
Hords Creek Lake	USACE	2,900
Hugo Lake	USACE	21,000
Jim Chapman Lake/Cooper Dam	USACE	32,300
Joe Pool Lake	USACE	17,200
John Redmond Reservoir	USACE	11,200
Kanopolis Lake	USACE	21,400
Kaw Lake	USACE	21,100
Keystone Lake	USACE	31,500
Lake Texoma	USACE	162,400
Lavon Lake	USACE	38,600
Lewisville Lake	USACE	54,600
Marion Lake	USACE	12,300
McClellan-Kerr Navigation System	USACE	13,500
Melvern Lake	USACE	23,700
Milford Lake	USACE	42,400
Navarro Mills Lake	USACE	14,800
O.C. Fisher Lake	USACE	18,100
Oologah Lake	USACE	36,600
Optima Lake	USACE	8,200
Pat Mayse Lake	USACE	21,300
Pearson-Skubitz Lake (Big Hill Lake)	USACE	2,600

**Table 3-1
Water Bodies with BLM-Administered Subsurface**

Lake Name	Surface Managing Agency	Acres of BLM-Administered Subsurface Lands¹
Perry Lake	USACE	40,200
Pine Creek Lake	USACE	17,600
Pomona Lake	USACE	10,300
Proctor Lake	USACE	16,700
Ray Roberts Lake	USACE	48,900
Robert S. Kerr Lake	USACE	43,100
Sam Rayburn Reservoir	USACE	187,900
Sardis Lake	USACE	21,800
Somerville Lake	USACE	33,200
Stillhouse Hollow Reservoir	USACE	16,200
Tenkiller Lake	USACE	3,900
Toronto Lake	USACE	8,500
Town Bluff Dam and BA Steinhagen Lake	USACE	22,700
Tuttle Creek Lake	USACE	34,500
Waco Lake	USACE	22,000
Wallisville Reservoir	USACE	100
Waurika Lake	USACE	14,700
Webbers Falls Lock and Dam and Reservoir Project	USACE	16,900
Whitney Lake	USACE	53,500
Wilson Lake	USACE	22,800
Wister Lake	USACE	4,500
Wright Patman Lake	USACE	163,000
Cedar Bluff Lake	Bureau of Reclamation	15,100
Cheney Conservation Pool	Bureau of Reclamation	10,700
Choke Canyon Reservoir	Bureau of Reclamation	27,200
Fort Cobb Lake	Bureau of Reclamation	3,800
Foss Reservoir	Bureau of Reclamation	9,000
Glen Elder Reservoir (Waconda Lake)	Bureau of Reclamation	26,300
Keith Sebelius Lake (Norton Lake)	Bureau of Reclamation	8,000
Lake Altus	Bureau of Reclamation	4,500
Lake Meredith	Bureau of Reclamation	8,700
Lake Thunderbird	Bureau of Reclamation	4,900
Lovewell Reservoir	Bureau of Reclamation	6,500
Palmetto Bend Lake/Lake Texana	Bureau of Reclamation	16,300
Twin Buttes Reservoir/Lake Nasworthy	Bureau of Reclamation	2,400
Webster Lake	Bureau of Reclamation	9,000
Amistad Reservoir	International Boundary Water Commission	70,600
Falcon Reservoir	International Boundary Water Commission	40,300
Lake Carl Blackwell	State of Oklahoma	14,500

Table 3-1
Water Bodies with BLM-Administered Subsurface

Lake Name	Surface Managing Agency	Acres of BLM-Administered Subsurface Lands¹
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¹Rounded to the nearest 100 acres
Source: BLM GIS 2015

Dams, diversions, and alterations of instream flow, in combination with and independent of adjacent land uses, has historically affected fish and other aquatic species in the planning area, creating unsuitable conditions for some species (Anderson et al. 1995). Additionally, the introduction and spread of aquatic nuisance species has disrupted ecological processes and displaced native species. Zebra mussels (*Dreissena polymorpha*), have been found in Oklahoma, Kansas, and Texas and are known to inhabit decision area waterways, such as Lake Texoma, Ray Roberts Lake, Lavon Lake, Waco Lake, Benton Lake, Kaw Lake, Keystone Lake, Eufaula Lake, Oologah Lake, McClellan-Kerr Navigation System, Clinton Lake, Council Grove Lake, El Dorado Reservoir, John Redmond Reservoir, Kanopolis Lake, Marion Lake, Melvern Lake, Milford Lake, Perry Lake, Pomona Lake, Wilson Lake, as well as various streams and rivers (USGS 2015; KDWPT 2014). Zebra mussels may affect native aquatic biota by altering food web dynamics and competing with native mussels (TPWD 2010).

In 2005, the status of fishes in Kansas was reevaluated; the results showed that 54 of the 116 native fish species should be assigned special conservation status due to substantial declines in distribution or abundance or due to their rarity in the state (Haslouer et al. 2005).

3.1.2 Wildlife

Nineteen different ecoregions cover the planning area, which provide habitat for a wide array of wildlife species. Due to the scattered land management patterns, few surveys or monitoring studies specific to BLM and BIA lands are available. Numerous wildlife management areas, wildlife refuges, and state parks contain BLM-administered subsurface; these decision area lands provide key habitat for mammals, waterfowl, reptiles, amphibians, and other wildlife (see **Table 3-2**).

Table 3-2
Wildlife Management Areas, State Wildlife Refuges, and State Parks With BLM-Administered Subsurface

Lake Name	Surface Managing Agency	Acres of BLM-Administered Subsurface Lands¹
Broken Bow Wildlife Management Area	USACE	3,600
Canton Wildlife Management Area	USACE	11,200
Copan Wildlife Management Area	USACE	8,000
Eufaula Wildlife Management Area; Deep Fork Unit	USACE	8,300

**Table 3-2
Wildlife Management Areas, State Wildlife Refuges, and State Parks With BLM-
Administered Subsurface**

Lake Name	Surface Managing Agency	Acres of BLM-Administered Subsurface Lands¹
Eufaula Wildlife Management Area; Duchess Creek Unit	USACE	2,100
Eufaula Wildlife Management Area; Gaines Creek Unit	USACE	3,700
Eufaula Wildlife Management Area; Mill Creek and South Canadian Unit	USACE	5,300
Eufaula Wildlife Management Area; North Canadian Unit	USACE	5,100
Fort Gibson Lake - Sequoyah State Park	USACE	2,800
Fort Gibson State Waterfowl Refuge	USACE	3,200
Fort Gibson Wildlife Management Area	USACE	16,600
Fort Supply Wildlife Management Area	USACE	7,200
Hugo Waterfowl Refuge	USACE	3,300
Hugo Wildlife Management Area	USACE	14,700
Kaw Wildlife Management Area	USACE	16,700
Keystone State Park	USACE	500
Keystone Waterfowl Refuge	USACE	1,400
Keystone Wildlife Management Area	USACE	14,800
Lake Texoma Wildlife Management Area; Tishomingo Unit	USACE	2,900
Lake Texoma Wildlife Management Area; Washita Arm Unit	USACE	10,900
McClellan-Kerr Wildlife Management Area; Billy Creek Unit	USACE	400
McClellan-Kerr Wildlife Management Area; Chouteau Unit	USACE	2,000
McClellan-Kerr Wildlife Management Area; Webbers Falls Unit	USACE	3,100
Oologah Lake - Will Rogers State Park	USACE	600
Oologah Wildlife Management Area	USACE	16,100
Optima Wildlife Management Area	USACE	2,400
Pine Creek Wildlife Management Area	USACE	9,000
Tenkiller Wildlife Management Area	USACE	2,100
Waurika Wildlife Management Area	USACE	6,300
Wister State Park	USACE	3,400
Wister Wildlife Management Area	USACE	29,200
Fort Cobb State Park	Bureau of Reclamation	2,700
Fort Cobb Wildlife Management Area	Bureau of Reclamation	2,100
Foss State Park	Bureau of Reclamation	2,400
Lake Altus - Lugert Wildlife Management Area	Bureau of Reclamation	3,100
Lake Altus - Quartz Mountain State Park	Bureau of Reclamation	4,500
Lake Thunderbird State Park	Bureau of Reclamation	7,200

**Table 3-2
Wildlife Management Areas, State Wildlife Refuges, and State Parks With BLM-
Administered Subsurface**

Lake Name	Surface Managing Agency	Acres of BLM-Administered Subsurface Lands¹
McGee Creek Natural Scenic Recreation Area	Bureau of Reclamation	8,600
McGee Creek State Park	Bureau of Reclamation	8,700
Mountain Park Wildlife Management Area (Tom Steed)	Bureau of Reclamation	12,000

¹Rounded to the nearest 100 acres

Source: BLM GIS 2015

Bats are found throughout the planning area, with approximately 22 species in Oklahoma, 31 in Texas, and 15 in Kansas (Kansas State University Agricultural Experiment Station and Cooperative Extension Service 2005; ODWC 2014; Texas Parks and Wildlife 2007). Roost sites are widely distributed and include rock crevices, trees, caves, buildings, and bridges. Variable changes in bat abundance over a 40-year survey period have been documented in the Red Hill region of Kansas and Oklahoma, an area that lies at the peripheries of four bat species' distributions.

The increasing abundance of some hibernacula may reflect range expansions or changes in qualities of hibernacula or other habitat aspects (Prendergast et al. 2010). Decision area lands in this region are primarily restricted to BLM subsurface tracts. Factors contributing to the decline of bat populations are loss of habitat from surface mining operations, urbanization, lake and reservoir construction, and cave commercialization and vandalism (ODWC 2014).

White-nose syndrome is a disease affecting hibernating bats and is named for a white fungus that appears on the muzzle and other parts of infected bats. A newly discovered fungus, *Pseudogymnoascus* (formerly *Geomyces*) *destructans*, has been demonstrated to cause white-nose syndrome (Coleman 2014).

The disease is responsible for extensive mortality of bats in eastern North America, and the fungus that causes the disease has been documented as of August 2014 in western Missouri, next to the planning area. Infected bats act irregularly during cold winter months, flying outside during the day and clustering near the entrances to caves and other hibernacula. The disease has killed more than 5.5 million bats in the Northeast and Canada; in some areas, 90 to 100 percent of bats have died.

As of 2014, bat species confirmed with the disease include big brown bat (*Eptesicus fuscus*), eastern small-footed bat (*Myotis leibii*), the federally endangered gray myotis (*M. grisescens*), the federally endangered Indiana bat (*M. sodalist*), little brown bat (*M. lucifugus*), the federally threatened northern long-

eared bat (*M. septentrionalis*), and tri-colored bat (*Perimyotis subflavus*; Coleman 2014). Several of these species are present in the planning area.

Additional bat species have been confirmed to have the fungus but with no associated disease symptoms. One example is the federally endangered Ozark big-eared bat (*Corynorhinus townsendii ingens*), which is also found in the planning area.

Furbearing mammals are also common throughout the planning area. Examples are raccoon (*Procyon lotor*), mink (*Neovision vision*), weasel (*Mustela* spp.), badger (*Taxidea taxus*), muskrat (*Ondatra zibethicus*), opossum (*Didelphimorphia* spp.), bobcat (*Lynx rufus*), beaver (*Castor canadensis*), skunks (family Mephitidae), foxes (*Vulpes* spp.), coyote (*Canis latrans*), and others, though the lists of legally taken furbearers differ between individual states in the planning area. Furbearing mammals are typically managed through hunting or trapping permits administered by the state wildlife agencies.

Small mammals, such as squirrels, cottontails, voles, woodrats, and mice, are also common throughout much of the decision area. In southeastern Oklahoma, Clark et al. (1998) found relative abundances of all small mammals were significantly greater in fencerows, lowland prairie, and lowland prairie with forbs and shrubs than upland prairie. Trends related to the abundance and distribution of small mammals is largely influenced by humans and varies by species (Clark et al. 1998). For example, deer mice (*Peromyscus maniculatus*) populations have responded positively to agricultural conversion and livestock grazing, whereas western harvest mice (*Reithrodontomys megalotis*) have been reduced in cultivated areas (Clark et al. 1998).

A rich diversity of amphibians and reptiles is found throughout the decision area. Upland prairie, shrubland, and forests provide habitat for numerous species of salamanders, toads, frogs, turtles, lizards, skinks, and snakes. Uplands with sandy or friable soils containing rodent burrows provide particularly valuable habitat for many species of reptiles and amphibians, and small mammal populations provide prey for several species of snakes, like the prairie rattlesnake (*Crotalus viridis*) and western massasauga (*Sistrurus catenatus tergeminus*).

Aquatic environments, such as reservoirs with subsurface BLM management, wet meadows, ponds, rivers, riparian forests, and wetlands, provide breeding habitat for amphibians and year-round habitat for aquatic turtles, like the softshell (*Apalone* spp.), northern painted (*Chrysemys picta*), and common snapping turtle (*Chelydra serpentina*), and snake species, like the northern watersnake (*Nerodia sipedon*).

Insects may be the most diverse and least studied animal group in the planning area. They are in important group ecologically, as they play vital roles as

herbivores, predators, pollinators, decomposers, and soil aerators and as food for other wildlife (Schneider et al. 2011).

Big Game Occurrence and Habitats

Big game species in the planning area are white-tailed deer (*Odocoileus virginianus*), mule deer (*O. hemionus*), pronghorn (*Antilocapra americana*), elk (*Cervus elaphus*), javelina (*Tayassu tajacu*), black bear (*Ursus americanus*), and feral hogs (*Sus scrofa*). Big game are typically managed through hunting permits administered by state wildlife agencies.

Distribution and abundance of big game species varies by habitat type and ecoregion. White-tailed deer, mule deer, pronghorn, elk, and feral hog are found in all four states in the planning area. White-tailed deer are typically found at the edges of woodlands and forested areas (ASM 2015). Mule deer prefer open, arid, sparsely wooded areas; in mountainous areas, they will migrate to lower elevations for winter (ASM 2015). Pronghorn are widely dispersed but localized in the planning area, restricted to open habitat where sight is unrestricted (ASM 2015).

Similarly, elk were formerly widespread in the planning area but are now restricted to mountainous areas, including a large portion of western Texas (TPWD 2015a). Black bears were also formerly common in the planning area, but are now restricted to eastern Oklahoma, following reintroductions in the Ouachita and Ozark Mountains of Arkansas (ODWC 2015). In Texas, black bears are restricted to the western portion of the state, in desert scrub or woodland habitats of the Chisos and Guadalupe Mountains (TPWD 2015b). The javelina's range is restricted to arid or semiarid parts of Texas, including the southern brush country, desert grasslands, and oak-juniper woodlands (TPWD 2015c). Feral hogs are widespread in the planning area and can adapt to many plant communities; however, they prefer moist bottomlands or riparian areas associated with streams and rivers, with adequate water and dense vegetation (ODWC 2015).

3.1.3 Special Status Species

Special status species is a universal term used in the scientific community for species that are considered sufficiently rare that they require special consideration or protection and should be, or have been, listed as rare, threatened, or endangered by the federal or state government or both. The authority for this policy and guidance regarding the evaluation of special status species comes from the ESA, the Federal Land Policy and Management Act (FLPMA) of 1976, and BLM Special Status Species Management (Manual 6840).

According to the ESA, an endangered species is any that is in danger of extinction throughout all or a significant portion of its range; a threatened species is any that is likely to become endangered in the foreseeable future throughout all or a significant portion of its range. The BLM's Oklahoma Field

Office manages habitats for species listed by the USFWS as endangered, threatened, or proposed for listing under the authority of the ESA (see **Table 3-3**).

Table 3-3
Federal-Listed and Proposed Species Occurring in the Planning Area

Group	Common Name	Scientific Name (Synonym)	Federal Status*	Other Status* (State)	State Where Present
Amphibians	Houston toad	<i>Anaxyrus houstonensis</i>	E	SE (TX)	TX
Amphibians	Salado salamander	<i>Eurycea chisholmensis</i>	T		TX
Amphibians	San Marcos salamander	<i>E. nana</i>	T	ST (TX)	TX
Amphibians	Georgetown salamander	<i>E. naufragia</i>	T		TX
Amphibians	Texas blind salamander	<i>E. rathbuni</i>	E	SE (TX)	TX
Amphibians	Barton Springs salamander	<i>E. sosorum</i>	E	SE (TX)	TX
Amphibians	Jollyville salamander	<i>E. tonkawae</i>	T		TX
Amphibians	Austin blind salamander	<i>E. waterlooensis</i>	E		TX
Birds	Sprague's pipit	<i>Anthus spragueii</i>	C	BCC	OK, TX
Birds	Rufa red knot	<i>Calidris canutus rufa</i>	T		TX
Birds	Piping plover	<i>C. melodus</i>	T	ST (OK, TX, NE)	OK, KS, TX
Birds	Mountain plover	<i>C. montanus</i>	C	ST (NE), BCC, SINC (KS)	OK, KS
Birds	Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	T	BCC	TX
Birds	Golden-cheeked warbler	<i>Dendroica chrysoparia</i>	E	SE (TX)	TX
Birds	Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	E	SE (TX), BCC	TX
Birds	Northern aplomado falcon	<i>Falco femoralis septentrionalis</i>	E	SE (TX)	TX
Birds	Whooping crane	<i>Grus americana</i>	E	SE (OK, TX, NE)	OK, KS, TX
Birds	Eskimo curlew	<i>Numenius borealis</i>	E	SE (TX, NE)	KS, TX
Birds	Red-cockaded woodpecker	<i>Picoides borealis</i>	E	SE (TX), REA	OK, TX
Birds	Least tern	<i>Sterna antillarum</i>	E	SE (KS), BCC	KS

**Table 3-3
Federal-Listed and Proposed Species Occurring in the Planning Area**

Group	Common Name	Scientific Name (Synonym)	Federal Status*	Other Status* (State)	State Where Present
Birds	Interior least tern	<i>S. antillarum athalassos</i>	E	SE (KS, TX, NE), BCC	OK, KS, TX
Birds	Mexican spotted owl	<i>Strix occidentalis lucida</i>	T	ST (TX)	TX
Birds	Attwater's greater prairie chicken	<i>Tympanuchus cupido attwateri</i>	E	SE (TX)	TX
Birds	Lesser prairie-chicken	<i>T. pallidicinctus</i>	T	BCC	OK, TX
Birds	Black-capped vireo	<i>Vireo atricapilla</i>	E	SE (TX)	OK, KS, TX
Fishes	Ozark cavefish	<i>Amblyopsis rosae</i>	T		OK
Fishes	Leon Springs pupfish	<i>Cyprinodon bovinus</i>	E	SE (TX)	TX
Fishes	Comanche Springs pupfish	<i>C. elegans</i>	E	SE (TX)	TX
Fishes	Devils River minnow	<i>Dionda diaboli</i>	T	ST (TX)	TX
Fishes	Arkansas darter	<i>Etheostoma cragini</i>	C	ST (KS)	OK, KS
Fishes	Fountain darter	<i>E. fonticola</i>	E	SE (TX)	TX
Fishes	Big Bend gambusia	<i>Gambusia gaigei</i>	E	SE (TX)	TX
Fishes	San Marcos gambusia (extinct)	<i>G. georgei</i>	E	SE (TX)	TX
Fishes	Clear Creek gambusia	<i>G. heterochir</i>	E	SE (TX)	TX
Fishes	Pecos gambusia	<i>G. nobilis</i>	E	SE (TX)	TX
Fishes	Rio Grande silvery minnow	<i>Hybognathus amarus</i>	E	SE (TX)	TX
Fishes	Smalleye shiner	<i>Notropis buccula</i>	E		TX
Fishes	Arkansas River shiner	<i>N. girardi</i>	T	SE (KS), ST (TX)	OK, KS, TX
Fishes	Sharpnose shiner	<i>N. oxyrhynchus</i>	E		TX
Fishes	Topeka shiner	<i>N. topeka</i>	E	ST (KS) SE (NE)	KS
Fishes	Neosho madtom	<i>Noturus placidus</i>	T	ST (KS)	OK, KS
Fishes	Leopard darter	<i>Percina pantherina</i>	T		OK
Fishes	Smalltooth sawfish	<i>Pristis pectinata</i>	E	SE (TX)	TX
Fishes	Pallid sturgeon	<i>Scaphirhynchus albus</i>	E	E (KS, NE)	KS, NE
Invertebrates	Ouachita Rock pocketbook	<i>Arkansia wheeleri</i>	E		OK
Invertebrates	Pecos assiminea snail	<i>Assiminea pecos</i>	E	SE (TX)	TX
Invertebrates	Coffin Cave mold beetle	<i>Batrisodes texanus</i>	E		TX
Invertebrates	Helotes mold beetle	<i>B. venyivi</i>	E		TX
Invertebrates	Robber baron cave meshweaver	<i>Cicurina baronia</i>	E		TX

**Table 3-3
Federal-Listed and Proposed Species Occurring in the Planning Area**

Group	Common Name	Scientific Name (Synonym)	Federal Status*	Other Status* (State)	State Where Present
Invertebrates	Madla Cave meshweaver	<i>C. madla</i>	E		TX
Invertebrates	Bracken bat cave meshweaver	<i>C. venii</i>	E		TX
Invertebrates	Government Canyon bat cave meshweaver	<i>C. vespera</i>	E		TX
Invertebrates	Warton Cave meshweaver	<i>C. wartoni</i>	C		TX
Invertebrates	Diminutive amphipod	<i>Gammarus hyalleloides</i>	E		TX
Invertebrates	Pecos amphipod	<i>G. pecos</i>	E		TX
Invertebrates	Comal Springs riffle beetle	<i>Heterelmis comalensis</i>	E		TX
Invertebrates	Texas fatmucket	<i>Lampsilis bracteata</i>	C	ST (TX)	TX
Invertebrates	Scaleshell	<i>Leptodea leptodon</i>	E	SE (NE)	OK
Invertebrates	American burying beetle	<i>Nicrophorus americanus</i>	E	SE (KS, NE)	OK, KS, TX
Invertebrates	Rattlesnake master-borer moth	<i>Papaipema eryngii</i>	C		OK
Invertebrates	Texas hornshell	<i>Popenaias popeii</i>	C	ST (TX)	TX
Invertebrates	Diamond Y spring snail	<i>Pseudotryonia adamantina</i>	E		TX
Invertebrates	Phantom Cave snail	<i>Pyrgulopsis texana</i>	E		TX
Invertebrates	Golden orb	<i>Quadrula aurea</i>	C	ST (TX)	TX
Invertebrates	Winged mapleleaf	<i>Q. fragosa</i>	E		OK
Invertebrates	Smooth pimpleback	<i>Q. houstonensis</i>	C	ST (TX)	TX
Invertebrates	Texas pimpleback	<i>Q. petrina</i>	C	ST (TX)	TX
Invertebrates	A ground beetle	<i>Rhadine exilis</i>	E		TX
Invertebrates	A ground beetle	<i>R. infernalis</i>	E		TX
Invertebrates	Tooth Cave ground beetle	<i>R. persephone</i>	E		TX
Invertebrates	Peck's Cave amphipod	<i>Stygobromus pecki</i>	E	SE (TX)	TX
Invertebrates	Comal Springs dryopid beetle	<i>S. comalensis</i>	E		TX
Invertebrates	Tooth Cave pseudoscorpion	<i>Tartarocreagris texana</i>	E		TX
Invertebrates	Gov. Canyon bat cave spider	<i>Tayshaneta microps</i>	E		TX
Invertebrates	Tooth Cave spider	<i>T. myopica</i>	E		TX
Invertebrates	Kretschmarr Cave mold beetle	<i>Texamaurops reddelli</i>	E		TX
Invertebrates	Cokendolpher Cave harvestman	<i>Texella cokendolpheri</i>	E		TX
Invertebrates	Reddell harvestman	<i>T. reddelli</i>	E		TX

**Table 3-3
Federal-Listed and Proposed Species Occurring in the Planning Area**

Group	Common Name	Scientific Name (Synonym)	Federal Status*	Other Status* (State)	State Where Present
Invertebrates	Bone Cave harvestman	<i>T. reyesi</i>	E		TX
Invertebrates	Texas fawnsfoot	<i>Truncilla macrodon</i>	C	ST (TX)	TX
Invertebrates	Phantom spring snail	<i>Tryonia cheatumi</i>	E		TX
Invertebrates	Gonzales springsnail	<i>T. circumstriata</i>	E		TX
Mammals	Finback whale	<i>Balaenoptera physalus</i>	E	SE (TX)	TX
Mammals	Gray wolf	<i>Canis lupus</i>	E	SE (TX)	TX
Mammals	Red wolf	<i>C. rufus</i>	E	SE (TX)	TX
Mammals	Ozark big-eared bat	<i>Corynorhinus townsendii ingens</i>	E		OK
Mammals	Jaguarundi	<i>Herpailurus yaguarondi</i>	E	SE (TX)	TX
Mammals	Ocelot	<i>Leopardus pardalis</i>	E	SE (TX)	TX
Mammals	Mexican long-nosed	<i>Leptonycteris nivalis</i>	E	SE (TX)	TX
Mammals	Humpback whale	<i>Megaptera novaeangliae</i>	E	SE (TX)	TX
Mammals	Black-footed ferret	<i>Mustela nigripes</i>	E	SE (KS, NE)	KS
Mammals	Gray myotis	<i>Myotis grisescens</i>	E	SE (KS)	OK, KS
Mammals	Northern long-eared Bat	<i>M. septentrionalis</i>	T		OK, KS
Mammals	Indiana bat	<i>M. sodalis</i>	E		OK
Mammals	Jaguar	<i>Panthera onca</i>	E	SE (TX)	TX
Mammals	West Indian manatee	<i>Trichechus manatus</i>	E	SE (TX)	TX
Mammals	Louisiana black bear	<i>Ursus americanus luteolus</i>	T	ST (TX)	TX
Reptiles	Loggerhead sea turtle	<i>Caretta caretta</i>	T	ST (TX)	TX
Reptiles	Green sea turtle	<i>Chelonia mydas</i>	T	ST (TX)	TX
Reptiles	Leatherback sea turtle	<i>Dermochelys coriacea</i>	E	SE (TX)	TX
Reptiles	Atlantic hawksbill sea turtle	<i>Eretmochelys imbricata</i>	E	SE (TX)	TX
Reptiles	Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>	E	SE (TX)	TX
Reptiles	Louisiana pine snake	<i>Pituophis ruthveni</i>	C	ST (TX)	TX
Plants	Large-fruited sand-verbena	<i>Abronia macrocarpa</i>	E	SE (TX)	TX
Plants	South Texas ambrosia	<i>Ambrosia cheiranthifolia</i>	E	SE (TX)	TX
Plants	Mead's milkweed	<i>Asclepias meadii</i>	T		KS
Plants	Star cactus	<i>Astrophytum asterias</i>	E	SE (TX)	TX
Plants	Texas ayenia	<i>Ayenia limitaris</i>	E	SE (TX)	TX
Plants	Texas poppy-mallow	<i>Callirhoe scabriuscula</i>	E	SE (TX)	TX
Plants	Bunched cory cactus	<i>Coryphantha ramillosa</i> ssp. <i>ramillosa</i>	T	ST (TX)	TX
Plants	Terlingua Creek cat's-eye	<i>Cryptantha crassipes</i>	E	SE (TX)	TX

**Table 3-3
Federal-Listed and Proposed Species Occurring in the Planning Area**

Group	Common Name	Scientific Name (Synonym)	Federal Status*	Other Status* (State)	State Where Present
Plants	Chisos mountains hedgehog cactus	<i>Echinocereus chisoensis</i> var. <i>chisoensis</i>	T	ST (TX)	TX
Plants	Pinkflower hedgehog cactus	<i>E. fendleri</i> ssp. <i>fendleri</i> (<i>E. f.</i> var. <i>kuenzleri</i>)	E		TX
Plants	Davis's green pitaya	<i>Echinocereus viridiflorus</i> var. <i>davisii</i>	E	SE (TX)	TX
Plants	Black lace cactus	<i>E. reichenbachii</i> ssp. <i>fitchii</i> (<i>E.</i> <i>r.</i> var. <i>albertii</i>)	E	SE (TX)	TX
Plants	Lloyd's fishhook cactus	<i>Echinomastus mariposensis</i> (<i>Neolloydia m.</i>)	T	ST (TX)	TX
Plants	Nellie's cory cactus	<i>Escobaria minima</i> (<i>Coryphantha m.</i>)	E	SE (TX)	TX
Plants	Sneed's pincushion cactus	<i>E. sneedii</i> var. <i>sneedii</i> (<i>Coryphantha s.</i>)	E	SE (TX)	TX
Plants	Guadalupe fescue	<i>Festuca ligulata</i>	C		TX
Plants	Johnston's frankenia	<i>Frankenia johnstonii</i>	E	SE (TX)	TX
Plants	Colorado butterfly plant	<i>Gaura neomexicana</i> ssp. <i>coloradensis</i>	T		NE
Plants	Earth fruit	<i>Geocarpon minimum</i>	T	ST (TX)	TX
Plants	Pecos sunflower	<i>Helianthus paradoxus</i>	T	ST (TX)	TX
Plants	Neches River rose- mallow	<i>Hibiscus dasycalyx</i>	T		TX
Plants	Slender rushpea	<i>Hoffmannseggia tenella</i>	E	SE (TX)	TX
Plants	Texas prairie dawn	<i>Hymenoxys texana</i>	E	SE (TX)	TX
Plants	Texas golden gladecress	<i>Leavenworthia texana</i>	E		TX
Plants	Walker's manioc	<i>Manihot walkerae</i>	E	SE (TX)	TX
Plants	Blowout beardtongue	<i>Penstemon haydenii</i>	E	SE (NE)	NE
Plants	Texas trailing phlox	<i>Phlox nivalis</i> ssp. <i>texensis</i>	E	SE (TX)	TX
Plants	White bladderpod	<i>Physaria pallida</i> (<i>Lesquerella</i> <i>p.</i>)	E	SE (TX)	TX
Plants	Zapata bladderpod	<i>P. thamnophila</i> (<i>Lesquerella</i> <i>t.</i>)	E	SE (TX)	TX
Plants	Eastern prairie-fringed orchid	<i>Platanthera leucophaea</i>	T	ST (OK)	OK
Plants	Western prairie- fringed orchid	<i>P. praeclara</i>	T	ST (OK, NE)	OK
Plants	Little aguja pondweed	<i>Potamogeton clystocarpus</i>	E	SE (TX)	TX
Plants	Harperella	<i>Ptilium nodosum</i>	E	SE (OK)	OK
Plants	Hinckley's oak	<i>Quercus hinckleyi</i>	T	ST (TX)	TX
Plants	Chaffseed	<i>Schwalbea americana</i>	E		TX

**Table 3-3
Federal-Listed and Proposed Species Occurring in the Planning Area**

Group	Common Name	Scientific Name (Synonym)	Federal Status*	Other Status* (State)	State Where Present
Plants	Tobusch fishhook cactus	<i>Sclerocactus brevihamatus</i> <i>ssp. tobuschii</i> (<i>Ancistrocactus</i> <i>t.</i>)	E	SE (TX)	TX
Plants	Lloyd's mariposa cactus	<i>S. mariposensis</i>	T	ST (TX)	TX
Plants	Ute ladies'-tresses	<i>Spiranthes diluvialis</i>	T	ST (NE)	NE
Plants	Navasota ladies'-tresses	<i>S. parksii</i>	E	SE (TX)	TX
Plants	Bracted twistflower	<i>Streptanthus bracteatus</i>	C		TX
Plants	Texas snowbells	<i>Styrax</i> <i>platanifolius</i> spp. <i>texanus</i> (<i>S.</i> <i>t.</i>)	E	SE (TX)	TX
Plants	Ashy dogweed	<i>Thymophylla tephroleuca</i>	E	SE (TX)	TX
Plants	Running buffalo-clover	<i>Trifolium stoloniferum</i>	E		KS
Plants	Texas wild-rice	<i>Zizania texana</i>	E	SE (TX)	TX

Sources:¹ USFWS 2008a; NRCS 2014e, 2014f, 2014g, 2015; Nebraska Natural Heritage Program 2013

*Status Codes:

E—Federal-listed Endangered, T—Federal-listed Threatened, C—Federal-listed Candidate, P—Proposed for Listing, BCC—Bird of Conservation Concern, SE—State Endangered, ST—State Threatened

SINC—Species in Need of Conservation, REA—Southern Great Plains Rapid Ecoregional Assessment

Designated critical habitat occurs on BLM-administered lands for the following species: Arkansas River shiner, Houston toad, whooping crane, piping plover, *Rhadine exilis*, leopard darter, *Rhadine infernalis*, Georgetown salamander, (USFWS GIS 2014).

Some special status species either are not listed under the ESA but still warrant some protection or insufficient data have been collected for the USFWS to make a determination for listing. These are state threatened or endangered species, species in need of conservation, birds of conservation concern, and species of greatest conservation concern. Federal land management agencies are mandated to manage special status species so that they should not need to be listed under the ESA in the future (see **Table 3-4**).

¹Thomas, George, BLM Wildlife Biologist. Personal communication via e-mail to Kevin Rice, EMPSi, dated February 13, 2015. Subject: Special status species list and definition.

Table 3-4
Special Status Species Occurring in the Planning Area but not Listed on the ESA

Group	Common Name	Scientific Name (Synonym)	Status* (State)	State Where Present
Amphibians	Green toad	<i>Bufo debilis</i>	ST (KS)	KS
Amphibians	Red-spotted toad	<i>B. punctatus</i>	SINC (KS)	KS
Amphibians	Cascade Caverns salamander	<i>Eurycea latitans</i>	ST (TX)	TX
Amphibians	Longtail salamander	<i>E. longicauda</i>	ST (KS)	KS
Amphibians	Cave salamander	<i>E. lucifuga</i>	SE (KS)	KS
Amphibians	Blanco blind salamander	<i>E. robusta</i>	ST (TX)	TX
Amphibians	Comal blind salamander	<i>E. tridentifera</i>	ST (TX)	TX
Amphibians	Eastern narrowmouth toad	<i>Gastrophryne carolinensis</i>	ST (KS)	KS
Amphibians	Sheep frog	<i>Hypopachus variolosus</i>	ST (TX)	TX
Amphibians	White-lipped frog	<i>Leptodactylus fragilis</i>	ST (TX)	TX
Amphibians	Black-spotted newt	<i>Notophthalmus meridionalis</i>	ST (TX)	TX
Amphibians	Eastern newt	<i>N. viridescens louisianensis</i>	ST (KS)	KS
Amphibians	Spring peeper	<i>Pseudacris crucifer</i>	SINC (KS)	KS
Amphibians	Strecker's chorus frog	<i>P. streckeri</i>	ST (KS)	KS
Amphibians	Crawfish frog	<i>Rana areolata</i>	SINC (KS)	KS
Amphibians	Green frog	<i>R. clamitans melanota</i>	ST (KS)	KS
Amphibians	Mexican burrowing toad	<i>Rhinophrynus dorsalis</i>	ST (TX)	TX
Amphibians	South Texas siren (large form)	<i>Siren</i> sp.	ST (TX)	TX
Amphibians	Mexican treefrog	<i>Smilisca baudinii</i>	ST (TX)	TX
Amphibians	Grotto salamander	<i>Typhlotriton spelaeus</i>	SE (KS)	KS
Birds	Bachman's sparrow	<i>Aimophila aestivalis</i>	ST (TX), BCC, REA	TX
Birds	Botteri's sparrow	<i>Aimophila botterii arizonae</i>	ST (TX), BCC	TX
Birds	Texas Botteri's sparrow	<i>A. b. texana</i>	ST (TX), BCC	TX
Birds	Henslow's sparrow	<i>Ammodramus henslowii</i>	BCC, SINC (KS)	KS
Birds	Golden eagle	<i>Aquila chrysaetos</i>	BCC, SINC (OK, KS)	OK, KS, TX
Birds	Short-eared owl	<i>Asio flammeus</i>	BCC, SINC (KS)	KS
Birds	Burrowing owl	<i>Athene cunicularia</i>	BCC, REA	OK, KS, TX
Birds	White-tailed hawk	<i>Buteo albicaudatus</i>	ST (TX), BCC	TX
Birds	Zone-tailed hawk	<i>B. albonotatus</i>	ST (TX)	TX
Birds	Gray hawk	<i>B. nitidus</i>	ST (TX)	TX
Birds	Ferruginous hawk	<i>B. regalis</i>	BCC, SINC (KS), REA	OK, KS, TX
Birds	Whip-poor-will	<i>Camprimulgus vociferus</i>	BCC, SINC (KS)	KS

Table 3-4
Special Status Species Occurring in the Planning Area but not Listed on the ESA

Group	Common Name	Scientific Name (Synonym)	Status* (State)	State Where Present
Birds	Northern beardless-tyrannulet	<i>Camptostoma imberbe</i>	ST (TX), BCC	TX
Birds	Snowy plover	<i>Charadrius nivosus</i>	BCC, REA	OK, KS, TX
Birds	Black tern	<i>Chlidonias niger</i>	BCC, SINC (KS)	KS
Birds	Chihuahuan raven	<i>Corvus cryptoleucus</i>	SINC (KS)	KS
Birds	Bobolink	<i>Dolichonyx oryzivorus</i>	SINC (KS)	KS
Birds	Reddish egret	<i>Egretta rufescens</i>	ST (TX), BCC	TX
Birds	Swallow-tailed kite	<i>Elanoides forficatus</i>	ST (TX), BCC	TX
Birds	American peregrine falcon	<i>Falco peregrinus anatum</i>	ST (TX), BCC	TX
Birds	Cactus ferruginous Pygmy-owl	<i>Glaucidium brasilianum cactorum</i>	ST (TX)	TX
Birds	Bald eagle	<i>Haliaeetus leucocephalus</i>	ST (TX), BCC SINC (OK, KS)	OK, KS, TX
Birds	Black rail	<i>Laterallus jamaicensis</i>	BCC, SINC (KS)	KS
Birds	Wood stork	<i>Mycteria americana</i>	ST (TX)	TX
Birds	Long-billed curlew	<i>Numenius americanus</i>	BCC, SINC (KS), REA	OK, KS, TX
Birds	Rose-throated becard	<i>Pachyramphus aglaiae</i>	ST (TX), BCC	TX
Birds	Tropical parula	<i>Parula pitaiayumi</i>	ST (TX), BCC	TX
Birds	White-faced Ibis	<i>Plegadis chihi</i>	ST (TX)	TX
Birds	Cerulean warbler	<i>Setophaga cerulea</i>	BCC, SINC (KS)	KS
Birds	Yellow-throated warbler	<i>Setophaga dominica</i>	SINC (KS)	KS
Birds	Sooty tern	<i>Sterna fuscata</i>	ST (TX)	TX
Birds	Curve-billed thrasher	<i>Toxostoma curvirostre</i>	BCC, SINC (KS)	KS
Birds	Greater prairie chicken	<i>Tympanuchus cupido</i>	SINC (OK)	OK
Fishes	Lake sturgeon	<i>Acipenser fulvescens</i>	SINC (KS), ST (NE)	KS
Fishes	River goby	<i>Awaous banana</i>	ST (TX)	TX
Fishes	Mexican stoneroller	<i>Camptostoma ornatum</i>	ST (TX)	TX
Fishes	Highfin carpsucker	<i>Carpiodes velifer</i>	SINC (KS)	KS
Fishes	Southern redbelly dace	<i>Chrosomus erythrogaster</i>	SINC (KS)	KS
Fishes	Banded sculpin	<i>Cottus carolinae</i>	SINC (KS)	KS

Table 3-4
Special Status Species Occurring in the Planning Area but not Listed on the ESA

Group	Common Name	Scientific Name (Synonym)	Status* (State)	State Where Present
Fishes	Mexican goby	<i>Ctenogobius claytonii</i>	ST (TX)	TX
Fishes	Blue sucker	<i>Cycleptus elongatus</i>	ST (TX), SINC (KS)	KS, TX
Fishes	Proserpine shiner	<i>Cyprinella proserpina</i>	ST (TX)	TX
Fishes	Spotfin shiner	<i>C. spiloptera</i>	SINC (KS)	KS
Fishes	Conchos pupfish	<i>C. eximius</i>	ST (TX)	TX
Fishes	Pecos pupfish	<i>C. pecosensis</i>	ST (TX)	TX
Fishes	Gravel chub	<i>Erimystax x punctatus</i>	SINC (KS)	KS
Fishes	Creek chubsucker	<i>Erimyzon oblongus</i>	ST (TX)	TX
Fishes	Greenside darter	<i>Etheostoma blennioides</i>	SINC (KS)	KS
Fishes	Bluntnose darter	<i>E. chlorosoma</i>	SINC (KS)	KS
Fishes	Slough darter	<i>E. gracile</i>	SINC (KS)	KS
Fishes	Rio Grande darter	<i>E. grahami</i>	ST (TX)	TX
Fishes	Sunburst darter	<i>E. mihileze</i>	SINC (KS)	KS
Fishes	Johnny darter	<i>E. nigrum</i>	SINC (KS)	KS
Fishes	Highland darter	<i>E. teddyroosevelt</i>	SINC (KS)	KS
Fishes	Redfin darter	<i>E. whipplei</i>	SINC (KS)	KS
Fishes	Banded darter	<i>E. zonale</i>	SINC (KS)	KS
Fishes	San Felipe gambusia	<i>Gambusia clarkhubbsi</i>	ST (TX)	TX
Fishes	Blotched gambusia (wild extinct)	<i>G. senilis</i>	ST (TX)	TX
Fishes	Rio Grande chub	<i>Gila pandora</i>	ST (TX)	TX
Fishes	Western silvery minnow	<i>Hybognathus argyritis</i>	ST (KS)	KS
Fishes	Plains minnow	<i>H. placitus</i>	ST (KS)	KS
Fishes	Northern hog sucker	<i>Hypentelium nigricans</i>	SINC (KS)	KS
Fishes	Chestnut lamprey	<i>Ichthyomyzon castaneus</i>	SINC (KS)	KS
Fishes	Cardinal shiner	<i>Luxilus cardinalis</i>	SINC (KS)	KS
Fishes	Striped shiner	<i>L. chrysocephalus</i>	SINC (KS)	KS
Fishes	Common shiner	<i>L. cornutus</i>	SINC (KS)	KS
Fishes	Sturgeon chub	<i>Macrhybopsis gelida</i>	ST (KS), SE (NE)	KS
Fishes	Shoal chub	<i>M. hyostoma</i>	ST (KS)	KS
Fishes	Sicklefin chub	<i>M. meeki</i>	SE (KS)	KS
Fishes	Silver chub	<i>M. storeriana</i>	SE (KS)	KS
Fishes	Arkansas River speckled (peppered) chub	<i>M. tetranema</i>	SE (KS)	KS
Fishes	Opossum pipefish	<i>Microphis brachyurus</i>	ST (TX)	TX
Fishes	Spotted sucker	<i>Minytrema melanops</i>	SINC (KS)	KS
Fishes	River redhorse	<i>Moxostoma carinatum</i>	SINC (KS)	KS
Fishes	Black redhorse	<i>M. duquesnei</i>	SINC (KS)	KS
Fishes	Redspot chub	<i>Nocomis asper</i>	ST (KS)	KS
Fishes	Hornyhead chub	<i>N. biguttatus</i>	ST (KS)	KS

Table 3-4
Special Status Species Occurring in the Planning Area but not Listed on the ESA

Group	Common Name	Scientific Name (Synonym)	Status* (State)	State Where Present
Fishes	Tadpole madtom	<i>Norturus gyrinus</i>	SINC (KS)	KS
Fishes	River shiner	<i>Notropis blennioides</i>	SINC (KS)	KS
Fishes	Bigeye shiner	<i>N. boops</i>	SINC (KS)	KS
Fishes	Chihuahua shiner	<i>N. chihuahua</i>	ST (TX)	TX
Fishes	Ozark minnow	<i>N. nubilus</i>	SINC (KS)	KS
Fishes	Silverband shiner	<i>N. shumardi</i>	SINC (KS)	KS
Fishes	Bluntnose shiner (extinct)	<i>N. simus</i>	ST (TX)	TX
Fishes	Brindled madtom	<i>Noturus miurus</i>	SINC (KS)	KS
Fishes	Black-sided darter	<i>Percina maculata</i>	ST (OK, KS, TX)	OK, KS, TX
Fishes	Long-nosed darter	<i>P. nasuta</i>	SE (OK)	OK
Fishes	River darter	<i>P. shumardi</i>	SINC (KS)	KS
Fishes	Flathead chub	<i>Platygobio gracilis</i>	ST (KS)	KS
Fishes	Paddlefish	<i>Polyodon spathula</i>	ST (TX)	TX
Fishes	Bluehead shiner	<i>Pteronotropis hubbsi</i>	ST (TX)	TX
Fishes	Western blacknose dace	<i>Rhinichthys obtusus</i>	SINC (KS)	KS
Fishes	Widemouth blindcat	<i>Satan eurystomus</i>	ST (TX)	TX
Fishes	Shovelnose sturgeon	<i>Scaphirhynchus platyrhynchus</i>	ST (TX)	TX
Fishes	Toothless blindcat	<i>Trogloglanis pattersoni</i>	ST (TX)	TX
Invertebrates	Mucket mussel	<i>Actinonaias ligamentina</i>	SE (KS)	KS
Invertebrates	Elktoe mussel	<i>Alasmidonta marginata</i>	SE (KS)	KS
Invertebrates	Flat floater mussel	<i>Anodonta suborbiculata</i>	SE (KS)	KS
Invertebrates	Cylindrical papershell mussel	<i>Anodontooides ferussacianus</i>	SINC (KS)	KS
Invertebrates	Rock pocketbook mussel	<i>Arcidens confragosus</i>	ST (KS)	KS
Invertebrates	Oklahoma Cave crayfish	<i>Cambarus tartarus</i>	SE (OK)	OK
Invertebrates	Western fanshell mussel	<i>Cyprogenia aberti</i>	SE (KS)	KS
Invertebrates	Butterfly mussel	<i>Ellipsaria lineolata</i>	ST (KS)	KS
Invertebrates	Spike mussel	<i>Elliptio dilatata</i>	SINC (KS)	KS
Invertebrates	Snuffbox mussel	<i>Epioblasma triquetra</i>	SINC (KS)	KS
Invertebrates	Texas pigtoe	<i>Fusconaia askewi</i>	ST (TX)	TX
Invertebrates	Wabash pigtoe mussel	<i>F. flava</i>	SINC (KS)	KS
Invertebrates	Triangle pigtoe	<i>F. lananensis</i>	ST (TX)	TX
Invertebrates	Prairie mole cricket	<i>Gryllotalpa major</i>	SINC (KS)	KS
Invertebrates	Neosho mucket	<i>Lampsilis rafinesqueana</i>	SE (OK, KS)	OK, KS
Invertebrates	Sandbank pocketbook	<i>L. satura</i>	ST (TX)	TX
Invertebrates	Fat mucket mussel	<i>L. siliquoidea</i>	SINC (KS)	KS
Invertebrates	Yellow sandshell mussel	<i>L. teres</i>	SINC (KS), REA	OK, KS, TX
Invertebrates	Fluted-shell mussel	<i>Lasmigona costata</i>	ST (KS)	KS
Invertebrates	Washboard mussel	<i>Megaloniais nervosa</i>	SINC (KS)	KS
Invertebrates	Southern hickorynut	<i>Obovaria jacksoniana</i>	ST (TX)	TX

**Table 3-4
Special Status Species Occurring in the Planning Area but not Listed on the ESA**

Group	Common Name	Scientific Name (Synonym)	Status* (State)	State Where Present
Invertebrates	Optioservus riffle beetle	<i>Optioservus phaeus</i>	SE (KS)	KS
Invertebrates	Neosho midget crayfish	<i>Orconectes macrus</i>	SINC (KS)	KS
Invertebrates	Round pigtoe mussel	<i>Pleurobema coccineum</i>	SINC (KS)	KS
Invertebrates	Louisiana pigtoe	<i>P. riddellii</i>	ST (TX)	TX
Invertebrates	Sharp hornsnail	<i>Pleurocera acuta</i>	ST (KS)	KS
Invertebrates	Slender walker snail	<i>Pomatiopsis lapidaria</i>	SE (KS)	KS
Invertebrates	Texas heelsplitter	<i>Potamilus amphichaenus</i>	ST (TX)	TX
Invertebrates	Salina mucket	<i>P. metnecktayi</i>	ST (TX)	TX
Invertebrates	Delta hydrobe	<i>Probythinella emarginata</i>	ST (KS)	KS
Invertebrates	Ouachita kidneyshell mussel	<i>Ptychobranthus occidentalis</i>	ST (KS)	KS
Invertebrates	Giant floater	<i>Pyganodon grandis</i>	REA	OK, KS, TX
Invertebrates	Rabbits-foot mussel	<i>Quadrula cylindrica</i>	SE (KS)	KS
Invertebrates	False spike	<i>Q. mitchelli</i>	ST (TX)	TX
Invertebrates	Wartyback mussel	<i>Q. nodulata</i>	SINC (KS)	KS
Invertebrates	Ozark emerald dragonfly	<i>Somatochlora ozarkensis</i>	SINC (KS)	KS
Invertebrates	Creeper mussel	<i>Strophitus undulatus</i>	SINC (KS)	KS
Invertebrates	Gray petaltail dragonfly	<i>Tachopteryx thoreyi</i>	SINC (KS)	KS
Invertebrates	Mexican fawnsfoot	<i>Truncilla cognata</i>	ST (TX)	TX
Invertebrates	Fawnsfoot mussel	<i>T. donaciformis</i>	SINC (KS)	KS
Invertebrates	Deertoe mussel	<i>T. truncata</i>	SINC (KS)	KS
Invertebrates	Pondhorn	<i>Uniomerus tetralasmus</i>	REA	OK, KS, TX
Invertebrates	Ellipse mussel	<i>Venustaconcha ellipsiformis</i>	SE (KS)	KS
Mammals	Pallid bat	<i>Antrozous pallidus</i>	SINC (KS), REA	OK, KS, TX
Mammals	Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	ST (TX)	TX
Mammals	Townsend's big-eared bat	<i>C. townsendii</i>	SINC (KS), REA	OK, KS, TX
Mammals	Black-tailed prairie dog	<i>Cynomys ludovicianus</i>	SINC (OK)	OK
Mammals	Texas kangaroo rat	<i>Dipodomys elator</i>	ST (TX)	TX
Mammals	Spotted bat	<i>Euderma maculatum</i>	ST (TX)	TX
Mammals	Pygmy killer whale	<i>Feresa attenuata</i>	ST (TX)	TX
Mammals	Southern flying squirrel	<i>Glaucomys volans</i>	SINC (KS), ST (KS)	KS
Mammals	Short-finned pilot whale	<i>Globicephala macrorhynchus</i>	ST (TX)	TX
Mammals	Pygmy sperm whale	<i>Kogia breviceps</i>	ST (TX)	TX
Mammals	Dwarf sperm whale	<i>Kogia simus</i>	ST (TX)	TX
Mammals	Eastern red bat	<i>Lasiurus borealis</i>	REA	OK, KS, TX
Mammals	Southern yellow bat	<i>Lasiurus ega</i>	ST (TX)	TX
Mammals	Margay	<i>Leopardus wiedii</i>	ST (TX)	TX

Table 3-4
Special Status Species Occurring in the Planning Area but not Listed on the ESA

Group	Common Name	Scientific Name (Synonym)	Status* (State)	State Where Present
Mammals	River otter	<i>Lutra canadensis</i>	ST (NE)	NE
Mammals	Gervais's beaked whale	<i>Mesoplodon europaeus</i>	ST (TX)	TX
Mammals	White-nosed coati	<i>Nasua narica</i>	ST (TX)	TX
Mammals	Killer whale	<i>Orcinus orca</i>	ST (TX)	TX
Mammals	Coues's rice rat	<i>Oryzomys couesi</i>	ST (TX)	TX
Mammals	Texas mouse	<i>Peromyscus attwateri</i>	SINC (KS)	KS
Mammals	Palo duro mouse	<i>P. truei comanche</i>	ST (TX)	TX
Mammals	False killer whale	<i>Pseudorca crassidens</i>	ST (TX)	TX
Mammals	Franklin's ground squirrel	<i>Spermophilus franklinii</i>	SINC (KS)	KS
Mammals	Eastern spotted skunk	<i>Spilogale putorius</i>	ST (KS)	KS
Mammals	Atlantic spotted dolphin	<i>Stenella frontalis</i>	ST (TX)	TX
Mammals	Rough-toothed dolphin	<i>Steno bredanensis</i>	ST (TX)	TX
Mammals	Southern bog lemming	<i>Synaptomys cooperi</i>	SINC (KS)	KS
Mammals	Mexican free-tailed bat	<i>Tadarida brasiliensis</i>	REA	OK, KS, TX
Mammals	Black bear	<i>Ursus americanus</i>	ST (TX) (due to similarity to Louisiana black bear)	TX
Mammals	Swift fox	<i>Vulpes velox</i>	REA, SE (NE)	OK, KS, TX
Mammals	Goose-beaked whale	<i>Ziphius cavirostris</i>	ST (TX)	TX
Plants	American ginseng	<i>Panax quinquefolium</i>	ST (NE)	NE
Reptiles	Glossy snake	<i>Arizona elegans</i>	SINC (KS)	KS
Reptiles	Scarlet snake	<i>Cemophora coccinea</i>	ST (TX)	TX
Reptiles	Reticulated gecko	<i>Coleonyx reticulatus</i>	ST (TX)	TX
Reptiles	Black-striped snake	<i>Coniophanes imperialis</i>	ST (TX)	TX
Reptiles	Timber rattlesnake	<i>Crotalus horridus</i>	ST (TX), SINC (KS)	KS, TX
Reptiles	Reticulate collared lizard	<i>Crotaphytus reticulatus</i>	ST (TX)	TX
Reptiles	Texas indigo snake	<i>Drymarchon melanurus erebennus</i>	ST (TX)	TX
Reptiles	Speckled racer	<i>Drymobius margaritiferus</i>	ST (TX)	TX
Reptiles	Broadhead skink	<i>Eumeces laticeps</i>	ST (KS)	KS
Reptiles	Texas tortoise	<i>Gopherus berlandieri</i>	ST (TX)	TX
Reptiles	Cagle's map turtle	<i>Graptemys caglei</i>	ST (TX)	TX
Reptiles	Common map turtle	<i>G. geographica</i>	ST (KS)	KS
Reptiles	Western hognose snake	<i>Heterodon nasicus</i>	SINC (KS)	KS
Reptiles	Eastern hognose snake	<i>H. platirhinos</i>	SINC (KS)	KS
Reptiles	Chihuahuan night snake	<i>Hypsiglena jani</i>	SINC (KS)	KS
Reptiles	Chihuahuan mud turtle	<i>Kinosternon hirtipes murrayi</i>	ST (TX)	TX
Reptiles	Northern cat-eyed snake	<i>Leptodeira septentrionalis</i>	ST (TX)	TX

Table 3-4
Special Status Species Occurring in the Planning Area but not Listed on the ESA

Group	Common Name	Scientific Name (Synonym)	Status* (State)	State Where Present
Reptiles	Smooth green snake	<i>Liochlorophis vernalis</i>	ST (TX)	TX
Reptiles	Alligator snapping turtle	<i>Macrochelys temminckii</i>	ST (TX), SINC (KS)	KS, TX
Reptiles	Brazos water snake	<i>Nerodia harteri</i>	ST (TX)	TX
Reptiles	Texas horned lizard	<i>Phrynosoma cornutum</i>	ST (TX)	TX
Reptiles	Mountain short-horned lizard	<i>P. hernandesi</i>	ST (TX)	TX
Reptiles	Texas blind snake (New Mexico blind snake)	<i>Rena dissecta</i>	ST (KS)	KS
Reptiles	Longnose snake	<i>Rhinocheilus lecontei</i>	SINC (KS)	KS
Reptiles	Massasauga	<i>Sistrurus catenatus</i>	ST (NE)	NE
Reptiles	Redbelly snake	<i>Storeria occipitomaculata</i>	SINC (KS)	KS
Reptiles	Checkered garter snake	<i>Thamnophis marcianus</i>	ST (KS)	KS
Reptiles	Chihuahuan desert lyre snake	<i>Trimorphodon vilkinsonii</i>	ST (TX)	TX
Reptiles	Rough earth snake	<i>Virginia striatula</i>	SINC (KS)	KS
Reptiles	Smooth earth snake	<i>V. valeriae</i>	SINC (KS)	KS

Sources:² USFWS 2008a; Nebraska Natural Heritage Program 2013

*Status Codes:

E—Federal-listed Endangered, T—Federal-listed Threatened, C—Federal-listed Candidate, P—Proposed for Listing, BCC—Bird of Conservation Concern, SE—State Endangered, ST—State Threatened

SINC—Species in Need of Conservation, REA—Southern Great Plains Rapid Ecoregional Assessment

Key Species

Key species are described in detail below. They include species or species assemblages which are listed as conservation elements in the Southern Great Plains REA (Assal et al. 2015); or those species which are known to occur within the decision area.

Freshwater mussels species assemblage. Freshwater mussels of the family Unionidae are the most abundant and diverse group of native mussels in North America. However, currently freshwater mussels are the single most threatened animal group in North America, with 72 percent of species listed as threatened or endangered (Haag 2012). Key mussel species in the planning area are giant floater, pondhorn, and yellow sandshell (Assal et al. 2015).

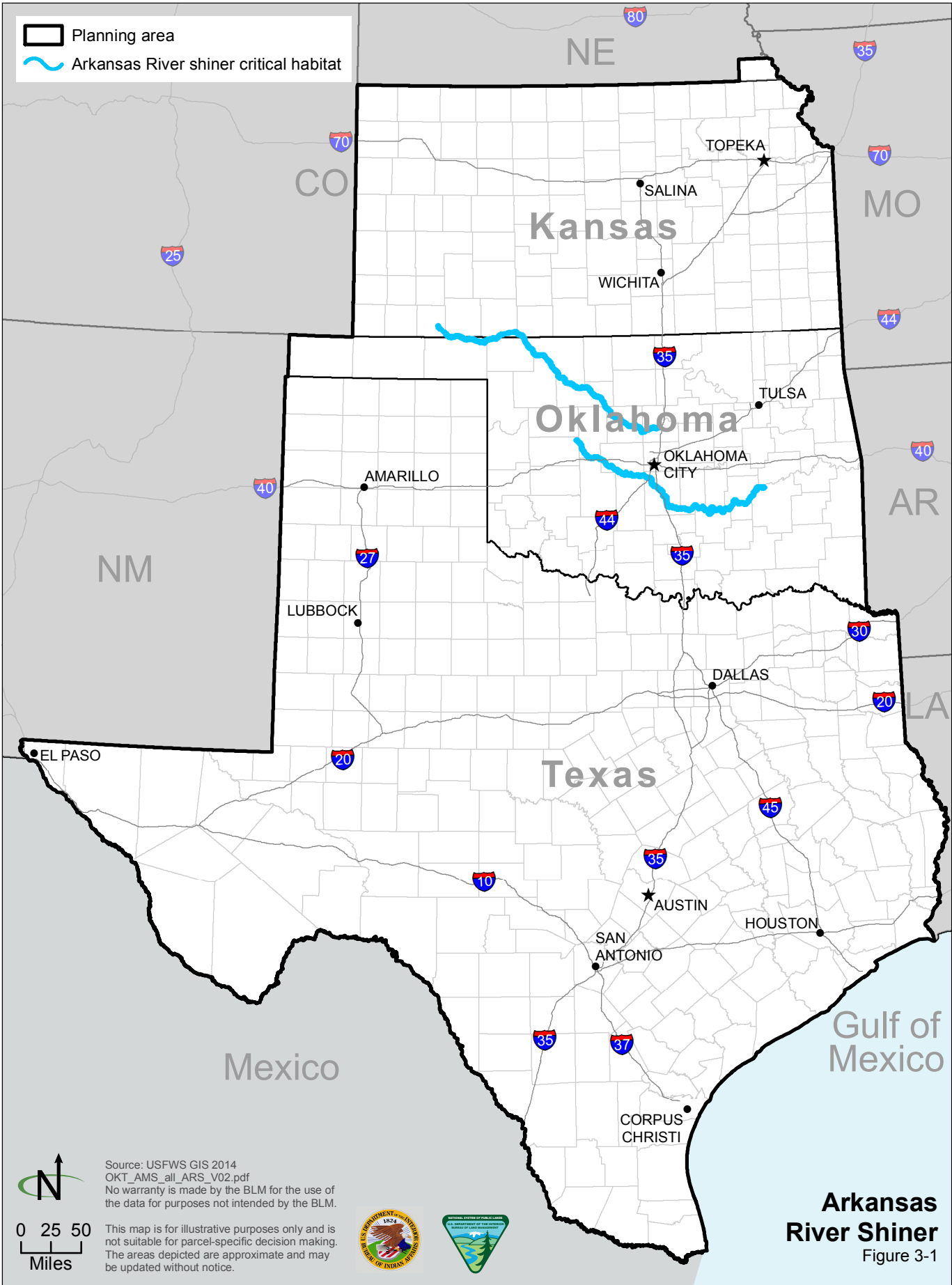
Many mussels are benthic (bottom-dwelling) filter feeders that occur in dense aggregations called mussel beds. Mussels filter algae and other food items from the water and excrete nutrients into the aquatic system. Therefore, they serve

²Ibid.

as important links between the pelagic (water column) and benthic (sediment, stream, or lake bottom) components of the habitat (Vaughn and Hakenkamp 2001). The nutrients they excrete can increase primary productivity (Vanni 2002; Vaughn et al. 2007), provide nitrogen (Atkinson et al. 2013), and fuel surrounding terrestrial systems (Allen et al. 2012).

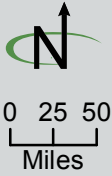
Mussels have biological and behavioral characteristics that make them less able to respond quickly to disturbance. They are relatively immobile and cannot easily move to new habitats if their current habitats become unsuitable. Because many species are long lived and have slow and complicated reproduction cycles, the effects of disturbances are often delayed and recovery can be very slow (Assal et al. 2015).

Arkansas River shiner (*Notropis girardi*), federal-listed threatened, state endangered (Kansas), state threatened (Texas). The Arkansas River shiner is a small streamlined minnow, found in the Arkansas River basin. The species inhabits shallow braided channels with pool, riffle, run, and backwater components. Water quality is characterized by low contaminant concentration and seasonally variable temperature, turbidity, conductivity, dissolved oxygen, and pH (USFWS 2001). Critical habitat for Arkansas River shiner was originally designated in 2001 (66 FR 18002-18034) and was later revised in a newly issued final rule in 2005 (70 FR 59808-59846). Critical habitat consists of two units; one contains two segments of the Canadian River and one unit contains one segment of the Cimarron River (see **Figure 3-1**). Critical habitat includes associated riparian zones of generally 300 feet on each side of the stream.



Source: USFWS GIS 2014
 OKT_AMS_all_ARS_V02.pdf
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 not suitable for parcel-specific decision making.
 The areas depicted are approximate and may
 be updated without notice.



**Arkansas
 River Shiner**
 Figure 3-1

Historically, the Arkansas River shiner was widespread and abundant throughout the Arkansas River basin in Kansas, New Mexico, Oklahoma, and Texas; however, the species no longer inhabits more than 80 percent of its original range. Current populations are almost entirely restricted to approximately 500 miles of the Canadian River in Oklahoma, Texas, and New Mexico (USFWS 1998). The construction of reservoirs has fragmented, inundated, dewatered, or otherwise directly affected habitat for the Arkansas River shiner, and depletions and diversions continue to threaten the species. Water quality degradation caused by concentrated animal feeding operations, municipal sewage effluent, and other sources have impacted aggregations (USFWS 2009a).

Burrowing owl (*Athene cunicularia*), bird of conservation concern. A small, ground-dwelling owl with long legs, white chin stripe, round head, and stubby tail, it may be observed perching on the ground, on fence posts, or on mounds in open spaces. Burrowing owls are not highly territorial and may share a common foraging area with other nesting pairs. Habitat includes open grasslands, prairie, plains, savanna, and sometimes vacant lots near human habitation or airports.

This owl spends much time on the ground or on low perches, such as fence posts or dirt mounds. It nests in abandoned burrows dug by prairie dogs, ground squirrels, foxes, woodchucks, or badgers. In Oklahoma, burrowing owls are highly associated with prairie dog colonies. Their diet includes large insects, rodents, and sometimes birds and amphibians. Widely distributed throughout the Great Plains and Rocky Mountains in the United States and Canada, the burrowing owl's numbers have been greatly reduced by habitat loss (e.g., due to intensive agriculture), degradation (e.g., via human control of prairie dogs and other small burrowing mammals), and fragmentation from conversion to agriculture (NatureServe 2015).

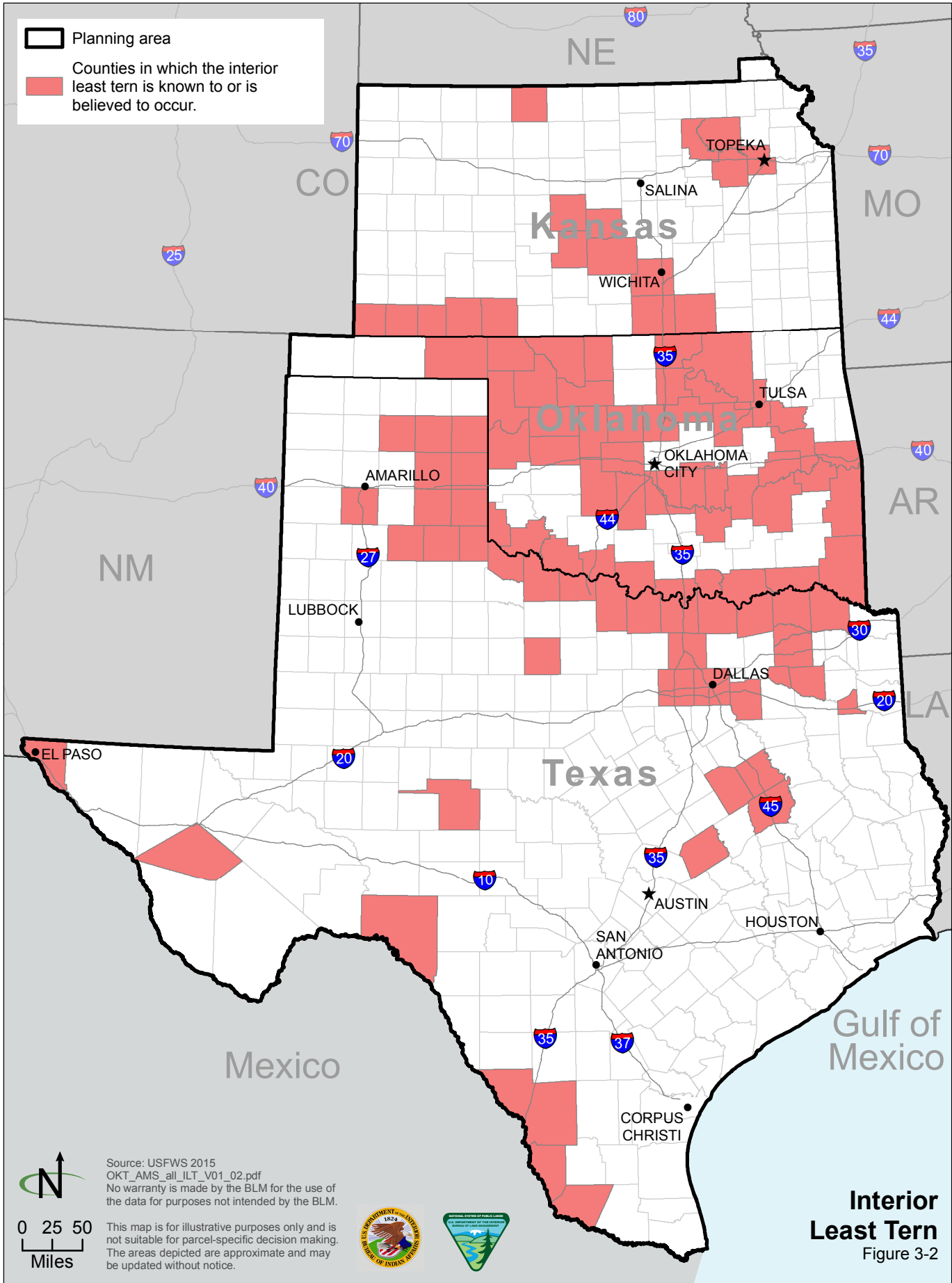
Ferruginous hawk (*Buteo regalis*), bird of conservation concern. A hawk with a rusty back and shoulders, pale head, and white tail, the ferruginous hawk winters in Texas and Oklahoma in grassland and desert shrub areas. It prefers open country, primarily prairies, plains, and badlands; sagebrush, saltbush-greasewood shrubland, the periphery of pinyon-juniper and other woodlands, and desert. It nests in tall trees or willows along streams or on steep slopes, on cliff ledges, hillsides, on power line towers, on sloped ground on the plains, or on mounds in open desert, avoiding agriculture and human activity. Ferruginous hawks may maintain several nests in a territory and alternate their use. Clutch size varies with the availability of prey, especially ground squirrels (*Spermophilus* spp.) and jackrabbits (*Lepus* spp.). Home range size varies widely, from 3 to 30 square miles in some areas. Uncommon but widespread in suitable habitat in the western United States and Canada, the ferruginous hawk has declined in local areas. It is highly sensitive to human disturbance and subject to continuing

habitat loss from agricultural development and forest incursion into grasslands (NatureServe 2015).

Interior least tern (*Sterna antillarum athalassos*), federal-listed endangered. Interior least terns nest locally along the Colorado, Red, Arkansas, Missouri, Ohio, and Mississippi River systems. Least terns nesting on the California coast and along interior rivers are listed as endangered by the USFWS, except in areas within 50 miles of the Texas coast. The least tern is the smallest North American tern, gray above, with a black cap and nape, white forehead, and a black line running from the crown through the eye to the base of the bill. Interior populations mainly eat aquatic invertebrates, primarily cyprinids (minnows). They nest in shallow depressions on the ground on sandy beaches, salt flats, or sparsely vegetated river or lake banks in North America and winter in Mexico and Central America. Least terns were formerly more widespread and common but now survive only in scattered remnants. Their habitat has been decimated by human use of beaches and sandbars and by upstream dams that remove alluvium and create scour in river channels, reducing sandbars and beaches used for nesting (NatureServe 2015; see **Figure 3-2**).

Lesser prairie chicken (*Tympanuchus pallidicinctus*), federal-listed threatened. The lesser prairie chicken is characterized by brown and buff-colored barring, similar in appearance to the greater prairie-chicken but slightly smaller. It inhabits mixed-grass/dwarf shrub communities that occur on sandy soils, principally the sand sagebrush (*Artemisia filifolia*)-bluestem (*Andropogon* spp.) association in Colorado, Kansas, and Oklahoma, and to a lesser extent, Texas and New Mexico. Leks typically occur on knolls or ridges with relatively short or sparse vegetation. Nesting sites are in sand sagebrush or shinnery oak grasslands, with high canopy cover in relatively tall dense vegetation. Diet is insects, seeds, acorns, vegetative material, and cultivated grains, such as sorghum. In spring and fall, adults congregate on leks, where males engage in communal courtship displays; the number of males attending a lek is influenced by habitat and population density. Droughts and hot dry weather during nesting season negatively impact grass height and may reduce hatching success. Lesser prairie chickens form flocks in fall and winter and generally do not migrate. Males and females both demonstrate strong site fidelity.

The lesser prairie-chicken has a small fragmented range in the southwestern Great Plains. Its distribution and abundance have declined due to habitat loss, degradation, and fragmentation caused by conversion of native rangelands to cropland, the spread of invasive species, and cumulative habitat degradation caused by inappropriate livestock grazing, energy development, woodland spread due to fire suppression, and structural and transportation developments (NatureServe 2015). Additionally, collisions with stock fences represent a leading cause of mortality of lesser prairie chicken. In the planning area,

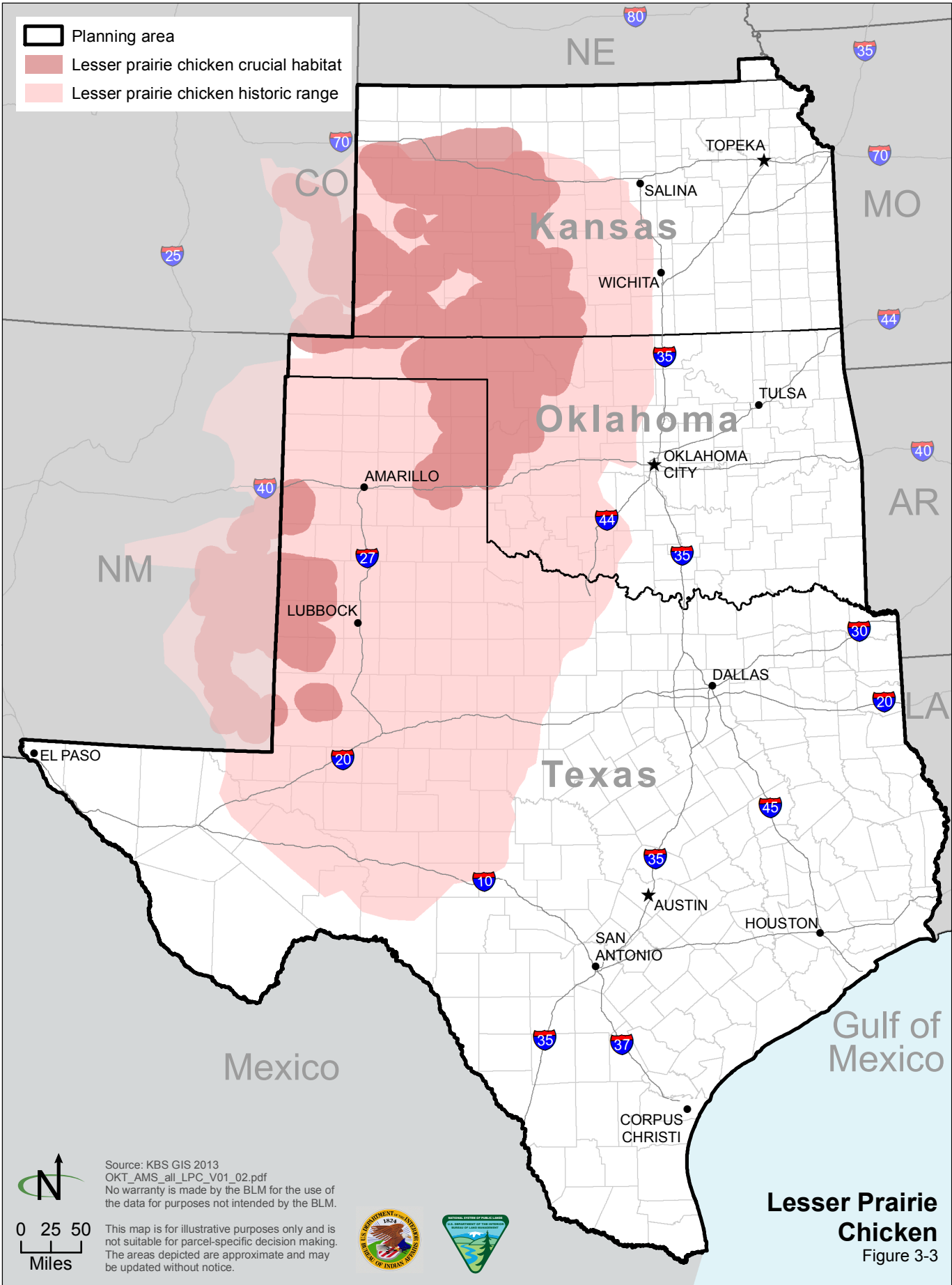


populations are primarily concentrated in western Kansas and the Oklahoma and Texas panhandle. Populations are estimated at approximately 20,000 to 30,000 in Kansas, fewer than 3,000 in Oklahoma, and 2,000 in Texas (USFWS 2014a). See **Figure 3-3** for the species range in the planning area.

Long-billed curlew (*Numenius americanus*), bird of conservation concern. The long-billed curlew is a large dusky shorebird, with black barring and a long decurved bill for probing for food in the mud. It is a long-distance migrant and breeds in prairies and grassy meadows, generally near water. It nests on the ground, usually in a flat area with short grass, sometimes on more irregular terrain, often near rocks, in prairies and meadows. In winter, it is often found on beaches and mudflats. It is an opportunistic feeder, ranging from insects, such as beetles and grasshoppers, to berries, crabs, small toads, and snails. It is found widely across the western United States and Canada, but its range is diminishing. It occurs in the decision area in northern Texas through southwestern Kansas but is vulnerable or imperiled throughout these areas. Its populations have declined from hunting, and habitat loss from cultivation has led to localized declines (NatureServe 2015).

Mountain plover (*Charadrius montanus*), bird of conservation concern. The mountain plover has a brown back, mainly white undersides, and a dark crown. It is a long-distance migrant, wintering along the Pacific coast and nesting in the Great Plains and Rocky Mountains on the ground in bare or sparsely vegetated areas. It is found in croplands, deserts, and grassland areas, and it nests in short-grass prairie and sagebrush habitat, sometimes in prairie dog towns. Nests are on the ground in shallow depressions in dry soils. Nest predation is high, mainly from foxes and coyotes, and nests in fallow fields may be lost by if the fields are subsequently planted. The mountain plover feeds primarily on insects, including grasshoppers, crickets, beetles, flies, and ants. Preferred winter habitat consists of short-grass plains and fields, plowed fields, and sandy deserts, where it forages and roosts in loose flocks that may exceed 1,000 birds on the southern Great Plains.

Numbers have been greatly reduced by hunting, and habitat has been lost by conversion of short-grass prairie to cropland or tall grasses, orchards, or developments. In the Great Plains, many nests were on prairie dog towns, which have declined greatly from human removal but are now increasing in abundance again. The USFWS recently declined to list the mountain plover under the ESA (NatureServe 2015).



Snowy plover (*Charadrius nivosus*), bird of conservation concern. The snowy plover is a small pale plover with a thin dark bill, white underside, a breast band, and dark ear patch. It nests on the ground in loose colonies on shorelines, mud or salt flats, and sandy or sparsely vegetated shores of rivers, lakes, and ponds. Nest predation by gulls, common raven, red fox, skunk, raccoon, and coyote results in a high rate of loss in some areas. Most populations are migratory and in winter are found on beaches, in salt ponds, and on estuarine sand and mud flats. It eats insects, small crustaceans, and other invertebrates in the mud or near shallow water. It has a large scattered range from Texas and Oklahoma west to California; populations are declining in many areas due to habitat loss and degradation, especially from development and disturbance by humans in shoreline areas, as well as from predators. On the Great Plains, its habitat has been lost to invasion of nonnative tamarisk (NatureServe 2015). The Pacific coast population is listed as threatened under the ESA.

Bat species assemblage. The bat assemblage in the planning area is made up of species with wide-ranging distributions. The planning area represents the eastern extent of species associated with arid landscapes and the western extent of species associated with temperate eastern North America (Assal et al. 2015).

Bat species in the planning area are primarily insectivorous and generally fall into one of four dietary classifications: aerial insectivores of forests and clearings (silver-haired bat, big brown bat), gleaning insectivores, which capture prey from the vegetation or the ground (fringed myotis, pallid bat), water surface foragers, which forage aquatic insects from and above bodies of water (Yuma myotis, little brown bat), and open-air aerial insectivores (Mexican free-tailed bat, hoary bat; Findley 1993). Bats are also prey to many animals, including other mammals, birds and other raptors, amphibians, fish, and reptiles, including snakes (Sparks et al. 2000).

Bats in the planning area use a variety of structures for reproduction, hibernation, and roosting. Some species roost in caves but also may roost in abandoned mines and other subterranean features that provide cave-like conditions. Other species roost in rock features that provide crevices and sheltered areas on cliff faces and escarpments or between and under rocks in boulder fields and talus slopes. Still other species roost in the foliage of trees or other vegetation, typically roosting individually or in small groups.

Sites that serve as maternity roosts are usually relatively warm and near predictable foraging areas and water (Dalquest et al. 1990; Miller 2011), while winter hibernation sites are relatively cold, stable roosting environments enable bats to lower their core body temperatures and metabolic rates (Humphrey and Kunz 1976). Hibernation sites are generally not abundant, and as such large segments of regional bat populations may be restricted to only a few roosting

sites during certain times of the year (Prendergast et al. 2010). Some species may also have very high fidelity to certain roosts (Prendergast et al. 2010), making them vulnerable to disturbance from human activities and destruction of roosts (Hutson et al. 2001).

There are five federally listed bats in the planning area: gray myotis (endangered), Indiana bat (endangered), Ozark big-eared bat (endangered), Mexican long-nosed bat (endangered), and northern long-nosed bat (threatened). Three other species in the planning area are considered sensitive: Townsend's big-eared bat, pallid bat, and Mexican free-tailed bat.

Black-tailed prairie dog (*Cynomys ludovicianus*) species of species concern (Oklahoma). Black-tailed prairie dog is a diurnal rodent, approximately 15 inches in length. It lives in colonies or towns, which can cover up to thousands of acres of grassland habitat (Arizona Game and Fish Department 1999). Well drained and medium textured soils are required for burrow excavation. Declines in populations in Oklahoma, Kansas, and Texas have been attributed to population control efforts, habitat destruction, and fragmentation by agricultural conversion and plague (Arizona Game and Fish Department 1999).

Black-tailed prairie dogs provide important habitat and feeding grounds for other species, including the endangered black-footed ferret. This species uses prairie dog burrows for shelter and depend on prairie dogs as a food source. Activities that affect black-tailed prairie dog populations or habitat may also affect black-foot ferrets (USFWS 2013a).

Swift fox (*Vulpes velox*), species of special concern (Oklahoma). The swift fox is the smallest fox in North America, found primarily in short-grass and mixed-grass prairies. It relies on dens year-round for shelter, escape from predators, and rearing of young (Meyer 2009). Coyotes are the primary predator, and badgers and raptors are also responsible for some swift fox mortality. Threats are trapping, poisoning, vehicle collision, red fox range expansion, coyotes, and habitat loss and degradation (Meyer 2009). The swift fox is found in northern Texas, the Oklahoma panhandle region, and western Kansas.

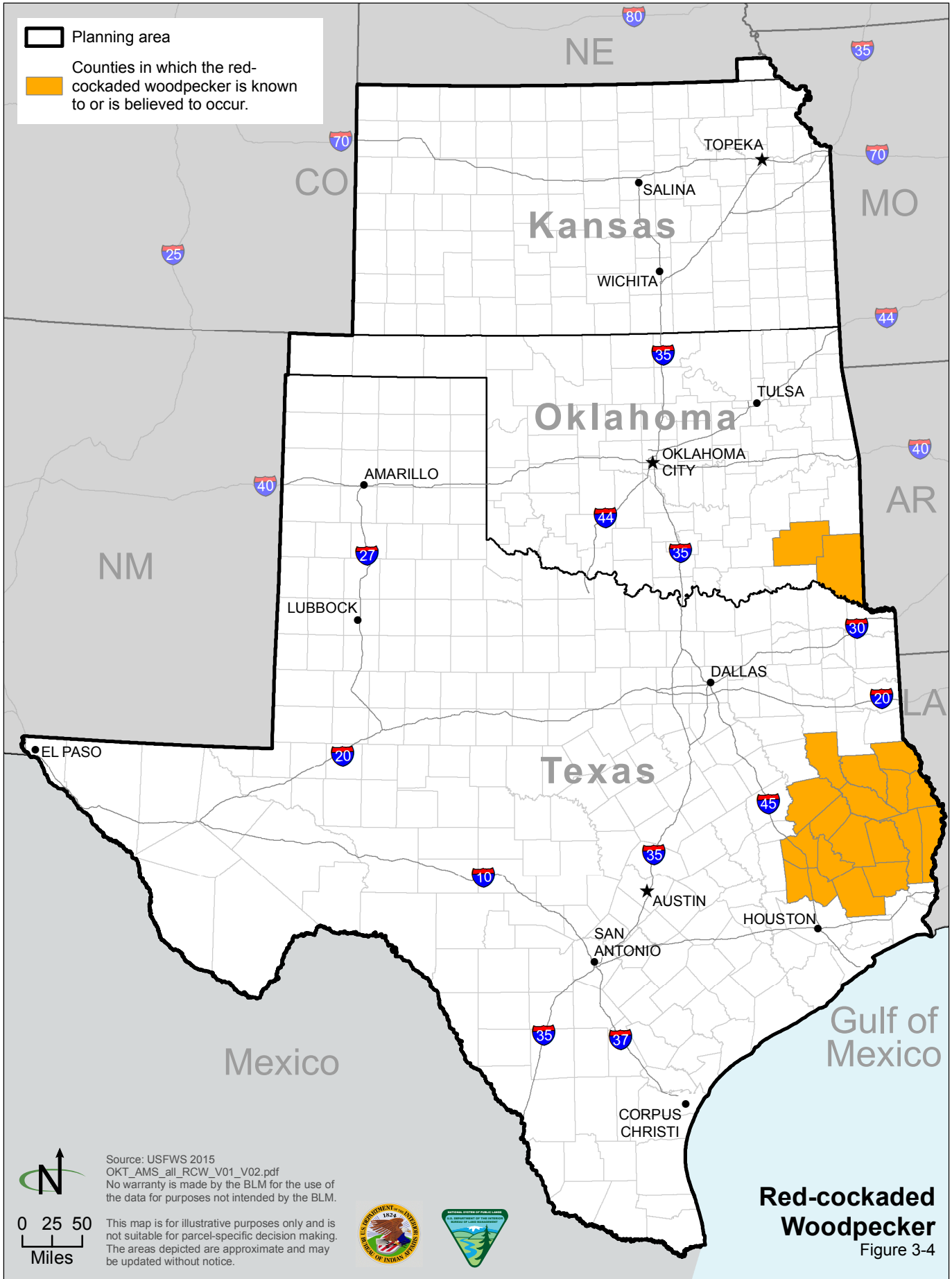
Red-cockaded woodpecker (*Picooides borealis*). federal-listed endangered. A small woodpecker closely related to the hairy woodpecker (*Picooides villosus*), it has red streaks (cockades) are on either side of the head of adult males. It lives in groups, unlike other woodpeckers, with a single breeding pair and sometimes helpers, which incubate eggs, feed nestlings and fledglings, and defend territories. It roosts in cavities excavated in mature pine trees. Rat snake predation takes a heavy toll on nestlings, and flying squirrels (*Glucocomys volans*) may seize and destroy nests.



Nesting groups are highly territorial, and competition for cavities is strong with other woodpeckers and flying squirrels. Home ranges are approximately 100 to 125 acres. Historically found from New Jersey to Texas, this species is now reduced to small fragmented populations in the southeastern United States. It is highly imperiled in Oklahoma and Texas; Kansas and Nebraska are not part of its range. See **Figure 3-4** for the species range in the planning area. It requires mature old-growth pine trees for cavity nesting and foraging. Deforestation and short rotation timber management practices have removed habitat, while fire suppression has allowed pine stands to be invaded by hardwoods (NatureServe 2015).


American burying beetle (*Nicrophorus americanus*), federal-listed endangered. The American burying beetle is a large beetle approximately one to 1.5 inches in length; it is the largest member of its genus in North America. The species is identifiable by its large size and by a large orange-red disk, which covers a portion of the thorax (USFWS 1988). Once widely distributed throughout eastern North America, populations have disappeared from most of its historic range. The species occupies a range of habitats, including tall-grass prairie, woodlands, and forests. In the planning area, the American burying beetle is found primarily in eastern Oklahoma (USFWS GIS 2014), although field surveys have documented it in Kansas and Texas as well (USFWS 2008b; **Figure 3-5**). In Oklahoma, the highest concentration of beetles is found at Camp Gruber—an area composed of 32,000 acres of cross-timber habitat, with an oak-hickory forest and tall-grass prairie mosaic pattern (USFWS 2008b). This area contains BLM-administered subsurface lands.

Greater prairie chicken (*Tympanuchus cupido*), bird of conservation concern. The greater prairie-chicken is a chunky hen-like bird, barred with dark brown, cinnamon, and pale buff. It is slightly larger, darker, and more barred than the lesser prairie and sharp-tailed grouse. Its preferred habitat is grasslands with herbaceous cover; it may also be found in cultivated lands and pastures. Males gather in leks for communal courtship, as with lesser prairie chicken, and females nest in the vicinity, in a scrape on the ground lined with vegetation. Both sexes show site fidelity and most do not migrate; ranges vary from 25 to 500 acres.

The diet consists primarily of insects, especially grasshoppers in summer. At other times of year it eats fruit, leaves, flowers, shoots, and grain. Formerly widespread in grasslands of Canada and the western United States, the greater prairie chicken is now found locally in much reduced numbers in the Great Plains south to Texas. The species' decline is mainly the result of loss and fragmentation of tall-grass prairie. The largest remaining populations are in Kansas, Nebraska, Oklahoma, and South Dakota. The closely related lesser prairie chicken is also diminished in range, and the subspecies *cupido* (heath hen) of the eastern seaboard has been extinct since the 1930s (NatureServe 2015).



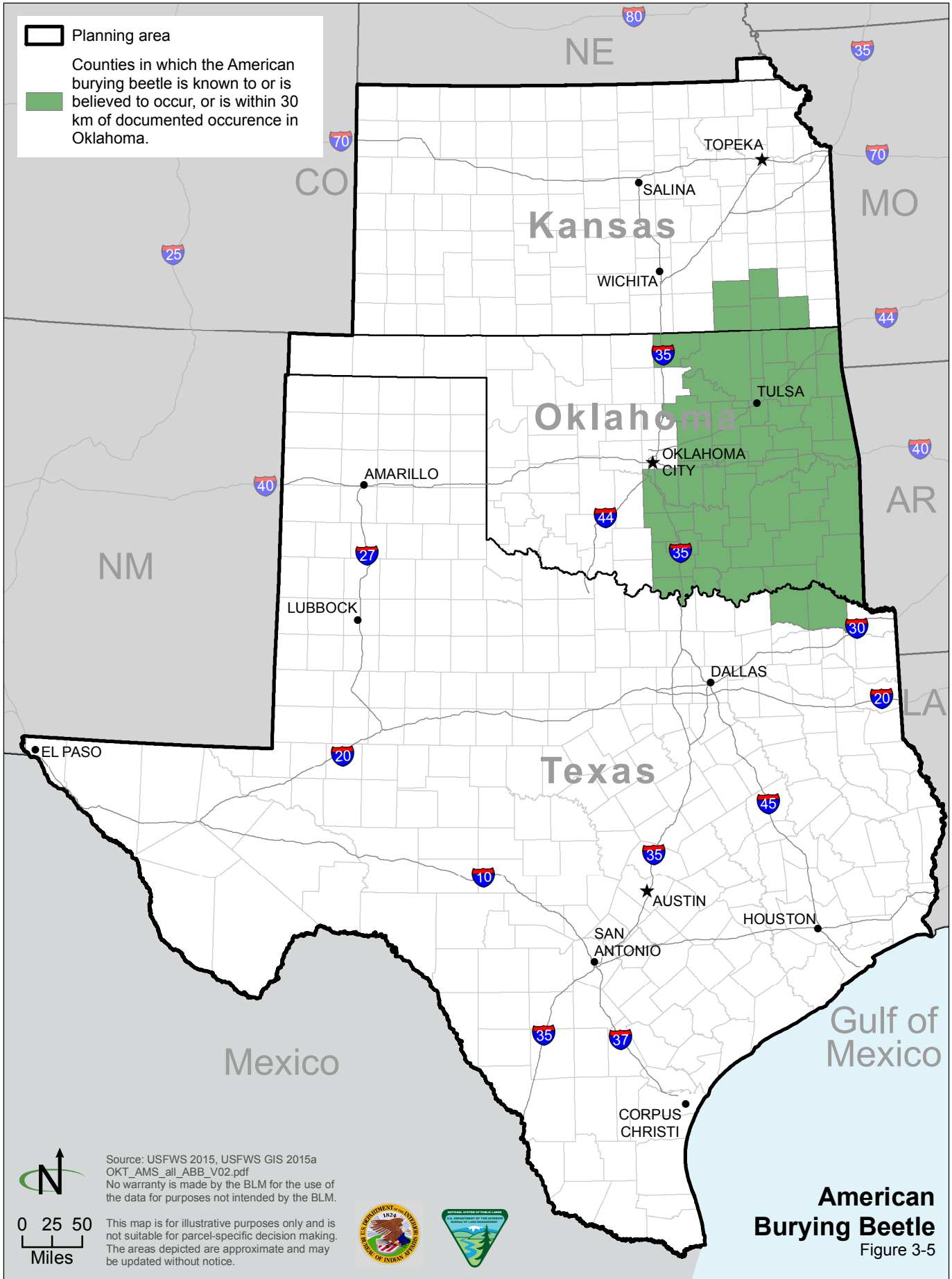
 Planning area
 Counties in which the red-cockaded woodpecker is known to or is believed to occur.



 0 25 50
 Miles

Source: USFWS 2015
 OKT_AMS_all_RCW_V01_V02.pdf
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 This map is for illustrative purposes only and is not suitable for parcel-specific decision making. The areas depicted are approximate and may be updated without notice.



Red-cockaded Woodpecker
 Figure 3-4



 Planning area
 Counties in which the American burying beetle is known to or is believed to occur, or is within 30 km of documented occurrence in Oklahoma.


 0 25 50
 Miles

Source: USFWS 2015, USFWS GIS 2015a
 OKT_AMS_all_ABB_V02.pdf
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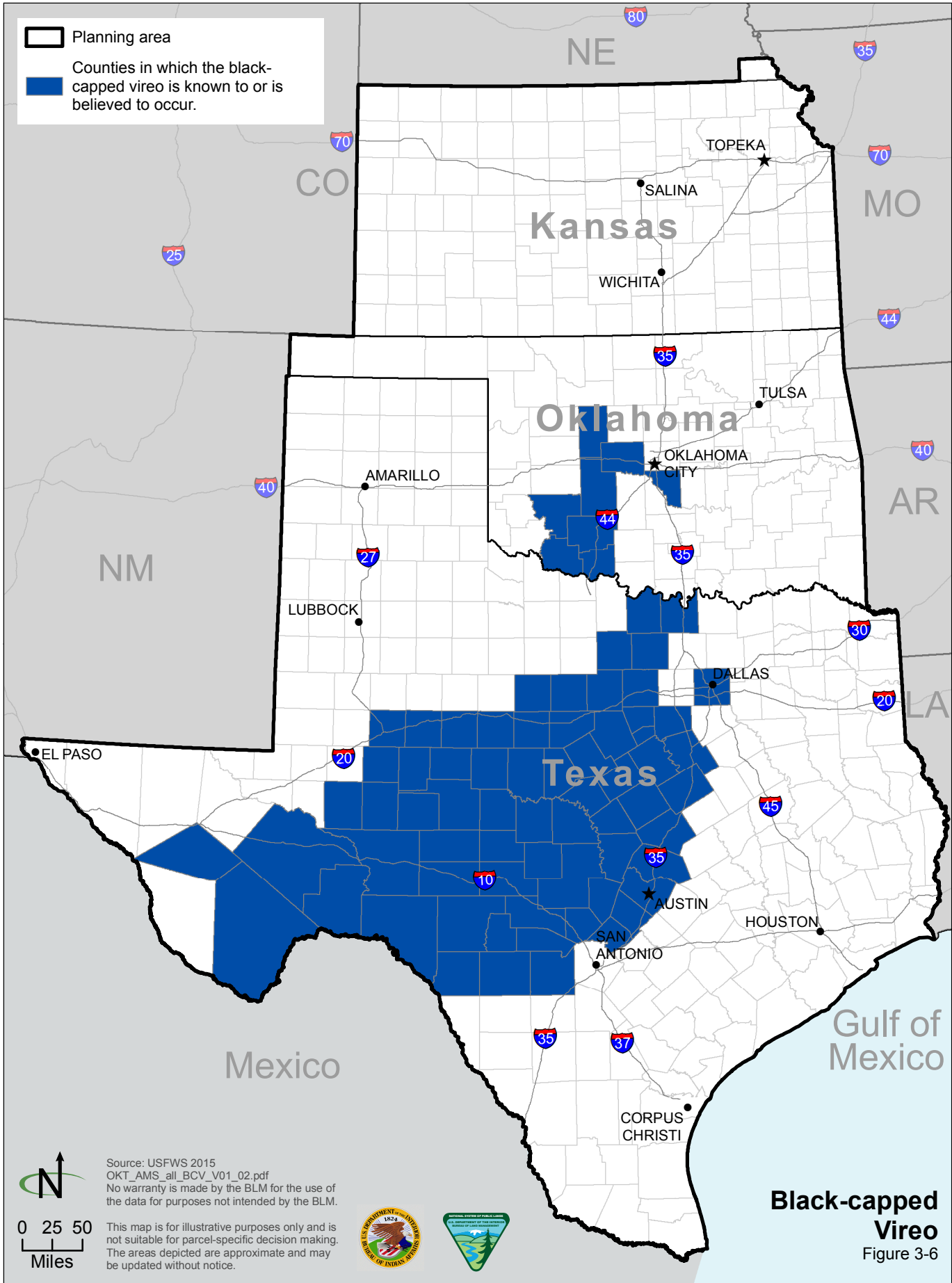
American Burying Beetle
 Figure 3-5

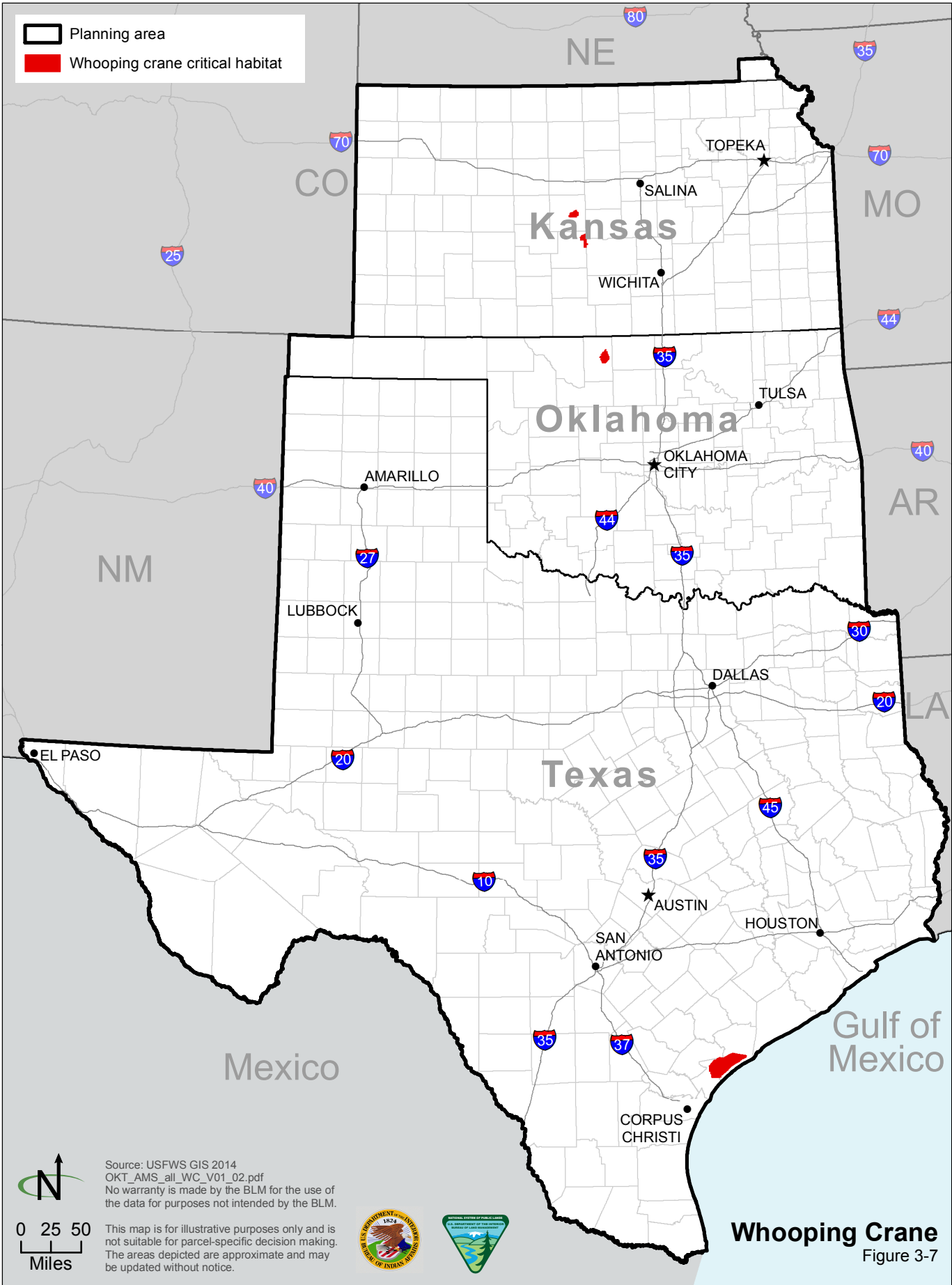
Black-capped vireo (*Vireo atricapilla*), federal-listed endangered. A vireo with white eye rings, olive upper parts, a white breast, and belly with yellowish flanks, and a black head (in adult males), the black-capped vireo is similar in appearance to the solitary vireo but is somewhat smaller. A long-distance migrant, it nests in Texas and Oklahoma and winters in Mexico. It feeds on insects (especially caterpillars), spiders, and fruits. It is found in shrubland and chaparral habitat, in dense low thickets and oak scrub, mostly on rocky hillsides or steep ravines in rugged terrain. Nests are in tangles of shrubby growth close to the ground in small trees or shrubs, with vegetation extending to the ground, among barren or less vegetated areas.

Historically the black-capped vireo was found from south-central Kansas through central Oklahoma and Texas into northeastern Mexico. Its present range extends from Blaine County, Oklahoma (two locations, only one of which, the Wichita Mountains, has substantial numbers), south through central and western Texas into Mexico, where it is thought to be more common. Threats are habitat loss and degradation resulting from human development, fire suppression, effects of grazers, and range management practices that remove low woody vegetation and promote juniper (*Juniperus* spp.) invasion. In addition, it is a frequent host of the brown-headed cowbird (*Molothrus ater*), which may reduce nesting success 80 to 100 percent in some years (NatureServe 2015). See **Figure 3-6** for the species range in the planning area.

Whooping crane (*Grus americana*), federal-listed endangered. The whooping crane is a very tall, mostly white, long-legged bird with red facial skin. During summer, it feeds on insects, crustaceans, and berries; its winter diet also includes grains, acorns, fishes, amphibians, and marine worms. Critical habitat was designated for whooping crane on May 15, 1978 (43 FR 20938-20942). Critical habitat units are found in each state in the planning area (see **Figure 3-7**).

The species' preferred habitat is wetland, lagoon, riparian tidal flat and shallow water, grassland, and cropland. Nesting occurs in dense emergent vegetation, such as bulrushes in shallow ponds, marshes, wet prairies, or lake margins. The nest is made of marsh vegetation, rising about 8 to 20 inches above the surrounding water level. Breeding territories are very large, averaging 1,900 acres. The pairs mate for life. Habitat during migration and winter is marshes, shallow lakes, lagoons, salt flats, grain and stubble fields, and barrier islands. The remaining birds migrate mainly through the Great Plains south to Texas for the winter. Mated pairs and families establish and defend winter territories on coastal marshes in Texas. Pairs or family groups begin a northward migration in April.





Whooping Crane
 Figure 3-7

The whooping crane is on the brink of extinction; the wild population reached a low of 14 birds, but has since improved to over two hundred, with intensive captive breeding, including migration following ultralight aircraft. Ultralight aircrafts act as surrogate parents and guide captive-hatched whooping cranes along a planned migration route. At present, one self-sustaining population nests in Canada, wintering along the Texas coast; there are two additional

reintroduced populations: one migrates from Wisconsin to Florida, one is in Florida and does not migrate. Historically, whooping cranes suffered from hunting and habitat loss from conversion of prairie to cropland. The remaining wild cranes are vulnerable to catastrophic natural events and ongoing human threats, such as loss of coastal wetlands, oil spills, collisions with power lines and structures during migration, and poaching. In addition, because of delayed sexual maturity and low annual reproductive output, the population of this species grows slowly and is especially vulnerable to poor survivorship. The population shrinking to such small numbers results in a loss of genetic variability that increases the birds' vulnerability to disease. The Aransas reintroduced population migrates through western Kansas and Oklahoma and central Texas en route to its wintering ground at Aransas National Wildlife Refuge on the coast in south Texas, a distance of 2,500 miles (NatureServe 2015).

Trends

Special status species diversity and abundance is directly related to maintaining habitat availability, diversity, and quality. The species described above each have their own specialized habitat requirements. In many instances, these habitat types have been drastically altered or reduced from the historic native ranges.

Continuing threats to native ecosystems and species diversity in the planning area are fragmentation and loss of critical or important habitat due to human activities.

In Oklahoma, 26 species of breeding land birds have experienced population declines of 45 percent or more between 1968 and 2003 (ODWC 2005). Additionally, channelization and impoundment of rivers has directly eliminated nesting habitat for such species as the least tern. However, listed species that have benefitted from extensive conservation efforts, such as the whooping crane and bald eagle, have been recovering in the region (ODWC 2005; Wasson et al. 2005). The bald eagle has recovered from a low of nine pairs to approximately 150 breeding pairs in Oklahoma today.³ In eastern Texas, red-cockaded woodpeckers experienced severe population declines in the 1980s. Management activities on federal surface lands (such as thinning projects and translocations)

³Wolfe, Don. 2015. Biologist at Sutton Avian Research Center in Bartlesville, Oklahoma, personal communication with Liza Wozniak, EMPSi biologist, January 2015.

have helped to reverse this trend, although loss of forested habitat, inadequate fire regimes to control hardwood mid-story, and demographic dysfunction remain an obstacle to recovery, particularly on private and state-owned surface lands (Conner et al. 2006).

Special Status Plant Species

Several key special status plant species are described below. While this is not an official designation, these species are relatively important in the planning area for several reasons. For one, they occur in native prairie grasslands (eastern and western prairie fringed orchids) and riparian areas (harperella), which are some of the most threatened habitats in the planning area. These species also could occur in portions of the planning area, where the most BLM- and BIA-administered surface lands are located (for example, the Central Great Plains ecoregion; see **Table 2-1**, EPA Level III Ecoregions in the Planning Area). Finally, these are the only threatened or endangered species listed by the State of Oklahoma, which is where most BLM activities in the planning area occur.⁴

Eastern prairie fringed orchid (*Platanthera leucophaea*), federal-listed threatened, state threatened (Oklahoma). Eastern prairie fringed orchid is a perennial herb in the orchid family (Orchidaceae) that flowers in late June or early July. Plants grow from an underground tuber and regenerate vegetatively through the tuber rootstock and buds and by seed. Successful seedling establishment requires development of a mycorrhizal association with a favorable soil-inhabiting fungus. Disturbance, either patch disturbance from animals or the death of other plants, appears to be important in seedling establishment (USFWS 1999). Occasionally plants will enter dormancy and not emerge above ground during the growing season (Bowles et al. 1992). Dormancy in this species is not well understood (USFWS 1999).

Eastern prairie fringed orchid occurs in a wide variety of habitats, from mesic prairie to wetland communities, such as sedge meadows, marsh edges, and even bogs, with sunny open conditions (USFWS 1999). Eastern prairie fringed orchid formerly occurred from eastern Iowa, Missouri, and Oklahoma eastward across southern Wisconsin, northern and central Illinois, southern Michigan, northern Indiana and Ohio, and northwestern Pennsylvania to western New York and adjacent southern Ontario. Disjunct populations also occurred in New Jersey, Virginia, and Maine.

Eastern prairie fringed orchid has declined more than 70 percent from original county records in the United States; at the time of listing, 59 populations were extant in six states (USFWS 1999). Plants have not been found again in

⁴Thomas, George. 2015. Personal communication via e-mail to Kevin Rice, EMPSi, dated February 13, 2015. Subject: Special status species list and definition.

Oklahoma. The eastern prairie fringed orchid's distribution has not changed appreciably since 1991 (USFWS 2010). Declines in populations have been due mainly to conversion of habitat to cropland and pasture (USFWS 1999). Remaining populations continue to be threatened by succession to woody vegetation, competition from nonnative species, pollinators impacted pesticides, over-collecting, wetland habitats drained and developed, and climate change (USFWS 1999, 2010).

Western prairie fringed orchid (*Platanthera praeclara*), federal-listed threatened, state threatened (Oklahoma, Nebraska). Western prairie fringed orchid is a terrestrial perennial herb in the orchid family (Orchidaceae). It flowers from mid-June to late July. Plants grow from an underground tuber and regenerate vegetatively through the tuber rootstock and buds and by seed. Successful seedling establishment requires development of a mycorrhizal association with a favorable soil-inhabiting fungus. Dormancy in the species generally lasts between one and three years (Sather 1997 in USFWS 2009b), though more than half of dormancy episodes last less than one year (Quintana-Ascencio et al. 2004 in USFWS 2009b).

Western prairie fringed orchid is known to occur only west of the Mississippi River, most often in unplowed, calcareous tall-grass prairie and sedge meadows and also in disturbed sites, including borrow pits, old fields, and roadside ditches (USFWS 1996). Extant populations in eastern Kansas occur in mesic to wet-mesic upland prairies; it occurred historically along the floodplains of several larger rivers (Freeman and Brooks 1989 in USFWS 1996). Although moist soil near the ground surface is critical to maintain western prairie fringed orchid populations, standing water may adversely affect populations, depending on the depth and duration of flooding (USFWS 2009b). Drought has significant and, in some cases, widespread effects on western prairie fringed orchid flowering and survival (USFWS 2009b). Threats identified are conversion of habitat to cropland, overgrazing, invasive species, over-collection, climate change, and herbicide and pesticide impacts on the plant and its pollinators (USFWS 2009b).

Harperella (*Ptilimnium nodosum*), federal-listed endangered, state endangered (Oklahoma). Harperella is an annual aquatic herb in the carrot family (Apiaceae) that blooms from May to October. Population sizes may vary dramatically from year to year in response to water levels (USFWS 1990). Only 45 occurrences in 24 watersheds are known, with the largest concentration of populations found along the Maryland/West Virginia border and in Arkansas. Around 25 percent of known occurrences have not been seen in 20 years (OBS 2013)

Harperella occurs in seasonally flooded rocky streams and coastal plain ponds (USFWS 1990). In Oklahoma, it occurs in the southeastern portion of the state in riverine habitat; this includes two stands of approximately 500 plants each (OBS 2013). Threats to the species are fluctuating water levels from dredging;

dam and reservoir construction, and wetland draining; water quality reduction from pollution, algae, and erosion; siltation from logging and road construction; and invasive plants (OBS 2013). Specific threats to the Oklahoma population are increased siltation from timber harvesting, runoff from ranching and poultry farming, the possibility of out-of-state water transfers, and recreation (OBS 2013). The region has experienced drought conditions since 2010, and this could eventually affect river flow (OBS 2013).

Additional Rare Plant Species

In addition to federal- and state-listed species, the Oklahoma Natural Heritage Inventory maintains a list of rare and vulnerable plant species in the state (ONHI 2005). Similarly, the Kansas Natural Heritage Inventory maintains a list of Kansas rare plants (KNHI 2012b). Nearly 400 species, in addition to the three federal-listed species, are on the Kansas element tracking list. Each species is assigned a global and state conservation status rank, based on the NatureServe system (NatureServe, n.d.). Neither Oklahoma nor Kansas lists special status plant species in their respective wildlife action plans (ODWS 2005; Wasson et al. 2005). The Texas Conservation Action Plan (TPWD 2012) lists 445 plant species of greatest conservation need (inclusive of federal- and state-listed species).

CHAPTER 4

MIGRATORY BIRDS, INCLUDING RAPTORS

4.1 SPECIES AND HABITAT REQUIREMENTS

Decision area lands are used for nesting and foraging grounds by large numbers of migratory birds, including songbirds, waterfowl, shorebirds, and raptors. Some over-winter in the decision area while others breed or are resident there. Natural habitats for migratory birds in Kansas and Nebraska are short-grass prairie, central mixed-grass prairie, and eastern tall-grass prairie. In Oklahoma, the regions are short-grass prairie, central mixed-grass prairie, oaks and prairies, eastern tall-grass prairie, Mississippi alluvial valley, and west Gulf coastal plain. In Texas, the regions are short-grass prairie, central mixed-grass prairie, Chihuahuan desert, Edwards plateau, oaks and prairies, west gulf coastal plain, Tamaulipan brushlands, and Gulf-coastal prairie (USFWS 2008a). More information on habitat types in the decision area is found in Section 2, Vegetation and Land Use.

4.2 BIRD SURVEYS IN THE PLANNING AREA

Migratory bird survey data are collected by the US Geological Survey (USGS) Wildlife Research Center in Patuxent, Maryland. There are over 60 breeding bird survey (BBS) routes in Oklahoma and in Kansas and approximately 200 in Texas (Pardieck et al. 2014). Data are available online by survey route at <https://www.pwrc.usgs.gov/BBS/PublicDataInterface/index.cfm>.

4.3 SPECIAL MANAGEMENT SPECIES

Special status birds are both federal-listed as threatened and endangered species and BLM-listed sensitive bird species and USFWS Birds of Conservation Concern (BCC). The USFWS BCC report (2008a) identifies migratory nongame birds that, without additional conservation action, are likely to become candidates for listing under the ESA (USFWS 2008a). **Table 4-1** shows the BCC in each region identified in the BCC report. Priority BCCs in the planning area are described in the Special Status Species section, above.

Table 4-1
USFWS Birds of Conservation Concern

	Short-grass prairie	Central mixed-grass prairie	Edwards Plateau	Oaks and prairies	Eastern tall-grass prairie	Mississippi alluvial plain	West Gulf coastal plain	Chihuahuan desert	Tamaulipan brushlands	Gulf-coastal prairie
Pied-billed grebe					x					
Horned grebe					x					
Audubon's shearwater										x
Band-rumped storm-petrel										x
American bittern					x	x				x
Least bittern					x	x	x			x
Reddish egret										x
Black-crowned night-heron					x					
Lesser prairie-chicken	x	x								
Little blue heron		x		x			x			
Swallow-tailed kite				x		x	x			x
Mississippi kite		x								
Bald eagle	x	x	x	x	x	x	x	x		x
Golden eagle	x							x		
Peregrine falcon			x	x	x	x		x		x
Prairie falcon	x									
Harris's hawk									x	
Swainson's hawk		x							x	
Ferruginous hawk								x		
Common black-hawk								x		
White-tailed hawk										x
American kestrel							x			
Black rail		x		x	x	x				x
Yellow rail						x	x			x
Snowy plover	x	x						x	x	x
Wilson's plover										x
Mountain plover	x	x	x					x	x	x
American oystercatcher										x
Solitary sandpiper		x			x		x		x	x
Upland sandpiper	x	x	x	x	x					x
Lesser yellowlegs									x	x
Long-billed curlew	x	x	x	x				x	x	x
Whimbrel					x					x
Hudsonian godwit		x		x	x	x	x			x

Table 4-1
USFWS Birds of Conservation Concern

	Short-grass prairie	Central mixed-grass prairie	Edwards Plateau	Oaks and prairies	Eastern tall-grass prairie	Mississippi alluvial plain	West Gulf coastal plain	Chihuahuan desert	Tamaulipan brushlands	Gulf-coastal prairie
Marbled godwit		x			x	x				x
Red knot					x					x
Buff-breasted sandpiper		x		x	x	x	x			x
Short-billed dowitcher		x			x	x				x
Least tern										x
Black tern					x					
Common tern					x					
Gull-billed tern									x	x
Sandwich tern										x
Black skimmer										x
Red-billed pigeon									x	
Green parakeet									x	
Red-crowned parrot									x	
Black-billed cuckoo					x					
Yellow-billed cuckoo								x		
Flammulated owl								x		
Elf owl								x	x	
Short-eared owl					x	x				x
Burrowing owl	x							x	x	
Lucifer hummingbird								x		
Buff-bellied hummingbird									x	
Whip-poor-will					x					
Chuck-will's widow							x			
Red-headed woodpecker		x		x	x	x	x			
Lewis's woodpecker	x									
Scissor-tailed flycatcher		x		x						
Willow flycatcher	x									
Northern flicker					x					
Acadian flycatcher					x					
Loggerhead shrike		x		x	x		x	x		x
Brown-headed nuthatch							x			
Northern beardless-tyrannulet									x	
Rose-throated becard									x	
Gray vireo			x					x		

Table 4-1
USFWS Birds of Conservation Concern

	Short-grass prairie	Central mixed-grass prairie	Edwards Plateau	Oaks and prairies	Eastern tall-grass prairie	Mississippi alluvial plain	West Gulf coastal plain	Chihuahuan desert	Tamaulipan brushlands	Gulf-coastal prairie
Bell's vireo	x	x		x	x			x	x	
Verdin									x	
Bendire's thrasher								x		
Curve-billed thrasher									x	
Bewick's wren					x		x			
Sedge wren						x				x
Wood thrush					x	x	x			
Sprague's pipit	x	x		x			x	x	x	x
Tropical parula									x	
Summer tanager									x	
White-collared seedeater									x	
Virginia's warbler								x		
Prairie warbler							x			
Worm-eating warbler							x			
Louisiana waterthrush							x			
Swainson's warbler				x		x	x			x
Blue-winged warbler					x					
Cerulean warbler					x	x	x			
Prothonotary warbler					x	x	x			x
Kentucky warbler					x	x	x			
Colima warbler								x		
Red-faced warbler								x		
Yellow warbler								x		
Grace's warbler								x		
Botteri's sparrow										x
Bachman's sparrow							x			
Field sparrow					x					
Grasshopper sparrow					x					x
Rufous-crowned sparrow			x							
Black-chinned sparrow								x		
Cassin's sparrow		x						x	x	
Henslow's sparrow		x		x	x	x	x			x
Harris's sparrow		x	x	x						
LeConte's sparrow						x				x

Table 4-1
USFWS Birds of Conservation Concern

	Short-grass prairie	Central mixed-grass prairie	Edwards Plateau	Oaks and prairies	Eastern tall-grass prairie	Mississippi alluvial plain	West Gulf coastal plain	Chihuahuan desert	Tamaulipan brushlands	Gulf-coastal prairie
Nelson's sharp-tailed sparrow										x
Seaside sparrow										x
Lark bunting	x	x						x	x	
Baird's sparrow								x		
McCown's longspur	x	x	x					x		
Smith's longspur		x		x	x		x			
Chestnut-collared longspur	x	x	x					x	x	
Varied bunting								x	x	
Painted bunting						x	x	x	x	x
Dickcissel					x	x			x	x
Rusty blackbird						x				
Orchard oriole			x	x	x	x	x			
Hooded oriole									x	
Altamira oriole									x	
Audubon's oriole									x	

Source: USFWS 2008a

The Important Bird Areas (IBA) Program is an effort by the National Audubon Society and local partners to identify and conserve areas vital to birds and other biodiversity. Identifying vital areas worldwide is an important step to improving public awareness and support and ensuring that all IBAs are properly managed and conserved.

Bird habitats are threatened by habitat loss and fragmentation from human development. Coupled with global warming and introduced predators, these factors pose serious threats to populations of birds across America and around the world. By working to identify and implement conservation strategies in IBAs, the Audubon Society and partners hope to avoid additional populations being listed as endangered or threatened or dropping to dangerously low levels. **Table 4-2** shows the names and acreages of IBAs in the planning area.

**Table 4-2
Important Bird Areas in the Planning Area**

Name	Import- ance	Acreage	Notes
KANSAS			
Cheyenne Bottoms Preserve and Wildlife Area	Global	27,552	Whooping crane and 47 other bird species
Cimarron National Grassland	Global	108,178	Lesser prairie-chicken, golden eagle, and 3 other species
Flint Hills Region	Global	3,300,112	Sprague's pipit, greater prairie-chicken, and 13 other species
John Redmond Reservoir and Flint Hills National Wildlife Refuge	State	18,464	Snow goose
Kirwin National Wildlife Refuge	State	10,779	N/A
Marais des Cygnes Wildlife Area and National Wildlife Refuge	Global	15,145	Red-headed Woodpecker and 2 other species
Neosho Wildlife Area	State	3,247	
Quivira National Wildlife Refuge	Global	22,136	Whooping crane and 3 other bird species
Red Hills Region	Global	2,298,319	Lesser prairie-chicken
OKLAHOMA			
Salt Plains National Wildlife Refuge	Global	32,000	Whooping crane and 5 other species
Selman Ranch	State	13,998	Lesser prairie-chicken and 4 other species
Tallgrass Prairie Preserve	Global	38,702	<u>Greater prairie-chicken and 5 other species</u>
Wichita Mountains National Wildlife Refuge	Global	59,021	<u>Painted bunting and 3 other species</u>
TEXAS			
Balcones Canyonlands National Wildlife Refuge	Global	80,003	Golden-cheeked warbler
Balcones Canyonlands Preserve	Global	27,928	Golden-cheeked warbler, dickcissel, and 120 other species
Blackjack Peninsula of Aransas National Wildlife Refuge	Global	70,504	Whooping crane and 4 other species
Brown Property	Global	321	Golden-cheeked warbler
Columbia Bottomlands	State	177,004	Bell's vireo, bald eagle, hooded warbler, and 5 other species
Deadman Island/Long Reef	State	5	Black skimmer, sandwich tern, and 14 other species
Dressing Point	Global	5	Black skimmer and 4 other species
Fort Hood	Global	217,008	Golden-cheeked warbler
Green Island	Global	25	Reddish egret and 4 other species
Jigsaw Islands	Global	2	Black skimmer, royal tern, and 5 other species

Table 4-2
Important Bird Areas in the Planning Area

Name	Import- ance	Acreage	Notes
Katy Prairie Conservancy	Global	17,500	Buff-breasted sandpiper, northern bobwhite, wood stork, and 5 other species
Laguna Vista Spoils	Global	2	Black skimmer and 4 other species
Lavaca Bay Spoils	Global	12	Black skimmer and 4 other species
Little Pelican Island	State	NA	Black skimmer, brown pelican, and 3 other species
Mustang Bayou Island	State	2	Royal tern, brown pelican, and 16 other species
Nature Conservancy Dolan Falls Preserve	Global	18,523	Golden-cheeked warbler, Bell's vireo, and painted bunting
Nature Conservancy Independence Creek Preserve	Global	19,741	Painted bunting and Bell's vireo
Nature Conservancy Love Creek Preserve	Global	1,401	Golden-cheeked warbler, Bell's vireo, painted bunting, and olive-sided flycatcher
North Deer Island	Global	143	Brown pelican and 4 other species
Port Bolivar Bird Sanctuaries - Bolivar Flats	Global	1,796	Clapper rail, snowy plover, and 20 other species
Port Bolivar Bird Sanctuaries - Horseshoe Marsh	State	N/A	Piping plover, brown pelican, and 11 other species
Sabal Palm Sanctuary	State	526	Green kingfisher, buff-bellied hummingbird, and 8 other species
Southernmost Edwards Plateau	Global	15,308	Golden-cheeked warbler
Sundown Island	Global	69	Black skimmer, brown pelican, and 15 other species
Yoakum Dunes Preserve	Global	7,099	Lesser prairie-chicken

Source: National Audubon Society Important Bird Areas 2015

N/A: Not available

4.4 THREAT ASSESSMENT

4.4.1 Migratory Bird and Raptor Use of the Project Area

Migratory birds are found widely throughout Oklahoma, Texas, and Kansas. To determine the likelihood of impacts on migratory birds, project managers should consult the USGS Breeding Bird Surveys for the project area to identify species that have been documented in the area.

A large number of raptor species occur in Texas, Oklahoma, and Kansas: ferruginous hawk, Swainson's hawk, osprey, prairie falcon, peregrine falcon, and numerous owl species. In addition, both bald and golden eagles occur in all three states. The western portion of Oklahoma has a small nesting population of

golden eagles; some also winter throughout the state. However, bald eagles have a larger population (both nesting and wintering) in Oklahoma. Bald eagles primarily nest in the watersheds of the Arkansas and Canadian Rivers in Oklahoma (Wolfe 2015). Eagles, raptors, and other migratory birds are also found in the Nebraska portion of the planning area. As of 2014, active bald eagle nests were documented in Richardson County, Nebraska (Jorgensen and Dinan 2014).

4.4.2 Causes of Mortality and Disturbance

A variety of factors can lead to avian mortality, including blunt trauma from collision with human structures, and collision and electrocution from power lines. Potential direct impacts on breeding migratory birds from actions in the decision area are loss of habitat, mortality, and loss or abandonment of nests from increased noise and human presence close to an active nest site.

Vulnerability of birds to collision depends on many factors: bird behavior and maneuverability, topography, weather, and power line design and placement. Bird collision risk is highest in areas with high avian use, such as those for nesting, foraging, roosting, or resting. For example, power lines between roosting and foraging habitat for a certain species will be frequently crossed, increasing the collision potential. Collision risk may increase when power lines are in open landscapes, like wetlands, where birds might congregate; whereas collision risk would likely be lower for power lines in an urban setting already containing significant human-made obstacles around which birds must navigate.

Development has impacts on air quality, noise, and lighting; exhaust from gas- and diesel-powered construction equipment, tractor-trailers, and construction personnel vehicles also impact birds. Temporary effects from noise, human presence, and heavy equipment during construction could reduce nesting success for individual birds displaced into surrounding areas. Further, those individuals that are not displaced could be affected by habitat fragmentation caused by the footprint of the project, leading to reduced nesting success.

Foraging birds are unlikely to be affected by construction and operational noise because they would likely avoid noisy areas to forage elsewhere.

Avian species, typically raptors, take advantage of transmission lines, distribution poles, trees, and other perch sites that provide viewing advantages and increase hunting success. Transmission lines may also provide suitable nesting substrates for birds. Nesting by raptors or corvids (for example, crows and ravens) would increase predation in habitat directly surrounding the nest, potentially resulting in a decline in the nesting success of migratory birds that serve as prey.

4.4.3 Protection Measures and Avian-Safe Modifications

The Avian Power Line Interaction Committee (APLIC) published guidance on avian-safe modifications for power lines that minimize the risk of collision and

electrocution (APLIC 2006). The APLIC (2012) released an updated version of their guidance document entitled Reducing Avian Collisions with Power Lines: State of the Art.

If eagles might be taken in association with project activities in a given area, the responsible party should develop an eagle conservation plan and apply for a take permit with the USFWS under the BGEPA. The USFWS has published eagle management guidelines (USFWS 2014b). Surveys for eagles should be conducted in accordance with USFWS protocol, and they may include ground or aerial surveys, depending on the terrain and conditions. Surveys should be conducted before nesting season and activities that could disturb the nests (USFWS 2014b).

4.5 MIGRATORY BIRD CONSERVATION

4.5.1 Current Conservation Planning

In accordance with Executive Order 13186, which directs federal agencies to protect migratory birds, the BLM and USFWS signed a national-level memorandum of understanding in 2010 to strengthen migratory bird conservation efforts, as discussed in **Section 1.4**. In response, the Oklahoma Ecological Services Field Office of the USFWS has issued migratory bird and eagle impact avoidance guidance for oil and gas projects in the region (Oklahoma Ecological Services Office 2014). The guidance is intended to help the oil and gas industry in Oklahoma comply with the MBTA and BGEPA, though recommendations may also be useful for other industrial activities in the region.

Avoidance measures for eagles are protecting nests and nest sites, nesting adults, eggs, nestlings, and fledglings. Eagle nest surveys must be conducted before activities that may alter potential nest site habitat. Not all eagle nest locations are documented, and new nests are found each year, as the resident population of bald eagles in the decision area expands.

If an activity such as oil and gas extraction is proposed within a mile of a critical component of eagle habitat—such as a nest, communal roost site, river, or freshwater wetland or reservoir covering more than 20 acres (referred to as an eagle use area)—protective measures should be implemented, in accordance with the USFWS permit (Oklahoma Ecological Services 2014):

- For a complete description of how to avoid negative impacts to bald eagle nests, refer to the National Bald Eagle Guidelines on pages 12-15 of the document here: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BaldEagle/NationalBaldEagleManagementGuidelines.pdf>.

- All flared gases should produce no exposed flames, and the ends of flaring gas pipes should be fitted with devices that deter birds from perching.
- For a given project, electrical distribution lines should not be sited in eagle use areas, or the lines should be buried.
- If a new electrical distribution line cannot be buried in an eagle use area, it should be marked with special diverter devices, in accordance with USFWS recommendations in APLIC (2012). This is to alert birds to the line so they can more readily avoid it. As a minimization measure for the aboveground electrical distribution lines in eagle use areas, an equal amount of existing electrical distribution lines should be marked within a mile of other eagle use areas.
- All power poles in an eagle use area should be designed to protect eagles from electrocution risk, following standard practices in APLIC (2012).
- As a minimization measure, extant electrical distribution lines and power poles in eagle use areas also need to be marked, in accordance with the USFWS recommendations in APLIC (2012).

Eagles occurring in a given area throughout the year may also include migrants, overwintering individuals, immature and subadult residents, and nonbreeding adult residents. Disturbance to other raptor nests should also be avoided under the MBTA. Nest buffers under the MBTA differ by the size of the bird and its sensitivity to nest disturbance (USFWS 2013b).

The MBTA prohibits taking, killing, possessing, and transporting and importing migratory birds, their eggs, parts, and nests, except when specifically authorized. However, there is no provision for incidental take under the MBTA. There is also no permit available under the MBTA that would authorize the unintentional take of migratory birds. The only way to ensure compliance with the MBTA is to avoid the take. Below are suggestions for minimizing or eliminating the potential for take during construction (USFWS 2013b).

- Conduct the activity outside the local nesting season so there are no active nests of birds that may be inadvertently damaged or destroyed by the project actions and no need to conduct surveys for active nests.
- Minimize the loss, destruction, or degradation of migratory bird habitat during the local nesting season if activities must occur during that timeframe. In the Southwest Region, although most species nest between early April and mid-August, some nest during all months of the year, depending on location. In desert regions, for

example, nesting may begin in January and continue into November. Some eagles, owls, and finches may nest in mid-winter.

- Due to this variability, project proponents should contact the USFWS Regional Office for details on timing of nesting in the area of the project. The proponent should be knowledgeable of which species may nest outside of the core nesting season.
- Document the extent of below ground and aboveground construction activities and the habitats that they will pass through. Recommendations on avoidance practices, survey timing, and the suite of potentially affected species could differ accordingly.
- For projects planned well in advance, clearing vegetation in the year before construction (outside the nesting season) may discourage bird nesting attempts in the proposed project area, thereby decreasing the chance of take during construction.
- If a proposed project or action may take migratory birds by disturbing or altering nesting habitat, and if work cannot occur outside the local nesting season, project proponents should provide the USFWS with an explanation for why work has to occur during the migratory bird nesting season. In these cases, project proponents should also demonstrate that all efforts to complete the work outside the migratory bird nesting season were attempted and that the reasons work needs to be completed during the nesting season were beyond the proponents' control.
- To determine if migratory birds are nesting on-site and therefore potentially at risk by the activity, project proponents should conduct initial general surveys of the project area during the best biological timeframe for detecting the presence of the locally nesting birds (to locate potential territories that may be in harm's way). This should be followed by nest searches in the project area shortly before the disturbance will occur (ideally within a week of the start of construction, due to the speed with which nests may be built). Project proponents should contact the USFWS Division of Migratory Birds for survey protocol recommendations.
- Except for the nests of large species, bird nests are well hidden and very difficult to find, and nest searches can be time intensive. Surveyors must be experienced in locating nests, as doing so successfully often relies on the ability to interpret subtle behavioral cues by the adult birds. Project proponents should also be aware that the results of migratory bird surveys are subject to spatial and temporal variability and should be conducted at the most appropriate times of day and season to detect territories and, ultimately, nests.

- If no migratory birds are found nesting in the proposed project or action areas immediately before construction and associated activities are to occur, then the project may proceed as planned.
- If protected species of birds are present and nesting in the proposed project or action area when project activities are slated to occur, project proponents should contact the nearest USFWS Ecological Services Field Office and the USFWS Regional Division of Migratory Birds for guidance on appropriate next steps for minimizing risk of violating the MBTA.

4.6 ADDITIONAL CONSERVATION MEASURES

These proposed conservation measures presume that no endangered or threatened animal or plant species (including migratory birds) exist in the project or action area. If endangered or threatened species are present or could be present and the project or action could affect them, then the project proponents should consult with the nearest USFWS office before proceeding.

The BLM and USFWS have developed 12 Wildlife Resource General Conditions of Approval. These are required for all approved permits issued by BLM for oil and gas projects and are briefly summarized below:

- NTL-96-01-TDO—The BLM requires that the operator follow all guidelines set forth in the Tulsa District Office Notice to Lessees and Operators (NTL-96-01-TDO) to minimize bird and bat mortality, including modification requirements for all open-vent exhaust stacks, open earthen pits, and open-topped tanks.
- American burying beetle—Follow all BLM and USFWS protocol regarding areas where the American burying beetle is known or suspected to exist or overwinter.
- Pipelines and wetlands—Specific surface water BMPs will be implemented before any surface disturbance where wetland habitat exists. Pipelines will be installed in a manner that does not impact wetland habitat.
- Transmission lines—Special conservation measures are required for transmission facilities in habitats occupied by lesser prairie chicken or American burying beetle.
- 40 CFR, Part 112—Constructing tank battery dikes (berms) will be impervious and designed according to requirements of 40 CFR, Part 112, the Spill Prevention, Control, and Countermeasure Rule.
- Vegetative establishment—The BLM requires the establishment of native vegetation on all areas of the development to be reclaimed, contingent on the wishes of the surface owner or the surface management agency or both.

- Erosion control—The BLM requires that erosion control measures be used before any construction begins, so as to effectively minimize the movement of materials from the BLM permit site to adjacent lands or drainages. These measures would be effectively maintained until the well is producing or has been declared a dry hole and plugged.
- Impervious liners—The BLM requires that the operator install an impervious liner under the drilling rig structure. No fluids associated with the drilling process should come in contact with earthen material. Metal catch pans may be used on isolated engines and storage tanks where the impervious liner may not be practical.
- Sumps—The BLM requires that all sumps be lined with impervious material (steel or concrete are preferred) on all sides and bottom. These sumps would be positioned so that drilling fluids can flow into them without coming in contact with native soil or other earthen layer. Sumps would be covered so as to prevent accidental entry by migratory birds.
- Rat and mouse hole—Rat and mouse holes would be made impervious by installing cylinders (conductors, culverts, or tin-horns) with concrete bottoms. The cylinders would be installed so as to prevent fluids from the pad surface from running into the cylinders or entering between the cylinders and the earthen wall of the rat or mouse hole. The top of the cylinder would be above the pad surface.
- Drilling cellar—The drilling cellar must also be lined and impervious to prevent liquids discharged from the drill hole, or drained from the pad surface, from percolating into the soil.
- Removal of impervious liners—Improper removal of impervious liners can defeat its purpose. The liquids and solids that have collected on or in the impervious liners would not be allowed to come in contact with the pad surface, parent soil, or any other earthen layers during site cleanup. The liners would be properly cleaned before removal or would be removed in such a manner so as not to allow liquids and solids to escape.

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CHAPTER 5

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