



DRAFT Range-wide Conservation Plan for the Lesser Prairie-Chicken

*Jonathan B. Haufler, Coordinator, Ecosystem Management Research
Institute*

A Collaborative Effort of the Lesser Prairie-Chicken Interstate Working Group:
Grant Beauprez, David Klute, Sean Kyle, Jim Pitman, Doug Schoeling, and Bill
Van Pelt

INTERIM DRAFT REPORT

This is a draft report on the current status of the development of a range-wide conservation plan for the lesser prairie-chicken. It is a work in progress. Numerous additions and changes are anticipated. Comments on this draft are encouraged. Please submit to Jan Caulfield janc@gci.net by February 1, 2013. A second draft of the plan will be released in February for further public review with a final plan completed by March.

Table of Contents

Introduction 1

Range-wide LEPC Conservation Plan Objectives 3

LEPC Background Information 3

 LEPC Life History and Habitat Requirements..... 3

 Leks..... 3

 Nesting Habitat 4

 Brood Habitat 5

 Autumn/Winter Habitat 6

 Food 6

 Water 6

 Home Ranges..... 7

 Minimum Sizes of Habitat Blocks 7

 Density Information..... 8

 Movement Information 8

LEPC Population Status 8

Threats to LEPC Populations 9

 Habitat Conversion from Agriculture..... 9

 Livestock Grazing..... 10

 Shrub Control and Eradication 10

 Altered Fire Regimes and Invasion of Woody Plants 11

 Wind Power and Energy Transmission Impacts 12

 Petroleum Production Impacts..... 12

 Climate Change..... 13

 Collision Mortality..... 13

 Habitat Loss and Fragmentation 13

 Other Factors and Potential Solutions..... 14

Planning Approach and Methods..... 14

Conservation Strategy for LEPC 17

 Population Goals..... 18

 Habitat Goals..... 19

 Focal Area Strategy 22

Habitat Improvement Programs.....	23
Federal Programs.....	24
Regional Organizational or Interagency Programs.....	30
State Programs	33
Threat Avoidance, Minimization, and Mitigation Programs.....	42
Existing Programs and Tools	42
LEPC Impact and Mitigation Metrics.....	47
Vegetation Monitoring in Mitigation Units	55
CHAT Category Weightings for Debits and Credits.....	55
Opportunities for Application of the Mitigation System	56
Establishing Strongholds	57
Monitoring and Adaptive Management	58
Conservation Strategy Summary and PECE Evaluations.....	58
Additional Action Steps.....	60
Acknowledgements	60
Literature Cited	60
Appendices	66

Introduction

The lesser prairie-chicken (*Tympanuchus pallidicinctus*; hereafter LEPC) is a North American grouse species that historically occupied sand sagebrush (*Artemisia filifolia*), sand shinnery oak (*Quercus havardii*) and mixed grass vegetation communities of the southern Great Plains. Historically, LEPC occupied an estimated range of approximately 182,843 sq. mi. Since the 19th century, LEPC and the habitat upon which they depend have diminished across their historical range by about 90% (Crawford and Bolen 1976a, Taylor and Guthery 1980a), with recent estimates of current occupied range totaling approximately 30,900 sq. mi., or about 17% of the estimated area of their historical range, as shown in Figure 1. Causes for this reduction in the occupied range are primarily attributed to habitat loss and fragmentation (USFWS 2012a). Habitat losses have been caused by conversion of native prairie to cropland (Bent 1932, Copelin 1963, Jackson and DeArment 1963, Crawford and Bolen 1976a, Taylor and Guthery 1980b), long term fire suppression (Woodward et al. 2001), grazing management practices that reduce LEPC habitat quality (Jackson and DeArment 1963, Taylor and Guthery 1980a, Riley et al. 1992), tree invasion (Fuhlendorf et al. 2002), herbicide spraying that reduces LEPC habitat quality (Jackson and DeArment 1963, Peterson and Boyd 1998, Thacker et al. 2012), habitat fragmentation from both oil and gas (Hunt 2004) and wind energy (Pruett et al. 2009) developments, fences and utility lines (Wolfe et al. 2007), prolonged drought (Dixon 2011, Lyons et al. 2011), and climate change (USFWS 2012a).

Because of these declines, the U.S. Fish and Wildlife Service (USFWS) was petitioned to list the LEPC as threatened in 1995. After review, the USFWS issued its findings in 1998 that the species was warranted for listing but precluded from listing because of actions needed by other higher priority species (USFWS 2012a). The USFWS assigned LEPC a species numerical rating of 8 (1 indicating the highest need for action and 12 lowest), which it then revised in 2008, increasing the species rating to a 2 status (USFWS 2012a) primarily because of the perceived increased threat of wind development and associated development of transmission lines within the occupied range. On December 11, 2012, the USFWS released a Proposed Rule to list the LEPC as a threatened species (Federal Register 50 CFR Part 17 Docket No. FWS-R2-ES-2012-0071:4500030113)

("http://www.gpo.gov/fdsys/pkg/FR-2012-12-11/pdf/2012-29331.pdf" \t "_blank"

http://www.gpo.gov/fdsys/pkg/FR-2012-12-11/pdf/2012-29331.pdf). It will make its final rule determination by September 30, 2013 unless this date is extended by an appeal. It is seeking comments to this rule to be provided by March 15, 2013.

Numerous efforts to reverse the decline of the LEPC have been initiated since the initial determination of its status as a warranted but precluded species. The USFWS (2012a) described many of these initiatives in its proposed rule, but expressed concerns that a number of existing and expanding threats are currently outside of the regulatory authority of the states to control, thus the determination to propose listing LEPC as threatened. However, a number of additional initiatives are underway, and could substantially alter the potential for a number of threats. Included in these initiatives is the development of this range-wide conservation plan for LEPC.

In June 2012, the 5 states supporting LEPC (KS, CO, OK, NM, and TX) agreed to develop a range-wide conservation plan for LEPC. The purpose of the plan was to identify and coordinate on-going conservation initiatives for LEPC, to develop an overall conservation strategy for the species, to engage a wide array of agencies, organizations, industries, and other stakeholders interested in LEPC conservation, and to identify conservation activities that could be developed to ensure the continued sustainability of the species. The 5 states worked through the Western Association of Fish and Wildlife Agencies (WAFWA) and its LEPC Interstate Working Group (IWG) to develop the range-wide plan, and engaged the Ecosystem Management Research Institute (www.emri.org) to coordinate development of the plan.

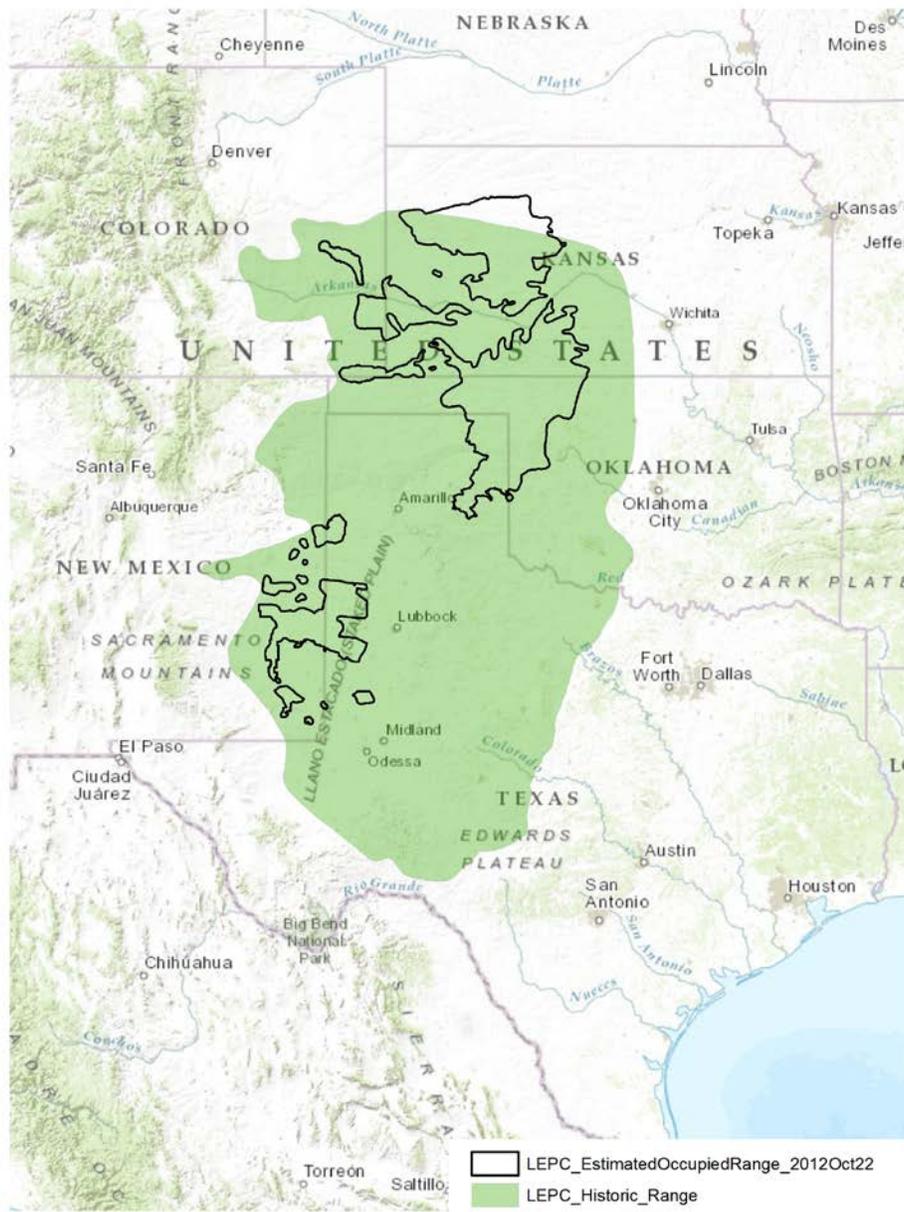


Figure 1. Estimated historical range and current occupied range of lesser prairie-chickens.

Range-wide LEPC Conservation Plan Objectives

The overall objective of the range-wide conservation plan for LEPC is to develop a conservation strategy for the species that identifies and coordinates conservation actions that can be implemented to ensure the continued sustainability of the species throughout its current or expanded occupied habitat. More specifically, this plan will:

- Identify a range-wide population goal for LEPC,
- Identify desired habitat conditions to achieve the population goal,
- Develop a map of focal areas where LEPC conservation actions will be emphasized to produce the habitat conditions required to sustain the species,
- Identify programs and cooperative efforts to produce the desired habitat conditions,
- Promote agreements designed to minimize impacts to LEPC from various development activities, and
- Obtain input from agencies, organizations, landowners, industries, other stakeholders, and the general public on concerns and suggestions for conservation planning for LEPC.

LEPC Background Information

LEPC Life History and Habitat Requirements

During the breeding season (primarily mid-March through May), male LEPC congregate on lek sites and perform courtship displays to attract females for mating. Nests are initiated mid-April through late May, typically within two weeks of lek attendance and copulation (e.g., Bent 1932, Copelin 1963, Snyder 1967, Merchant 1982, Haukos 1988). Hatching peaks in late May through mid-June throughout the range (e.g., Copelin 1963, Merchant 1982). Re-nests (following nest depredation or abandonment of the initial clutch) are initiated mid-May through early June, with hatching mid-June through early July (e.g., Merchant 1982, Pitman et al. 2006). In the autumn and winter, birds assemble into mixed flocks feeding primarily in sand sage, sand shinnery oak, or mixed-grass prairies, but also often in waste grain fields (Hagen and Giesen 2005). Habitat components necessary to fulfill LEPC life history needs include nesting habitat, brood-rearing and summer habitat, and autumn/winter habitat.

Leks

LEPC have high fidelity to lek sites (Campbell 1972) and males often use traditional leks sites year after year. Females tend to select traditional leks rather than newer or temporary leks (Haukos and Smith 1999), however new leks will form especially with an expanding population (Hamerstrom and Hamerstrom 1973). Lek sites are characterized by sparse, low vegetation (less than 4" (10 cm)) and are often located on a knoll or ridge, or grama-grass (*Boutela* spp.) flat (Jones 1963, Copelin 1963, Cannon and Knopf 1979, Taylor and Guthery 1980a, Giesen 1991). Disturbed areas such as roads, abandoned oil and gas well pads, areas around livestock watering facilities, herbicide treatments and prairie dog towns (Crawford and Bolen 1976a, Davis et al. 1979, Sell 1979, Taylor 1979, Ahlborn 1980, Locke 1992,

Bidwell et al. 2003) may also be used as lek sites. Jones (2009) reported on a lek being established in a sand sagebrush site one year after a burn. A study conducted by Jarnevich and Laubhan (2011) indicated that areas with slight topographic relief are favored as lek sites.

To ensure a viable population, Applegate and Riley (1998) recommended clusters of 6-10 or more leks, each with a minimum of six males, separated from one another by a distance of 1.2 miles or less. A number of studies have reported distances between leks of a mile or less (Crawford 1974, Crawford and Bolen 1976a, Taylor 1979, Locke 1992, Jamison et al. 2002a). If each lek in the cluster was surrounded by a 2 mile radius area (i.e., the minimum breeding season patch size around a lek), the entire cluster of leks and core habitat complex might occupy up to 32 square miles (~21,000 acres), with a wider perimeter of habitat for autumn and winter foraging and escape cover. This is more or less consistent with the 25,000-acre estimate of Bidwell et al. (2003) for a lek complex.

Generally, there are sufficient areas with appropriate conditions for use as leks to meet this LEPC habitat requirement. However, leks are very important in management for LEPC as they help wildlife managers understand the distribution and trends of LEPC in an area, and indicate where birds are finding nesting habitat. Monitoring of leks is an important component of an LEPC conservation plan. While it is difficult to assess densities of LEPC populations from lek data, this information does provide a valuable index of the population status of LEPC in an area over time. Further, lek locations provide valuable information on where maintenance and improvement of nesting and brood rearing habitat will be most effective. The presence of birds on leks reveals that at least minimum quality habitat exists in the area and that birds are present to respond to habitat improvements. Leks are therefore considered an important consideration in developing management plans for specific sites.

Nesting Habitat

Nesting success and brood survival are two of the most critical population parameters for LEPC sustainability (Hagen 2003, Pitman et al. 2006, Hagen et al. 2009). Therefore, nesting and brood rearing habitat are considered two of the most critical habitat components for this species.

The importance of shrub and herbaceous cover as a key component influencing nest fate of LEPC is well documented (e.g., see Davis et al. 2008). In sand sagebrush-grasslands, nests are most often in sand sage or in tall native bunchgrasses (Giesen 1994b, Pitman et al. 2005, 2006). Further, successful nests are typically associated with greater heights and cover of shrubs and/or tall perennial grasses (e.g., native bluestems) (Davis et al. 1979, 1981; Riley et al. 1992, Patten et al. 2005, Davis 2009, Lyons et al. 2011, Hagen et al. in review). Typically the height and density of shrubs, forbs, or residual grasses are greater at the nest site than in the surrounding rangeland, and are greater at successful nests than at unsuccessful nests (Riley 1978, Davis et al. 1979, Wisdom 1980, Haukos and Smith 1989, Riley et al. 1992, Pitman et al. 2005, Patten et al. 2005, Davis 2009, Lyons et al. 2011, Hagen et al. in review). In southwestern Kansas, LEPC that nested in areas with denser cover were more successful in hatching nests than females with less cover (Hagen et al. 2007b). A maximum height selection for grasses and shrubs appears to be around 18-20 in. (Lyons et al. 2011), with areas supporting taller grasses than this

not showing significant selection for these greater heights. Grasses were found to be taller at successful nests (average height = 26 in., n = 10), than unsuccessful nests (average height = 14 in., n = 26; Riley et al. 1992). Nesting habitat in sand sagebrush communities should strive to achieve >60% absolute cover of shrubs, grasses, and forbs, and where feasible should support grasses >20 in. in height (Hagen et al. in review). Residual litter should be maintained and bare ground minimized (Hagen et al. in review). In sand shinnery oak, nesting habitat will have a lower total vegetation cover (>35% absolute cover desired), but should strive to support grasses >20 in. in height and maintain a high level (>30%) residual cover of litter (Hagen et al. in review).

In Conservation Reserve Program (CRP) grasslands planted to mixed, native warm-season grasses, nests are predominately found in mid- and tall grasses such as western wheatgrass (*Pascopyrum smithii*), little bluestem (*Schizachyrium scoparium*), big bluestem (*A. gerardi*), and switchgrass (*Panicum virgatum*), where clumps of tall residual vegetation from the previous growing season are common (Fields 2004). Nests have been found in CRP planted to Old World bluestems (*Bothriochloa* spp.) (Wolfe et al. 2003) but such stands are generally thought to offer poorer quality nesting habitat than native warm season grass stands.

Leks are generally located around good nesting habitat, and female LEPC typically nest within 2 miles of leks (Suminski 1977, Riley 1978, Giesen 1994b). Pitman et al. (2006) reported that the majority of hens they monitored nested within 1 mile of a lek, but not necessarily the lek where they were captured. Thus locations of leks can serve as an indicator of where existing nesting habitat is located, and indicate prime areas for potential improvements to nesting habitat.

Brood Habitat

Areas used for brood-rearing are usually close to nesting areas (juxtaposition and interspersion of nesting and brood habitat is important), and so are generally found within 1.8 miles of lek sites. As broods have limited mobility, especially at early ages, brood habitat should be close to nesting habitat. Giesen (1998) suggested approximately 1000 ft. (300 m.) as a desirable maximum distance for brood movement. A mosaic of nesting and brood habitat provides the optimal combination of conditions for LEPC. Hagen et al. (in review) suggested that approximately 1/3 of an area should be in brood habitat and 2/3 in nesting habitat for optimum LEPC habitat quality. Thus, interspersion of nesting and brood habitat is important in providing optimum habitat conditions.

Brood habitat typically has a higher amount of forb cover and less grass cover than nesting sites (Ahlborn 1980, Applegate and Riley 1998, Hagen et al. in review). Brood-rearing locations are usually associated with higher levels of insect abundance (Jamison et al. 2002b, Hagen et al. 2005) and where chicks can move easily on the ground (Bidwell et al. 2003). Active sand dunes with shrubs, especially within sand shinnery oak or sand sagebrush vegetation types are common in brood-rearing habitat. Jones (2009) reported male LEPC and females with broods using sand sagebrush areas one and two years following a burn. Greater forb density was found in these areas. Burning of LEPC habitat (both sand sagebrush and sand shinnery oak communities) tends to temporally reduce shrub and grass cover

and increase forb cover for one to two years, depending on site location and conditions, before the shrub and grass component recovers and the forb cover is reduced (Davis et al. 2008). Thus, brood habitat is improved for a few years following a burn while nesting habitat is lowered in quality, but this is a temporary change as grasses and shrubs respond following the burn and typically return to their higher cover and density within several years.

Shrubs and hybrid shinnery – post oak mottes have been reported to be used for shade in summer (Copelin 1963, Donaldson 1969, Bell 2005 Larsson et al. 2012) for thermoregulation during high temperatures (Bell et al. 2010, Larsson et al. 2012). At higher temperatures, LEPC broods in New Mexico selected locations with more over-head cover and taller plant heights (Bell et al. 2010). There was also evidence that sand shinnery oak was preferred habitat irrespective of temperature (Bell et al. 2010).

Autumn/Winter Habitat

LEPC typically range across larger areas during the autumn and winter months, occupying the same general vegetation types as are used for nesting and brood-rearing (Giesen 1998). LEPC were found to use mixed-grass, sand sagebrush, or sand shinnery oak for resting and roosting (Taylor and Guthery 1980a). The birds fed in these vegetation communities, or congregated in agricultural fields with waste grains as long as they are located in close enough proximity of rangelands that provide adequate cover for resting and concealment (Jones 1964, Crawford and Bolen 1976b, Ahlborn 1980, Taylor and Guthery 1980b, Jamison 2000). Sand shinnery oak provides leaves, catkins, acorns, and insect galls as seasonal food resources.

Food

The USFWS (2012a) provided a good review of foods of LEPC. They noted that most food habits studies have been conducted in sand sagebrush and sand shinnery oak areas, with food habitats from mixed grass communities less well documented. Insects are a key component of the diet when available, and are especially important for broods. Martin et al. (1951:97) reported oaks as a primary food in fall, winter and spring, with grain crops, especially wheat and sorghum used in fall and winter, with sumac in winter, and gromwell in spring and summer. They reported insects as a key summer food with grasshoppers the largest component followed by “beetles, bugs, and caterpillars”. As summarized by the USFWS (2012a), vegetation provides the bulk of the diet of adults through fall, winter and early spring. Green vegetation becomes important in spring, with seeds, mast, and leafy vegetation being selected throughout this time. Insects are the primary food when available. In sand shinnery oak, acorns are an important food item when available, but their availability varies considerably from year to year (Smith 1979). Thus, vegetation eaten by LEPC is diverse with many different species selected.

Water

Water is not considered a direct requirement of LEPC (USFWS 2012a), although they will use surface water when it is available. Supplemental water sources were noted as being more available today than historically because of water developments for livestock. Supplemental water was suggested as a

benefit during periods of drought (Crawford 1974), but no data to support its importance are available. Generally, water developments are not considered to be a habitat improvement practice for LEPC.

Home Ranges

Home ranges of individual LEPC have been reported in various studies, and have been summarized by the USFWS (2012a). Home ranges vary by sex, age, and season, and weather patterns. Taylor and Guthery (1980c) reported home ranges of 19 telemetered birds in western Texas as ranging from 86 acres for 1 immature female in February to 4804 acres for 3 immature males in December. The overall average monthly home range for the 19 birds was 988 acres. Riley et al. 1994 conducted telemetry studies in New Mexico and found that 51 females averaged 571 acre home ranges during pre-nesting and 227 acres while nesting. Females with broods had home ranges that averaged 294 acres while females without broods averaged 180 acres in the post-nesting timeframe. Toole (2005) studied LEPC in Texas and found that home ranges for 24 birds distributed across 2 study areas for 2 years ranged from 286 acres to 729 acres during the breeding season while home ranges for 7 birds across the 2 study areas in one fall ranged from 422 to 647 acres. Toole (2005) found no significant differences between sexes or ages of the birds he monitored. Giesen (1998) reported that home ranges for males in Colorado were 512 acres while females were 1,473 acres. Jamison (2000) reported home ranges of males in Kansas to be 30- 346 acres in the spring, 190-356 acres in the summer, and 566-1010 acres in the fall. Taylor and Guthery (1980a) reported winter home ranges in Texas to range from 86 to 1223 acres. Home ranges have been noted to increase in size during droughts (Copelin 1963, Ahlborn 1980, Merchant 1982). Merchant (1982) found the average home range size of 7 female lesser prairie-chickens was 430 acres during a year of normal precipitation, but was 1,146 acres for 8 females in a drought year. Thus, in general, most home ranges of LEPC have been found to be less than 2 sq. mi. in size.

Minimum Sizes of Habitat Blocks

Taylor and Guthery (1980c) recommended that LEPC be managed in units of at least 16,000 acres in size. Bidwell et al. (2003) suggested that the collective home range of all birds that attend a particular lek site averages approximately 19 square miles (>12,000 acres), indicating that large areas are needed to ensure the long-term persistence of LEPC populations (Elmore et al. 2009). Although the minimum habitat patch size to support LEPC is not clear, several studies have speculated that habitat mosaics containing patches ranging from 1,200 to 25,000 acres of contiguous native rangelands may be necessary to sustain LEPC populations (Davison 1940, Copelin 1963, Crawford and Bolen 1976a, Taylor and Guthery 1980b, Wildlife Management Institute 1999, Woodward et al. 2001, Bidwell et al. 2003). The USFWS (2012b) discussed the need for “strongholds” to support viable populations of LEPC. They suggested that strongholds need to be a minimum of 25,000 acres but may need to be up to 50,000 acres or more. The size of a functional stronghold would depend on the quantity of high quality habitat within the area, the greater the concentration of high quality habitat, the smaller (closer to 25,000 acres) that the stronghold could be and provide its desired function for LEPC. Crawford and Bolen (1976a) reported that areas should be greater than 63% high quality habitat to provide good habitat conditions. Haufler et al. (2012) recommended maintaining core conservation areas averaging around 50,000 acres in size with at least 70% of the area in good to high quality habitat.

Density Information

Density estimates for LEPC are difficult to determine, as unlike species that defend territories, the communal lek activities and associated nesting and brood rearing behaviors spread the population out in non-regular patterns. In addition, densities are strongly influenced by habitat quality as well as changes to habitat quality that can occur annual with different weather patterns. As noted above, home range sizes have been found to expand in years with unfavorable weather conditions, indicating that densities may also fluctuate under similar conditions. Various estimates of densities have been made. Texas estimated a mean density of 5.63 LEPC/sq. mi. (range 2.18-8.64) (Davis et al. 2008). New Mexico used an estimate of 4.85 birds/sq. mi. (Davis et al. 2008). Kansas estimated densities of LEPC in much of its range at 10 breeding birds/sq. mi. (Davis et al. 2008). Oklahoma used an estimate of 5 birds/ sq. mi. in setting habitat goals for its LEPC plan (Haufler et al. 2012).

Movement Information

Movements of LEPC may be expressed as normal daily movements or occasionally as dispersal movements. Taylor and Guthery (1980c) recorded a daily movement of over 2.4 mi. in one day, with one juvenile male moving 7.7 mi. in 4 days, a move that they attributed to dispersal. Jamison (2000) in a study conducted in southwestern Kansas reported movements that averaged 806 ft. per day (n = 14, range 634 – 1,411 ft.) for broods less than 14 days of age and 1040 ft. per day (n = 8, range 605 – 2,139 ft.) for broods 14 to 60 days of age (Jamison 2000). Banded juvenile male LEPC moved an average of 5.3 mi. (range 0.2- 12.6 mi.) from the lek they were captured on to where they were collected by hunters (Campbell 1972). Riley et al. (1994) reported that 3 females with broods moved an average of 910 ft. per day.

LEPC Population Status

The LEPC is endemic to sand shinnery oak, sand sagebrush, and associated mixed-grass prairie communities in eastern New Mexico (Ligon 1961, Hubbard 1978), portions of southeastern Colorado (Hoffman 1963, Giesen 1994a), southwestern Kansas (Schwilling 1955, Horak 1985, Thompson and Ely 1989, Jensen et al. 2000), western Oklahoma (Duck and Fletcher 1944, Copelin 1963, Horton 2000), and the Texas panhandle (Henika 1940, Oberholser 1974, Sullivan et al. 2000). The USFWS (2012a) provided a good overview of the population status of LEPC in each of these 5 states.

In 2012, a range-wide aerial population monitoring program was initiated. This survey used helicopters flying standard routes within 15km by 15km blocks distributed within 4 LEPC ecoregions (McDonald et al. 2012) consisting of the sand shinnery oak ecoregion in eastern New Mexico-southwest Texas, the sand sagebrush ecoegion located in southeastern Colorado-southwestern Kansas and the western Oklahoma Panhandle, the mixed grass ecoregion located in the northeast Texas panhandle-northwest Oklahoma-south central Kansas area, and the short grass/CRP mosaic ecoregion located in northwestern Kansas and eastern Colorado. McDonald et al. 2012 reported observing 36 lesser prairie-chicken leks, 26 greater prairie-chicken leks, 5 lesser and greater prairie-chicken mixed leks and 85 prairie-chicken groups not confirmed to be lekking for a total of 152 prairie-chicken groups. Additional flights flown by Texas Tech University and the Oklahoma Department of Wildlife

Conservation detected 10 lesser prairie-chicken leks and 7 groups not confirmed to be lekking. An estimated total of 3,174 lesser prairie-chicken leks (90% CI: 1,672 – 4,705) and 441 lesser and greater prairie-chicken mixed leks (90% CI: 92 - 967) were reported to occur in the study area, equating to an estimated total of 37,170 individual lesser prairie-chickens (90% CI: 23,632 – 50,704) and 309 hybrid lesser-greater prairie-chickens (90% CI: 191 - 456).

Garton (2012) conducted a reconstruction analysis of LEPC populations for the overall population of LEPC as well as for each “ecoregion” recommended by the LEPC IWG; sand shinnery oak ecoregion, sand sagebrush ecoregion, mixed grass ecoregion, and shortgrass ecoregion. Garton (2012) developed the population analysis from past lek counts including the most recent aerial survey reported above and used these to estimate quasi-extinction probabilities. He discussed many of the limitations of the available population data including the limited number of leks surveyed as one goes farther back in time, the inconsistencies in the survey methods used, the assumptions of observed males on leks to numbers of females, and the minimum population sizes assumed to be needed to maintain populations. Garton (2012:16) showed “future projections of carrying capacity without substantial changes in key determinants of LEPC population dynamics are slightly above 10,000 in 30 years and less than 1,000 in 100 years.” Of significant value in the analysis were the comparisons of the various ecoregions. Data for the shortgrass ecoregion could not be analyzed prior to 1997 due to a lack of sufficient leks, but the data for 1997- present showed this population to have a high probability for persistence and projected increasing numbers. The population analysis for the sand shinnery oak ecoregion showed good probabilities of short and long term persistence. However, the projected populations in the mixed grass ecoregion and especially for the sand sagebrush ecoregion showed higher levels of short term risk and significant long term likelihood of dropping below the population extinction thresholds of 50 and 500 individuals.

Threats to LEPC Populations

Various threats to the future sustainability of LEPC have been identified. As with the LEPC population status, the USFWS (2012a) provided a thorough summary of the available information on these threats. Potential threats identified by the USFWS (2012a) included habitat conversion from agriculture, livestock grazing, collision mortality, shrub control and eradication, altered fire regimes and invasion by woody plants, insecticides, wind power and energy transmission development and operations, petroleum production, roads and other linear features, predation, disease, hunting loss and other recreational disturbances, hybridization, and competition from ring-necked pheasants (*Phasianus colchicus*). A number of these potential threats can cumulatively result in habitat loss and fragmentation, the primary concern of the USFWS in proposing LEPC as a threatened species.

Habitat Conversion from Agriculture

As documented by the USFWS (2012a) and numerous other authors (e.g., Crawford and Bolen 1976a), conversion of native prairies and shrublands to agricultural crops resulted in a substantial reduction in LEPC habitat as revealed by comparison of historical range to current range (Figure 1). Most of this

conversion occurred well in the past with settlement of the prairies. However, some conversion continues, as commodity demands and prices continue to influence the economics of agriculture production in new areas.

Potential Solutions to Agricultural Conversions

Various potential solutions to curb the conversion of native prairies and shrublands to croplands exist, as well as efforts to convert croplands back to native grasses. Landowners convert lands to agricultural production for a real or perceived economic advantage for doing so. Providing landowners with economic incentives to maintain native grass and shrublands is one solution. Such incentives may be focused on LEPC habitat needs, or may include additional considerations such as providing for carbon sequestration or other ecosystem services. Encouraging the conversion of croplands back to plantings of native grasses is a solution for increasing the areas of native grasslands. Programs that provide economic incentives to encourage these conversions as well as technical and financial assistance to implement them are potential solutions to this threat.

Livestock Grazing

Livestock grazing is a widespread practice on most remaining native grass and shrublands within LEPC range. Maintaining these native grass and shrublands is desirable, as indicated above, and grazing (ranching) is a land use that encourages maintaining lands in this condition. Grazing is a practice that can have both beneficial and detrimental effects of LEPC habitat. Grazing practices that result in reductions in vegetation structures and residual vegetation that are less than optimal for LEPC are detrimental to LEPC habitat quality. In particular, reductions in grass heights in nesting habitat can significantly reduce habitat quality. Grazing that reduces grass densities where they are too dense to allow for the movements of chicks, and that encourages the increase in forb cover or diversity will improve brood habitat quality. Thus, grazing can reduce the quality of LEPC nesting habitat, but is also an appropriate practice for improving brood habitat in some locations.

Potential Solutions to Livestock Grazing Impacts on LEPC Habitat

Clearly understanding the relationship between types of grazing and its effects on vegetation in different plant communities provides a framework for making recommendations about its use in relation to LEPC habitat. A review of prescribed grazing in relation to LEPC habitat is provided in Appendix X. Properly applied grazing is an important tool in the LEPC habitat toolbox. Providing economic incentives to landowners to encourage the application of appropriate grazing practices that can help improve LEPC habitat in the right locations and to reduce any economic disincentives of applying these practices is a potential solution to addressing impacts of grazing on LEPC.

Shrub Control and Eradication

Widespread control of sand shinnery oak or sand sagebrush can be detrimental to LEPC habitat quality (Haukos and Smith 1989, Johnson et al. 2004, Patten et al. 2005, Bell et al. 2010, Thacker et al. 2012). A few studies have suggested that reduction of sand shinnery oak in some locations may provide some benefits to LEPC (Doer and Guthery 1983, Leonard 2008) by increasing seed production or other benefits. Olawsky et al. 1988 did not find a statistical difference in LEPC densities between treated and untreated areas. However, none of these studies suggested that widespread control of sand shinnery

oak or sand sagebrush was beneficial. Haukos (2011) provided a good summary of LEPC use of sand shinnery oak communities and the effects of herbicide application to these communities, and cited studies that showed the role of fire as a dynamic influence that helped maintain the diversity of conditions desired in sand shinnery oak communities. Limited research has been conducted on effects of herbicide application to LEPC habitat quality in sand sagebrush ecosystems, although Thacker et al. (2012) found changes in plant communities that were expected to be detrimental to LEPC habitat quality, and numerous studies have shown LEPC preference for nesting in sand sagebrush communities. These studies demonstrate that widespread control of either sand sagebrush or sand shinnery oak is not favorable for LEPC populations.

Potential Solutions to Shrub Control and Eradication

Haukos (2011) indicated that without government subsidies chemical control of sand shinnery oak was not cost effective in terms of increases in grass production and associated weight gains by cattle, a primary reason for widespread treatment. Stopping such government subsidies within LEPC range would reduce the likelihood of this practice being applied. Incentive programs to encourage landowners to maintain sand sagebrush and sand shinnery oak communities, especially in conditions that provide high quality LEPC habitat, could help provide economic incentives to counter widespread herbicide use. Encouraging use of appropriate prescribed grazing and prescribed burning programs can maintain rangeland conditions for livestock and maintain LEPC habitat. Further demonstrations of the benefits of these types of management can help change the perception of the benefits of widespread herbicide use.

Altered Fire Regimes and Invasion of Woody Plants

Expansion of woody plants including eastern redcedar (*Juniperus virginiana*) into LEPC range has caused reductions in LEPC habitat (Woodward et al. 2001). In the southwest, mesquite has invaded many areas (USFWS 2012a). Substantial areas have been reduced or eliminated as LEPC habitat by the spread of these species. Further, alterations of fire regimes have changed the dynamic processes in sand shinnery oak, sand sagebrush, and mixed grass communities that historically produced the mix of habitats preferred by LEPC (Davis et al. 2008). Fear of use of prescribed burning as well as social perceptions of this practice have limited its use in many areas. LEPC habitat quality has declined as a result of these changes (USFWS 2012a).

Potential Solutions to Altered Fire Regimes and Invasion of Woody Plants

Increasing recognition and public knowledge of the important role that fire played historically in LEPC habitat and in maintaining productive sand shinnery oak, sand sagebrush, and mixed grass ecosystems are needed. Providing training and assistance in use of prescribed burning and increasing landowner assurances through cooperative burn associations and provision of appropriate liability insurance options would decrease fears of use of this practice. Providing technical and financial assistance for use of prescribed burning is also needed. Technical and financial assistance to mechanically control redcedar or mesquite where it has invaded to such an extent that burning may not be feasible with current conditions are also needed. Through such programs, appropriate uses of prescribed burning

and mechanical brush control can be applied to reverse the invasions of woody species and return fire to these ecosystems.

Wind Power and Energy Transmission Impacts

As indicated previously, one of the primary reasons why the USFWS (2012a) increased the priority for a listing decision on LEPC was the increased perception of risk from wind energy developments and associated increases in development of transmission lines. Substantial areas of LEPC current occupied range do have high suitability for wind energy development, particularly some of the sandy ridgelines that comprise high quality LEPC habitat. While empirical data on the effects of wind energy development on LEPC are lacking, and the avoidance behavior of LEPC towards transmission lines has limited empirical data, enough data exist to raise concerns about the impacts of these developments on habitat use by the species (Hagen et al. 2010, 2011), and was a big enough concern for the USFWS to change its listing priority for LEPC (USFWS 2012a).

Potential Solutions to Wind Power and Energy Transmission Impacts

The obvious solution to the threats of wind energy and transmission line development on LEPC populations is to encourage placement of these developments in areas that can avoid impacts and where this isn't possible, to use practices that minimize the impacts. Where impacts are unavoidable they can be mitigated through off-site habitat improvements to offset the effects on LEPC populations. Engagement of industry in programs or initiatives that will allow for needed expansion of this renewable energy source while balancing this need with those of LEPC populations can reduce this threat.

Petroleum Production Impacts

As with wind energy and transmission developments, oil and gas developments have the potential to cause impacts to LEPC (Hunt 2004, Hagen et al. 2005, Pitman et al. 2006, Hagen et al. 2010, 2011). While additional information on avoidance behaviors of LEPC around oil and gas development and production activities is still needed, concerns exist that with each increase in density of wells, LEPC avoidance and reduced populations will result. In addition, the activities associated with oil development and production including roads, power lines, pipelines, compressor stations, and other structures all add to the cumulative footprint and associated displacement of LEPC populations. An added concern in addressing oil and gas developments is that of split estates, where landowners that own and control the surface of the land and the uses of that land often don't own the subsurface or mineral rights. Mineral rights are often owned by multiple parties and may have complex leases of the rights. As surface rights owners cannot deny mineral rights owners from exercising those rights, the complexity of addressing oil and gas development increases. In particular, gaining assurances or certainty that key areas of LEPC habitat can be maintained into the future is greatly complicated by the presence of split estates. Addressing potential oil and gas threats to LEPC populations is an important component of a conservation plan.

Potential Solutions to Petroleum Production Threats

The ability to have any regulatory control on oil and gas developments varies with the ownership of mineral rights as well as among the states. Where the Federal government owns mineral rights, such as in substantial areas in New Mexico, it can incorporate LEPC needs into its leasing agreements. Some

states have the ability to regulate densities of wells if they fall into critical areas for species like LEPC, while other states lack this ability. Clearly, one important potential solution is to engage the oil and gas industry into programs or initiatives that can accommodate their needs for development and production while addressing the needs of LEPC.

Climate Change

The USFWS (2012a) addressed many of the concerns with climate change and how it might threaten the long-term persistence of LEPC. Climate projections clearly show warming trends throughout LEPC range along with projected reductions in precipitation and more extreme weather events including intense storms and prolonged drought. All of these are threats to LEPC populations. Plant communities in the southwest parts of LEPC range may shift in compositions or structures to be less favorable as LEPC habitat. Temperatures may stress LEPC populations in these warmer parts of the range. Prolonged drought conditions could cause population fluctuations that could threaten persistence of populations that are fragmented. Intense storms such as during the nesting season may cause significant local reductions in reproductive success or survival.

Potential Solutions to Climate Change Threats

The challenges for addressing climate change as an overall threat are far beyond the considerations of an LEPC conservation plan. However, there are actions that can be taken to minimize climate change threats to LEPC populations. Maintaining high quality habitat will ensure that populations will be robust and able to respond to local extreme events. Reducing potential fragmentation of LEPC habitats will allow for movements and shifts of LEPC populations. Recent expansions of LEPC in KS are an example of the ability of the species to move to new favorable environments. Should climate change require shifts in populations, maintaining linkage zones that allow for movements will be important.

Collision Mortality

LEPC have been shown to collide with fences, power lines, and cars (Hagen 2003, Wolfe et al. 2007, USFWS 2012a). Generally, these mortality rates have been relative minor, with the one exception of Wolfe et al. (2007) who reported a substantial level of mortality from fences in Oklahoma.

Possible Solutions to Collision Mortality

Minimizing the presence of collision mortality factors, principally distribution lines and fences in close proximity to leks where LEPC may concentrate will reduce the threat of this mortality. Marking of fences that do occur near leks is another possible solution. Providing landowners with technical and financial assistance to remove fences in high risk areas or helping provide marking of fences can reduce this threat.

Habitat Loss and Fragmentation

As mentioned previously, the USFWS (2012a) reported that the threat of habitat loss and fragmentation is a primary concern for proposing LEPC as a threatened species. Habitat loss and fragmentation is a result of the cumulative effects of all habitat altering activities. It can affect LEPC populations at multiple scales. At large scales, fragmented populations of LEPC may become genetically isolated and

loose genetic diversity. This has not been shown to occur with LEPC, other than the finding that the population in New Mexico and west Texas does have some genetic differences from the rest of the population (Hagen et al. 2010, Pruett et al. 2011), but this population is of adequate size and with a low enough quasi-extinction risk to not be of a concern (Garton 2012) for maintaining a population above N_e . Fragmented populations may require demographic support to help build numbers back up following a local population crash from such factors as severe weather events. If no other population sources are close enough or if the intervening habitat conditions are too adverse to allow movements of individuals, local populations could be extirpated. Finally, reductions in habitat quality within habitat patches can reduce population sizes, reproductive success, and survival rates. While these will fluctuate annually with weather patterns and other factors, areas with low habitat quality may be population sinks and not able to maintain their population sizes without demographic support from other areas.

Potential Solutions to Habitat Loss and Fragmentation

Restoring, enhancing, and maintaining high quality patches of LEPC habitat that are of adequate sizes, numbers, and distributions to provide population source areas and population movement capabilities to withstand periodic unfavorable weather and other conditions can be provided through a well-designed plan. Providing areas of high quality habitat will have populations with good reproduction and survival rates and will serve as source areas for demographic support to surrounding habitat patches and for movements of birds into new areas. Providing technical and financial assistance through incentive and other programs to landowners to create or maintain these patches is an important conservation activity. Working with industries to avoid or minimize potential development in important habitat patches can address the threats of these developments in these important areas.

Other Factors and Potential Solutions

Other factors have not been shown to present serious threats to LEPC. Diseases, as reviewed by the USFWS (2012a) have not been shown to cause any substantial population concerns. While the presence of parasites such as eye worm (*Oxyuris petrowi*) were noted, and their effects on LEPC health not well understood, no evidence exists that this is a significant threat to LEPC populations. The USFWS (2012a) concluded that “at this time, we have no basis for concluding that disease or parasite loads are a threat to any lesser prairie-chicken populations.” Predators were discussed as a potential threat (USFWS 2012a), but have not been shown to be a significant concern where good LEPC habitat exists. Hunting could be a concern in small, isolated LEPC habitat patches, but the states already control this potential threat. Hunting only continues in KS, where LEPC populations are doing well and there is no concern that hunting mortality is additive rather than compensatory for normal annual population cycles. Insecticides have not been found to present a threat to the species (USFWS 2012a), nor has competition from ring-necked pheasants, or recreational observations of leks.

Planning Approach and Methods

The range-wide conservation plan for LEPC was led by the IWG consisting of a representative from each

of the 5 states supporting LEPC (CO, KS, OK, TX, and NM) and a coordinator from WAFWA. WAFWA contracted with the Ecosystem Management Research Institute (EMRI) to help coordinate the development of the plan. The plan was developed by engaging agencies, organizations, industries, universities, and other stakeholders through a series of targeted meetings and through broader public input opportunities. Several working teams or committees were established to help provide input to the IWG for various components of the plan. Specifically, a science team was established, as were a mitigation/voluntary offset committee and a habitat credit trading/conservation banking committee. Each state established its own implementation team and held local public meetings. Various industry initiatives (candidate conservation agreement with assurances or habitat conservation plan initiatives) were included in planning discussions. Two broader meetings, one targeted as a general stakeholder meeting and a second more focused on industry interests in formal conservation agreements were also held. Finally the individual states also held meetings to solicit input from industry and agricultural associations as well as landowners and other stakeholders. Drafts of the plan were made available for public review and input.

A critical component of plan development was coordination among the various agencies, organizations, industries, landowners, and other stakeholders interested in LEPC and its conservation strategy. Coordination was needed at multiple levels including interagency coordination for Federal agencies, interagency coordination within and among states, interagency coordination between states and Federal agencies, coordination with regional organizations and industries, intrastate agency and organization coordination, and general outreach and engagement of landowners and the public. Sequencing of planning components involved establishment of various committees to accomplish specific tasks, then engaging broader involvement as various components of the plan were available for review and input.

The IWG established a science team to assist the planning effort with setting of plan goals as well as providing recommendations for science-based decisions included in the plan. The goals that the science team set were the desired population size and the conversion of the population goal into habitat goals for LEPC. The science team was also tasked with development of mitigation metrics to be used to quantify impact debits and mitigation credits, to recommend avoidance buffer distances to be used in impact assessments, and to recommend range-wide sub-divisions to be used in LEPC planning or delineation of service areas for conservation banking. The science team was also asked to review other science components of the conservation plan. The science team included the members of the IWG as well as Dwayne Elmore with Oklahoma State University, Dan Mulhern, Chris O'Melia, Allison Arnold, Aron Flanders, and Heather Whitlaw with the US Fish and Wildlife Service, Dave Haukos, with the U.S. Geological Survey, Blake Grisham with Texas Tech University, Don Wolfe with Sutton Research Center, Christian Hagen with Oregon State University representing the Natural Resource Conservation Service, and Alex Daniels and Anne Bartuszevige with Playa Lakes Joint Venture. This team met for 2 days in August 2012 and had several webinars/conference calls following the initial meeting to review and recommend inputs to the plan.

A significant focus of the conservation plan is the improvement of habitat for LEPC on private lands as well as integration of the limited amounts of public land that can contribute to LEPC habitat needs. A major component of this is through various conservation initiatives available through agencies or organizations that specifically target delivery of programs for LEPC or that can include the needs of LEPC as a priority. Most of these initiatives are administered at state levels, either through staffing of Federal programs at state levels, state agency programs, or organizations that either operate within a state or align with state level initiatives. For this reason, coordination of LEPC programs within each state is a critical part of conservation planning. Therefore, each state convened an implementation team consisting of agencies and organizations involved in delivery of LEPC programs to coordinate initiatives within each state for maximum effectiveness and efficiency in conservation delivery. These teams reviewed their current coordination, identified additional opportunities for increased coordination, and discussed how to ensure that landowners are being provided with “one-stop-shopping” through contacts with any of the partnering agencies or organizations. Each state also held public meetings to discuss the on-going LEPC planning process and coordination. Landowners were encouraged to attend these meetings and provide input to the planning process.

The conservation strategy for LEPC must address the identified threats discussed above if it is to be successful in providing for a high probability of long-term viability of the species. Inclusion in the plan of mitigation opportunities and tools for voluntary reductions in threats is essential for this success. A framework for the consistent development and application of such conservation tools was needed. The science team, as mentioned, was tasked with developing a set of metrics that could be used to evaluate potential impact debits and mitigation credits. However, various decisions concerning the application of these metrics are also needed that involve policy components beyond what science can provide as guidance. To address these policy components while providing a consistent foundation for impact and mitigation tools, a voluntary offset/mitigation committee was convened. This committee consisted of the following individuals: Chris O’Meilia, Bridget Fahey, and Allison Arnold with the US Fish and Wildlife Service, Sean Kyle and Kathy Boydston with Texas Parks and Wildlife Department, David Bender and Eric Johnson with Kansas Department of Wildlife, Parks, and Tourism, Doug Schoeling with Oklahoma Department of Wildlife Conservation, David Klute with Colorado Parks and Wildlife, Bill Van Pelt with WAFWA, Mark Watson with New Mexico Department of Game and Fish, Ed Arnett with the Teddy Roosevelt Conservation Partnership, and Christian Hagen with Oregon State University representing the Natural Resource Conservation Service. This committee met to make recommendations on a number of policy questions related to the mitigation metrics proposed by the science team as well as additional questions on a consistent operational foundation for impact and mitigation tools. Additional input to the committee was provided by David Wolfe with Environmental Defense Fund, Wayne Walker with Common Ground Capital, Brian Woodard with Oklahoma Independent Petroleum Association, Brad Loveless with Westar Energy, Ben Shepperd with Permian Basin Petroleum Association, and Wayne White with Wildlands, Inc.

An additional committee was formed to consider the various tools or options that could be developed for credit trading/conservation banking. This committee was tasked with reviewing the mitigation

metrics and policy framework developed by the science team and mitigation/voluntary offset committee and providing recommendations on how the foundation could be consistently applied to the various potential trading/banking tools. This committee consisted of Chris O’Meilia, Bridget Fahey, and Allison Arnold with the US Fish and Wildlife Service, Sean Kyle and Kathy Boydston with Texas Parks and Wildlife Department, Jim Pitman and Eric Johnson with Kansas Department of Wildlife, Parks, and Tourism, Doug Schoeling with Oklahoma Department of Wildlife Conservation, David Klute with Colorado Parks and Wildlife, Bill Van Pelt with WAFWA, Grant Beauprez with New Mexico Department of Game and Fish, Ed Arnett with the Teddy Roosevelt Conservation Partnership, Christian Hagen with Oregon State University representing the Natural Resource Conservation Service, David Wolfe with Environmental Defense Fund, Wayne Walker with Common Ground Capital, and Wayne White with Wildlands Inc. This committee met to make recommendations on a number of policy questions related to the mitigation metrics proposed by the science team as well as additional questions on a consistent operational foundation for impact and mitigation tools.

The IWG has coordinated with on-going CCAA/HCP efforts. The Wind HCP has held meetings and IWG has had representatives at these meetings to help coordinate efforts. An oil and gas initiative is developing a draft CCAA for KS, OK, TX, and CO and has involved the 5 states and the USFWS in review of drafts of this effort. A meeting occurred in January 2013 where all interests in CCAA/HCP’s or related conservation tools that might be applied to LEPC were invited to review the draft foundations developed for such tools and to provide input to the process. Discussions and coordination with industry groups will continue.

A first draft of the Range-wide Conservation Plan for Lesser Prairie-Chicken was provided for public input in January 2013. Input was received at a public meeting held in Edmond, OK on January 23, 2013 and was also received through both email and written inputs. A second draft of the plan was provided in February with the final draft provided in March 2013.

Conservation Strategy for LEPC

This plan describes a conservation strategy for LEPC that when implemented will provide the population and habitat needed to sustain this species. Components of the strategy include identification of a desired population size deemed adequate to sustain LEPC populations range-wide and within 4 identified ecoregions, developing recommendations for required amounts, sizes, and distributions of habitat recommended to support the population goals, coordinating and enhancing programs to improve habitat on private lands through landowner incentive programs, identifying programs that will avoid, minimize, and mitigate potential threats from developments, recommendations for monitoring the population, and adaptive management considerations.

A key component of the conservation strategy is applying the concept of core areas (e.g., http://gf.state.wy.us/web2011/Departments/Wildlife/pdfs/SAGEGROUSE_EO_COREPROTECTION00006_51.pdf). This concept is based on identifying the areas of greatest importance to the species, and

focusing habitat enhancement, maintenance, and protection in these areas. This accomplishes two things. First, it concentrates limited resources for species conservation in the most important areas, allowing for the establishment and maintenance of large blocks of habitat needed by many species including LEPC. Second, it identifies areas where development, especially energy development, should be avoided or minimized, which also helps identify where development is less likely to be a concern. This provides developers with the guidance they typically seek for their development planning purposes, and helps avoid conflicts over impacts to the species.

The conservation strategy employs various tools to achieve its management objectives with a focus on core areas. First, because LEPC occur primarily on private lands through most of its range, the strategy emphasizes delivery of habitat improvement in core areas through maximizing landowner incentives to make landowner engagement in LEPC habitat improvements either economically neutral or advantageous. The strategy identifies programs available to help provide these improvements and the steps being taken by agencies and organizations to help coordinate and maximize the delivery of these programs. Second, the strategy identifies approaches and tools to avoid, minimize, and mitigate potential threats to LEPC, with a primary focus on energy developments. Application of these approaches and tools using core areas can be applied through voluntary programs. A metric system was developed that quantifies impacts of developments and that also can quantify mitigation benefits in the same way. This system forms a foundation for tools such as Candidate Conservation Agreements with Assurances (CCAA's), Habitat Conservation Plans (HCP's) and voluntary offset programs (VOP's). Mechanisms for developing long-term voluntary protection of strongholds (USFWS 2012b) are incorporated into these approaches and tools. Finally, the strategy recognizes that many aspects of LEPC ecology and management remain unknown. Monitoring is proposed that will allow for the generation of new information as well as documentation of the population response to management activities. The strategy needs to include an adaptive management component that allows for adjustments as new information is generated.

Population Goals

The IWG science team discussed LEPC population goals during its August 2012 meeting. The science team recognized the limitations of historical population data and the limitations of any population viability analyses conducted on a range-wide or regional basis to set population goals. With these data limitations, the team agreed to utilize a long term spring population average, trend information, and variability analyses as a basis for setting initial population goals on an LEPC regional basis. Initial population goals were set, and these were then revisited after reviewing the report by Garton (2012). Based on these acknowledged limitations and review of the available population information and analyses, the science team recommended a range-wide population goal of 67,000 birds as an annual spring average over a 10 year time frame (expected annual range of 37,500-93,500 birds).

The science team discussed distributions of the range-wide goal. The team agreed with a previous determination used in developing a monitoring protocol that 4 "ecoregions" should be designated within the overall range, and population goals assigned to these ecoregions. The 4 ecoregions and

their goals were:

Sand shinnery oak ecoregion—long-term average goal of 8,000 birds (~4,000-12,000 range)

Sand sagebrush ecoregion—long-term average goal of 10,000 birds (5,000-15,000)

Mixed grass ecoregion—long-term average of 24,000 birds (12,000-36,000)

Short grass ecoregion—long-term average of 25,000 birds (12,500K-37,500).

Continued coordinated monitoring efforts (discussed below) would assess annual population sizes within each of these ecoregions.

Habitat Goals

Based on LEPC planning work conducted in Oklahoma (Haufler et al. 2012) as well as similar conservation planning efforts for other grouse species (e.g., sage-grouse: http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SAGEGROUSE_EO_COREPROTECTION0000651.pdf) the science team recommended use of the core area strategy, and identified “focal areas” as key planning elements. Focal areas are defined as areas that have the greatest potential for supporting and sustaining long-term populations of LEPC through maintenance or restoration of large blocks of good to high quality habitat with minimal anthropogenic disturbances. Focal areas serve several purposes including those previously discussed for core areas. First, they help conservation efforts to be coordinated and focused within core areas, creating the needed large blocks of habitat and minimizing what can become widespread application of habitat improvements that may produce only small local patches of habitat that will not support the desired populations. Second, focal areas present a much smaller acreage for concentrated conservation efforts than the overall occupied range of the species. This will assist developers such as wind and oil and gas industries by prioritizing avoidance objectives of the most important areas for LEPC and encouraging development in areas with minimal potential impacts to the species. Third, focal areas realistically define what is needed to sustain the species rather than assuming that all occupied range is needed and that all potential impacts to the species are equal.

To set habitat goals, the science team considered what densities of LEPC might be expected. While good empirical data on population densities of LEPC is very limited, past work has generally supported density estimates of 5-10 birds/sq. mi. to be reasonable. In Texas, a mean density of 5.63 breeding birds/sq. mi. ranging from 2.18-8.64 was reported (Davis et al. 2008). New Mexico estimated densities of 4.85 breeding birds/sq. mi. (Neville et al. 2005), while Kansas used an estimate of 10 breeding birds/sq. mi. (Davis et al. 2008). Additional analyses by state biologists have estimated population densities in the TX mixed grass ecoregion to be <4/ sq. mi. while in NM an estimate of 4/sq. mi. in sand shinnery oak was deemed appropriate. The science team recommended using a density of 9/ sq. mi. for the shortgrass ecoregion, 5 breeding birds/sq. mi. for the sand sagebrush ecoregion and the OK and TX areas of the mixed grass ecoregion, 9/ sq. mi. for the KS portion of the mixed grass ecoregion, and 4/ sq. mi. for the sand shinnery oak ecoregion. The science team set a goal of having sufficient habitat in focal areas to sustain 75% of the desired population goal of 67,000 birds. This equates to

approximately 7,085,714 million acres of habitat in focal areas, and was set by the science team as the initial habitat goal for the conservation strategy.

The science team further defined what was desired for focal areas. They identified the following:

- Average size of focal areas should be >50,000 acres,
- A minimum of 25,000 acres of high quality habitat in one block should be a goal,
- Goal of at least 70% good to high quality habitat within each focal area,
- Focal areas should strive to be <20 miles apart to provide connectivity for genetic and population support, and
- Connectivity zones connecting focal areas should provide suitable habitat to support movements by LEPC.

The science team made recommendations for connectivity zones to allow linkage among focal areas. Focal areas should be no more than 20 miles apart and linked with connectivity zones having certain minimum conditions. An exception is linkage between the sand shinnery oak ecoregion with the other three ecoregions. Connectivity zones should strive to maintain 40% of the area as LEPC habitat. Habitat patches should be no further than 2 mi. apart. Connectivity zones can be variable in width, but optimally would be approximately 5 miles in width. Connectivity zones should avoid or minimize the number of barriers they contain, including anthropogenic structures crossing connectivity zones that may serve as barriers. Where these must occur, they should be placed to minimize their effects on movements of LEPC

Each state was tasked with delineating focal areas for the state. Based on the population goals allocated to each ecoregion, each state implementation team developed a draft map of focal areas (Figure 2). Details of the focal areas are presented in Tables 1 and 2.

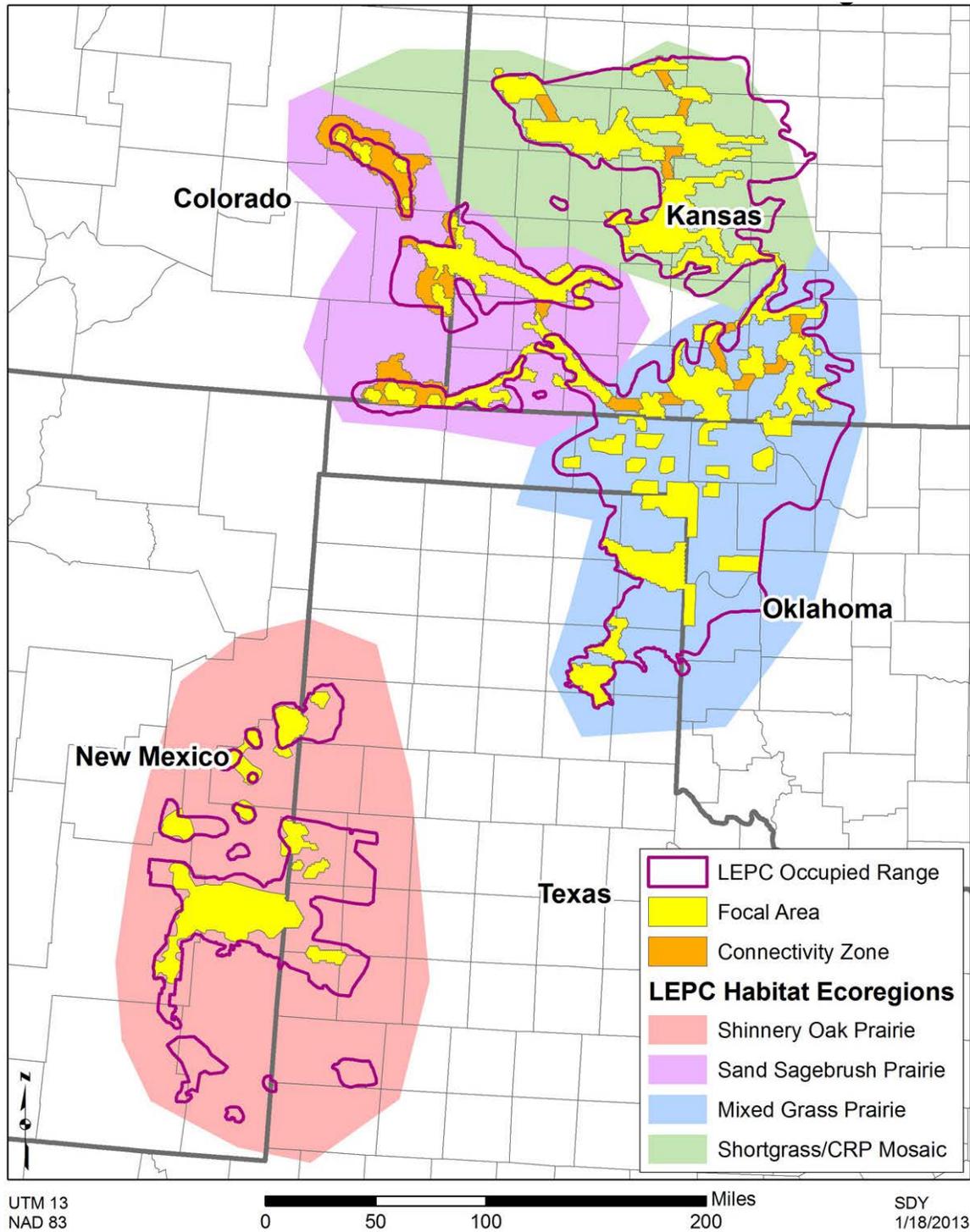


Figure 2. Map of focal areas where LEPC habitat improvements actions will be concentrated and development activities minimized.

Table 1. Focal area total acreage delineations for each state compared to acreage of estimated historical range and estimated current occupied range.

State	Historical Range (ac)	Current Occupied Range (ac)	% Current of Historical	Focal Area Goal (ac)	Focal Area Delineation (ac)	% Focal Delineated of Historical	% Focal Delineated of Current
Colorado	5,414,400	1,101,545	20.3%	411,429	361,654	6.7%	32.8%
Kansas	18,967,040	8,997,133	47.4%	3,931,429	3,924,870	20.7%	43.6%
Oklahoma	16,915,200	4,018,883	23.8%	685,714	748,870	4.4%	18.6
Texas	58,414,720	3,573,468	6.1%	942,857	962,885	1.6%	26.9
New Mexico	12,990,720	2,084,979	16.0%	1,114,286	1,286,465	9.9%	61.7%
Total	117,020,800	19,776,008	16.9%	7,085,715	7,284,744	6.2%	36.8%

Table 2. Population and focal area delineations by ecoregion. Population data were from the 2012 range-wide aerial monitoring survey.

Ecoregion	Population Goal (% of total goal)	Focal Area acreage goal	Estimated # of leks (from survey)	Estimated Population (from survey)	Focal Area Delineation (acres)	% of Focal Area Delineated	% of surveyed leks in ecoregion	% of surveyed pop. in ecoregion
Sand shinnery oak	8,000 (11.9%)	1,371,429	428	3,699	1,559,261	21.4%	13.5%	10.0%
Sand sagebrush	10,000 (14.9%)	1,371,429	105	1,299	1,298,852	17.8%	3.3%	3.5%
Mixed-grass	24,000 (35.8%)	2,438,095	877	8,444	2,530,942	34.8%	27.6%	22.7%
Short-grass	25,000 (37.3%)	1,904,762	1,764	23,728	1,895,689	26.0%	55.6%	63.8%
Totals	67,000	7,085,714	3,174	37,170	7,284,744	100%	100%	100%

Focal Area Strategy

Focal area delineations include approximately 37% of the currently estimated occupied range and approximately 6% of the historical range of LEPC. Focal areas will only be effective if conservation efforts can be concentrated in these areas, and if development can be minimized in them as well. While additional LEPC are expected outside of focal areas (focal areas are expected to provide for at least 75% of the population goal), focal areas will provide the blocks of habitat that will be source areas for the species and should ensure a sustainable and well distributed population into the future. The conservation strategy depends on the ability of incentive programs to engage landowners in implementing voluntarily LEPC habitat improvements, especially within focal areas where large blocks of good to high quality habitat can be restored and maintained. It also depends on the avoidance and

minimization of impacts to LEPC from energy and other developments especially within focal areas.

The conservation strategy for LEPC can be divided into these two management components; programs to maximize delivery of habitat improvements; and programs to avoid, minimize, and mitigate impacts from development to LEPC. Both of these components are designed to work in a voluntary framework.

Habitat Improvement Programs

Various habitat improvement programs and initiatives are available for LEPC at Federal, state, and local levels. The USFWS (2012a) provided a good description of many of the on-going programs and initiatives. An important part of an effective LEPC conservation plan is coordination among the various programs and initiatives. Coordination is needed at all levels of plan implementation, but is especially important for various range-wide initiatives as well as within each of the 5 states.

It is important that programs designed to improve conditions for LEPC in focal areas consistently provide good to high quality habitat through their actions. Focal areas will only serve their function as source areas for the population if they provide this good to high quality habitat. Habitat conditions for LEPC are often labeled as “suitable” habitat, implying that an area can support LEPC. However, supporting LEPC and providing good to high quality habitat can be substantially different. Therefore, programs designed to maintain or improve habitat for LEPC should have clear objectives for the desired conditions for the site. Boxes 1-3 provide descriptions of desired habitat conditions in sand shinnery oak, sand

sagebrush, and mixed grass prairie communities. In all areas, desired conditions should provide a mix with the majority of the area in nesting habitat intermixed with 25-35% in brood habitat (Hagen et al. in review). Management of the sites to produce optimum conditions should include prescribed grazing regimes that generally include light grazing using <25% of the annual herbaceous production and leaving substantial residual herbaceous vegetation. While interspersions is not well defined in the literature, hens should be able to find good patches of brood habitat within ¼ mi. of good patches of nesting habitat. Prescribed burning is encouraged as an effective practice

Box 1. Optimal LEPC habitat in sand shinnery oak ecosystems

Nesting habitat

1. *Absolute cover of sand shinnery oak: >30% but <50%*
2. *Absolute cover of preferred grasses (native bluestems, switchgrass, indiagrass, and sideoats grama): >20%*
3. *Absolute cover of a good mix of species of native forbs: >10%*
4. *Grass should average >15” in height*

Brood habitat

1. *Absolute cover of sand shinnery oak: 10-25%*
2. *Absolute cover of preferred native grasses: >15%*
3. *Absolute cover of a mix of native forbs: >20%*
4. *Grass should average >15” in height*
5. *Shrub, grass and forb understory open enough to allow movements of chicks.*

Box 2. Optimal LEPC habitat in sand sagebrush ecosystems
Nesting habitat

1. *Absolute cover of sand sagebrush: 15-30%*
2. *Absolute cover of preferred native grasses: >30%*
3. *Absolute cover of a mix of native forbs: >10%*
4. *Grass should average >15" in height*

Brood Habitat

1. *Absolute cover of sand sagebrush: 10-25%*
 2. *Absolute cover of preferred native grasses: >20%*
 3. *Absolute cover of a mix of native forbs: >20%*
 4. *Grass should average >15" in height.*
 5. *Shrub and grass cover should be open enough near the ground to allow easy movement of chicks*
-

to maintain a mosaic of brood and nesting habitat. CRP planted to LEPC preferred native grasses can provide high quality habitat. Intermediate CRP treatments such as prescribed burning or prescribed grazing can keep these grasslands with enough diversity of conditions to support nesting and brood habitat. Detailed descriptions of prescribed grazing, prescribed burning, and herbicide use to improve for LEPC habitat are included in the Appendix (see Appendix X).

Federal Programs

Five Federal agencies have programs or initiatives that directly relate to delivery of LEPC habitat improvement. These 5 agencies are the Natural Resource Conservation Service (NRCS), Farm Service Agency (FSA), U.S. Fish and Wildlife Service (USFWS), Bureau of Land Management

(BLM), and the U.S. Forest Service (USFS).

Natural Resource Conservation Service and Farm Service Agency Programs

In 2010, NRCS launched the Lesser Prairie-Chicken Initiative (LPCI). This initiative has the objective "to increase the abundance and distribution of the Lesser prairie-chicken and its habitat while promoting the overall health of grazing lands and the long-term sustainability of ranching operations" (http://www.nrcs.usda.gov/Internet/FS_E_DOCUMENTS/stelprdb1047025.pdf). In Addition to NRCS technical service providers, LPCI has partnered with various agencies and organizations to help to deliver the program to landowners through cooperative

Box 3. Optimal LEPC habitat in mixed and short grass ecosystems
Nesting habitat

1. *Absolute cover of preferred native grasses: >50%*
2. *Absolute cover of a mix of native forbs: >10%*
3. *Grass averages >15" in height*

Brood habitat

1. *Absolute cover of preferred native grasses: 40-60%*
 2. *Absolute cover of a mix of native forbs: >20%*
 3. *Grass averages >15" in height.*
 4. *Grass is not so dense to impede movement of chicks*
-

efforts. Partnering agencies and organizations include:

- Colorado Division of Wildlife
- Kansas Department of Wildlife, Parks and Tourism
- Kansas Forest Service
- New Mexico Department of Game and Fish
- Oklahoma Department of Wildlife Conservation
- Texas Parks and Wildlife Department
- LPC Interstate Working Group
- National Fish and Wildlife Foundation
- National Wildlife Foundation
- Pheasants Forever
- Playa Lakes Joint Venture
- Rocky Mountain Bird Observatory
- The Woods Foundation
- Texas Wildlife Association, and
- The Nature Conservancy

LPCI is funded through the NRCS Conservation Technical Assistance Program, Environmental Quality Incentives Program (EQIP) and Wildlife Habitat Incentive Program (WHIP) in helping producers apply practices including, but not limited to, brush management, prescribed grazing, range planting, prescribed burning and restoration of rare and declining habitats. Table 3 lists the funding provided through LPCI from 2010-2012.

In 2012, NRCS working with the USFWS initiated the Working Lands for Wildlife program that incorporated the LEPC as one of its 7 focus species and the LPCI as its delivery program. “Working Lands for Wildlife is a new partnership between NRCS and the U.S. Fish and Wildlife Service (FWS) to use agency technical expertise combined with \$33 million in financial assistance from the Wildlife Habitat Incentive Program to combat the decline of seven specific wildlife species whose decline can be reversed and will benefit other species with similar habitat needs” (<http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/?&cid=stelprdb1046975>).

Under this program landowners are provided with technical assistance, financial assistance to implement practices, and provided with regulatory assurances. “Under the WLFW partnership, federal, state and wildlife experts jointly identified at-risk or listed species that would benefit from targeted habitat restoration investments on private lands. Using the best available science, these wildlife experts prioritized restoration actions on a large regional scale to focus assistance most cost effectively. The federal government will grant farmers, ranchers and forest landowners regulatory predictability in return for voluntarily making wildlife habitat improvements on their private agricultural and forest lands. Participating producers must adhere to the requirements of each conservation

Table 3. Contracts and funding through NRCS's LPCI program, listed by state for 2010-2012.

Contract Year	State	Contracts	Acres	Amount (\$)
2010	KS	64	28,280	\$1,525,789
2011	KS	43	19,464	\$1,378,072
2012	KS	36	35,659	\$1,377,897
2010	CO	6	33,815	\$365,317
2011	CO	5	17,563	\$423,356
2012	CO	3	33,883	\$484,775
2010	OK	20	19,305	\$645,532
2011	OK	26	28,500	\$906,460
2012	OK	13	28,697	\$1,439,684
2010	TX	231	165,352	\$5,563,556
2011	TX	205	222,777	\$6,868,732
2012	TX	21	48,780	\$817,877
2010	NM	2	12,571	\$234,459
2011	NM	17	164,594	\$1,313,162
2012	NM	9	83,332	\$1,186,590
Totals		701	942,572	\$24,531,258

practice during the term of their contract, which can last from one to 15 years. If landowners would like to receive regulatory predictability for up to 30 years, they must maintain the conservation practices as outlined in the NRCS and FWS agreement" (<http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/?cid=stelprdb1048842>). This combination of Federal dollars for funding technical assistance and implementation of practices combined with partnering agency and organization funding of technical service providers and the regulatory assurances provided through the NRCS/USFWS agreement is a powerful voluntary, incentive-based initiative that is producing good results in terms of on-the-ground management of LEPC habitat.

NRCS has worked with the USFWS to ensure the assistance provided through the LPCI and all NRCS technical and financial assistance will provide long term benefits to LEPC and LEPC habitat. A conference report was entered into with the Service on June 30, 2011 that ensures practices implemented will provide for the long term benefit of LEPC habitat. The NRCS is currently working with the Service to roll this Conference Report into a Conference Opinion which will continue to provide insurances for NRCS assistance should the LEPC be listed as threatened.

NRCS also has other Farm Bill conservation programs that can be applied to LEPC management,

specifically the EQIP, WHIP, and the Grassland Reserve Program (GRP), while the Farm Service Agency administers the Conservation Reserve Program (CRP) including the State Acres for Wildlife Enhancement (SAFE) Program.

WHIP is a program offering technical and financial assistance to landowners to voluntarily develop and improve wildlife habitat on private lands. Participants work with NRCS and their local conservation district to develop a wildlife habitat development plan and contract. The plan describes the landowner's goals for improving wildlife habitat, includes a list of practices and a schedule for installing them, and specifies the steps necessary to maintain the new habitat for the life of the agreement. All privately owned rural lands are eligible for participation in WHIP. For more information see: <http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/financial/whip/?&cid=STELPRD B104697>.

EQIP is a voluntary conservation program that promotes agricultural production, forest management, and environmental quality as compatible goals. Through EQIP, farmers and ranchers may receive financial and technical assistance to install or implement structural and management conservation practices on eligible agricultural land. The NRCS administers EQIP with funding coming from the Commodity Credit Corporation. EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practice and a maximum term of 10 years. EQIP activities are carried out according to a conservation plan of operations developed with the program participants. For more information see:

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/>.

GRP is a voluntary program offering landowners the opportunity to protect, restore, and enhance grasslands on their property. The NRCS and Farm Service Agency (FSA) coordinate implementation of GRP, which helps landowners restore and protect grassland, rangeland, pastureland, shrubland and certain other lands and provides assistance for rehabilitating grasslands. The program will conserve vulnerable grasslands from conversion to cropland or other uses and conserve valuable grasslands by helping maintain viable ranching operations. For more information see:

http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/easements/grassland/?cid=nrcs143_008401.

CRP is a voluntary program for agricultural landowners administered by the FSA. Through CRP, agricultural producers can receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible farmland. The Commodity Credit Corporation (CCC) makes annual rental payments based on the agriculture rental value of the land, and it provides cost-share assistance for up to 50 percent of the participant's costs in establishing approved conservation practices. Participants enroll in CRP contracts for 10 to 15 years. For more information see: <http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp>.

SAFE is a new CRP continuous signup practice offered by the FSA. SAFE has been used in all 5 of the states supporting LEPC to target improvements for the species. Information on SAFE is available at: http://www.fsa.usda.gov/Internet/FSA_File/safe08.pdf. As reported by the USFWS (2012a:73830): "Areas allocated for the SAFE program vary by State and are as follows: Colorado 8,700 hectares (ha) (21,500 acres (ac)); Kansas 12,141 (30,000 ac); New Mexico 1,052 ha (2,600 ac); Oklahoma 6,111 ha (15,100 ac); and Texas 31,727 (78,400 ac). Total potential enrollment in SAFE program is 59,731 ha (147,600 ac) or about 1 percent of the current estimated occupied range."

U.S. Fish and Wildlife Service

The USFWS has its Partners for Fish and Wildlife Conservation Program. The Partners Program restores, improves and protects fish and wildlife habitat on private lands through partnerships between the USFWS, landowners and others. The objectives of this national program are to:

- Restore, enhance and manage private lands for fish and wildlife habitat
- Significantly improve important fish and wildlife resources while promoting compatibility between agricultural and other land uses
- Restore declining species and habitats
- Promote a widespread and lasting land use ethic.

Projects that benefit LEPC and other wildlife can fit well with most farming and ranching operations. Typical conservation practices directed to LEPC habitat conservation include invasive species removal (eastern redcedar, non-native grasses), fence marking or removal, native vegetation planting, prescribed fire, and brush control. Through the Partners Program, the USFWS provides technical assistance and financial incentives to landowners that improve the state of LEPC and important habitat on their property. Cooperating landowners agree to use funds for approved wildlife related projects, manage and maintain the project area for at least 10 years for the benefit of wildlife, and control livestock grazing in the project area. The program provides technical and financial assistance through a 10-year cost-share agreement (up to \$20,000 per landowner at a maximum federal cost share of 65%). Landowners agree to maintain the conservation practices for the duration of the agreement. More information is available at: <http://www.fws.gov/partners/>.

Candidate Conservation Agreement with Assurances (CCAA)

A CCAA is a formal agreement between the USFWS and one or more parties to address the conservation needs of proposed or candidate species, or species likely to become candidates before they become listed as endangered or threatened under the Endangered Species Act (ESA). Property owners voluntarily commit to conservation actions that will help stabilize or restore the species with the goal that listing will become unnecessary. The goal of CCAA's is that conservation can preclude the need for federal listing as threatened or endangered or can occur before the species status has become so dire that listing is necessary.

CCAA's related to LEPC habitat improvements provide landowners with assurances that if they apply good conservation practices for LEPC, they will not incur additional restrictions because they have LEPC

on their lands, should LEPC be listed by the USFWS at a later date. Currently, the USFWS has landowner CCAA's in place in NM and TX, with an additional CCAA being implemented in OK. A CCAA may benefit property owners in several ways. First, if the conservation actions preclude listing, no regulatory programs that could occur through ESA are implemented. Second, if the conservation actions are not sufficient and the species is listed, the CCAA automatically becomes a permit authorizing the property owner's incidental take of the species, covering any adverse effects of the landowners' normal activities on the species. Thus, the CCAA provides property owners with assurances that they will not face future additional conservation measures or restrictions beyond those they agree to at the time they enter into the Agreement. Third, for property owners who want to conserve the species or want to manage habitat on their land, the Agreement provides an avenue to potential federal or state cost-share programs. To enter into a CCAA, a landowner would be required to agree to implement an approved conservation plan that would achieve a net conservation benefit to LEPC habitat. The Agreement is a powerful incentive for landowners to participate in conservation actions that benefit the species. For more information see: <http://www.fws.gov/endangered/what-we-do/cca.html#cca>. CCAA's are also a tool to address voluntary conservation actions by developers, as discussed below.

Bureau of Land Management

The BLM manages lands within the occupied range of LEPC and in delineated focal areas, especially in New Mexico, as well as having regulatory responsibility for Federal oil and gas permitting. Where it has management control of lands, it can make substantial contributions towards LEPC habitat. In New Mexico, the BLM has implemented a Special Status Species Resource Management Plan for the LEPC, and as part of this plan, has established an LEPC Habitat Preservation Area of Critical Environmental Concern

(http://www.blm.gov/pgdata/etc/medialib/blm/nm/field_offices/roswell/rfo_planning/special_status_species.Par.34868.File.dat/pdf_sss_rod_rmpa_May_2008.pdf). This plan specifies decisions regarding oil and gas leasing and development within the plan area, off-highway vehicle use, land ownership adjustments, and wildlife habitat management. It addresses the management of all resources and uses on approximately 850,000 surface acres of public lands and approximately 1,150,000 acres of Federal mineral estate in the Planning Area located in southeastern New Mexico. The plan established the 58,000 acre Lesser Prairie-Chicken Habitat Preservation Area of Critical Environmental Concern (ACEC). The purpose of this ACEC is to maintain and enhance habitat for the lesser prairie-chicken and sand dune lizard. The plan describes areas that should be avoided from future energy developments, describes the desired plant communities that should be the goal of vegetation treatments and grazing plans, and recommendations for other land uses such as off-highway vehicles. As part of the oil and gas recommendations, it includes a description of best management practices.

U.S. Forest Service

The USFS manages national grasslands within the occupied range of LEPC, with some of these lands occurring within delineated focal areas. In particular, the Cimarron National Grassland in Kansas and the Comanche National Grasslands (NG) in Colorado can make substantial contributions towards LEPC habitat in these states. The Comanche NG encompass more than 444,000 acres in southeastern CO. An analysis conducted by Rondeau and Decker (2010) found vegetation conditions on a 9,300 acre high

priority area for LEPC generally within the range suitable for LEPC habitat although lacking in preferred bluestem grass species. However, they noted low LEPC populations in the area possibly as a result of the severe winter of 2006-2007. While both the Comanche and Cimarron NG's are still operating under a forest plan developed in 1984, both recognize the importance of management of LEPC habitat. The Comanche NG has instituted some changes in grazing rotations in designated LEPC grazing allotments to enhance LEPC habitat. The Cimarron NG in southwestern Kansas is 108,175 acres in size and is one of the largest areas of public land in Kansas and the only area managed by the U.S. Forest Service. The Cibola National Forest administers four National Grasslands: Black Kettle, McClellan Creek, Kiowa, and Rita Blanca, which cover 263,261 acres in northeastern New Mexico, western Oklahoma, and northern Texas. The Black Kettle NG include over 30,000 in western OK and while these acres are divided into smaller parcels of Federal ownership, provide opportunities for improvements to LEPC habitat.

Regional Organizational or Interagency Programs

Western Association of Fish and Wildlife Agencies Lesser Prairie Chicken Interstate Working Group

The Western Association of Fish and Wildlife Agencies (WAFWA) has its LEPC Interagency Working Group (IWG) that coordinates LEPC management among the 5 states within the range of this species. This group has been working for many years on coordination of activities. It previously developed a detailed report on range-wide status of the LEPC (Davis et al. 2008), and has led the development of the Southern Great Plains Crucial Habitat Assessment Tool, discussed below. It is currently responsible for coordinating the development of this range-wide plan.

Southern Great Plains Crucial Habitat Assessment Tool

The Western Governors' Wildlife Council is creating the Western Wildlife Crucial Habitat Assessment Tool (CHAT). The purpose of the CHAT is to provide greater "certainty and predictability to planning efforts by establishing a common starting point for discussing the intersection of development and wildlife". As a subset of this effort the Southern Great Plains CHAT is being developed. The Southern Great Plains CHAT has been led by the Oklahoma Department of Wildlife Conservation and the Kansas Department of Wildlife, Parks and Tourism along with the LEPC IWG, Playa Lakes Joint Venture, and USGS. The project is modeling LEPC habitat and developing an online tool usable by conservation managers, industry, and the public that identifies priority areas (<http://kars.ku.edu/geodata/maps/sgpchat/>). The CHAT is an important tool for implementation of the range-wide LEPC conservation plan.

The LEPC CHAT has been developed to identify different levels of priority areas that can help guide locations to concentrate habitat improvements as well as helping locate appropriate locations for energy and other developments. The current map of LEPC habitat in the CHAT includes 5 categories:

Category 1 (Irreplaceable): Habitat that is rare or fragile and is essential to achieving and/or maintaining LEPC population viability.

Category 2 (Limiting): Habitat which is limiting to LEPC populations or metapopulations. Loss of any of this habitat could result in a significant local or population-level decline in species distribution, abundance, or productivity.

Category 3 (Significant): Habitat, including wildlife corridors, that contributes significantly to the maintenance of LEPC populations or metapopulations. Loss of a significant portion of the habitat or corridor could result in local or population-level declines in species distribution, abundance, or productivity.

Category 4 (Unknown): Lands likely to have significant value to the LEPC, but for which there are insufficient data or a lack of information about the importance of the habitat in meeting conservation objectives.

Category 5 (Common): Habitat which is relatively common, generally less limiting to LEPC populations or metapopulations, and generally better suited for land use conversion.

The CHAT is being revised to better integrate with the range-wide plan. Specifically, delineated focal areas and their linkage zones will be added. Focal areas will have the highest quality rating, followed by irreplaceable habitat outside of focal areas combined with linkage zones, limiting habitat, significant habitat, and common habitat.

The CHAT is envisioned to work in several ways. First, it will be used to help steer conservation programs to concentrate benefits in the most important areas. The strategy behind the focal areas is to build and maintain large blocks of high quality habitat to provide population source areas for LEPC. Habitat improvement programs will have ranking criteria for allocation of funds where locations in focal areas will receive extra selection “points” over other categories. Similarly, irreplaceable habitat outside of focal areas and linkage zones will receive extra selection points, but not as many as focal areas, with each additional category similarly weighted. This will not exclude habitat improvement work from occurring outside of focal areas, but will ensure that building large blocks of habitat is encouraged. The CHAT will also help function in indicating where development activities should be avoided and where these activities should be encouraged. A metric system that quantifies both impacts and mitigation benefits (see section below on mitigation metrics) will be linked to the various CHAT categories in assigning multipliers of impact debits or mitigation credits depending on the location of the impact or mitigation site. In this way, developments are encouraged to be placed in areas with lower CHAT ratings while mitigation actions are encouraged to occur in more highly weighted CHAT categories.

Playa Lakes Joint Venture

Playa Lakes Joint Venture (PLJV) is a regional partnership of federal and state wildlife agencies, conservation groups and private industry dedicated to conserving bird habitat throughout the western Great Plains- including portions of Colorado, Kansas, Nebraska, New Mexico, Oklahoma and Texas. PLJV has several ongoing programs that provide conservation benefits to LEPC including the

development of spatially explicit decision support tools in collaboration with the NRCS and FSA; coordination, support and funding for private lands biologists that help deliver habitat in the LEPC region; promotion and funding of local and state prescribed burn associations in Kansas and Oklahoma; and coordination and hosting of a monthly conference call on LEPC to allow exchange of information about ongoing conservation efforts. PLJV was a facilitating partner in the development of the Southern Great Plains CHAT. In addition, PLJV is a member of collaborative groups in Colorado and New Mexico that developed siting guidance for wind energy developers and associated best management practices documents.

National Fish and Wildlife Foundation

The National Fish and Wildlife Foundation (NFWF) in partnership with NRCS initiated a new funding program in 2011 called the Private Land Technical Assistance Program. The purpose of this partnership is to provide grants on a competitive basis to support field biologists and other habitat professionals (botanists, ecologists, foresters, etc.) working with NRCS field offices in providing technical assistance to farmers, ranchers, foresters and other private landowners to optimize wildlife conservation on private lands. One of the funding priorities of this program was the short grass prairie with a specific focus on helping deliver programs to improve LEPC habitat.

Pheasants Forever

Pheasants Forever (PF) is dedicated to the conservation of pheasants, quail and other wildlife through habitat improvements, public awareness, education and land management policies and programs. In 2009, the North American Grouse Partnership joined with Pheasants Forever, Quail Forever, Theodore Roosevelt Conservation Partnership, Ecosystem Management Research Institute, American Bird Conservancy, and the Mule Deer Foundation to launch the Prairie Grouse Partners, a conservation partnership with an aggressive goal of restoring 20 percent of North America's native grasslands. This effort would result in 60 million acres of improved habitat for a wide range of wildlife, including three species of prairie grouse and pheasants. In support of this and its other habitat management efforts, PF has been an active partner in funding cooperative technical service provider positions with NRCS and state wildlife agencies. A number of these positions are within the range of LEPC and help deliver NRCS LPCI and other LEPC habitat improvement programs. In this cooperative effort, Farm Bill Wildlife Biologists are employed by PF but work out of NRCS offices. In 2012, PF had 10 biologists in four of five states helping provide technical services within the range of LEPC. The biologists provide direct technical assistance to producers and offer full service in implementing all phases of local programs provided through NRCS, FSA, state fish and wildlife agencies and other partners. This is one of several ways that PF is fulfilling its commitment to the Prairie Grouse Partners effort.

Rocky Mountain Bird Observatory (RMBO)

RMBO is a nonprofit organization that conserves birds and their habitats through science, education and stewardship efforts across the western United States and Mexico. RMBO has been working on grassland bird conservation on private lands for more than a decade including LEPC outreach and management. RMBO works in partnership with the Colorado Parks and Wildlife and Colorado Natural Resources Conservation Service (NRCS) to host and support two biologists through the Strategic

Watershed Action Team and Private Lands Wildlife Biologist program, respectively. These positions provide technical assistance to NRCS and landowners in Colorado to deliver NRCS (Lesser Prairie Chicken Initiative (LPCI) and other wildlife and habitat programs. Efforts include promoting grazing compatible with LEPC and landowner goals, conservation easements, creation and enhancement of LEPC habitat thru CRP, and leveraging of partner funding, among other benefits. In addition, RMBO partner positions play a key role in LPCI project monitoring, as well as assisting with annual lek surveys. Both positions are active in the Colorado LEPC working group and work hand-in-hand with NRCS state office staff on review of LPCI policy and implementation. RMBO has various landowner programs and tools that encourage grassland stewardship and promote enhancement of LEPC habitat. RMBO has partnered with several agencies and organizations to provide fence marking kits to help reduce the risk of LEPC collisions with fences, improve seed mixes, provide financial assistance with cost-share on LPCI project and provide wildlife escape ladders for stock water tanks.

Land Trusts

Various land trusts and other organizations have active programs to support conservation easements for private lands within LEPC range. Three land trusts collaborated in a focused effort to help LEPC through application of a NFWF grant. The Colorado Cattlemen's Agricultural Land Trust (CCALT), the Ranchland Trust of Kansas (RTK), and the Texas Agricultural Land Trust (TALT) are working to obtain conservation easements on ranchlands that can provide long term assurances for LEPC habitat. CCALT protects productive agricultural lands and the conservation values they provide by working with ranchers and farmers, thereby preserving Colorado's ranching heritage and rural communities. CCALT was started in 1995 by the Colorado Cattlemen's Association, who saw a need for a land trust to serve the farming and ranching community. Since inception, it has partnered with over 265 landowners to protect over 394,000 acres throughout the state of Colorado (www.ccalt.org). RTK is a land trust affiliated with the Kansas Livestock Association (KLA). KLA, formed in 1894, is a trade association that represents the state's multi-billion dollar cattle industry at both the state and federal levels, with a focus on legislative and regulatory issues. In 2003, KLA leaders formed RTK as a separate charitable conservation organization, with a mission to preserve Kansas' ranching heritage and open spaces for future generations through the conservation of working landscapes (www.klaranchlandtrust.org). TALT was founded in 2007 by leaders from the Texas Farm Bureau, Texas & Southwestern Cattle Raisers and Texas Wildlife Association. Today it holds easements on approximately 128,000 acres throughout Texas (www.txaglandtrust.org). TNC also offers conservation easements to interested landowners throughout LEPC range. In Kansas, TNC is in partnership with RTK in a program seeking to conserve mixed grass communities.

State Programs

As mentioned, much of the habitat improvement work for LEPC occurs through management programs administered at the state level, both in terms of the actual delivery of Federal agency programs by the NRCS, FSA, and USFWS as well as state agency programs and additional programs of conservation districts, conservation organizations, and others. Therefore, coordination of programs at a state level is extremely important to maximize delivery of LEPC habitat improvements within each state.

Oklahoma

Oklahoma Department of Wildlife Conservation (ODWC) has programs directed towards LEPC management. In 2011, at the request of the state legislature, ODWC began development of the Oklahoma Lesser Prairie Chicken Conservation Plan (Haufler et al. 2012; [www.wildlifedepartment.com/wildlifemgmt/lepc/Final OK LEPC Mgmt Plan 23Oct2012.pdf](http://www.wildlifedepartment.com/wildlifemgmt/lepc/Final_OK_LEPC_Mgmt_Plan_23Oct2012.pdf)) and completed the plan in 2012. The plan followed a collaborative process involving agencies, organizations, universities, industry, interest groups and the public in its development. It established a state LEPC science team to provide recommendations on population and habitat needs. It also established an LEPC implementation team to coordinate delivery of LEPC programs to landowners. A number of meetings were held with groups of stakeholders as were two series of 3 public meetings to obtain input to the plan. The plan was available for public review on the ODWC website, and numerous comments were received and addressed.

ODWC has a number of programs that it administers to provide technical and financial assistance to landowners to undertake conservation projects that benefit grasslands and restore and enhance habitats important to the LEPC. It also has programs and tools that assist with addressing impact evaluations and mitigation.

The ODWC LEPC Habitat Conservation program was designed to help private landowners develop, preserve, restore, enhance and manage LEPC habitat on their land. Landowners receive technical and cost-share financial assistance to develop and maintain LEPC habitat. Eligible conservation practices include brush management, water development, native grass planting, fence marking and removal, fire break construction and prescribed fire. Landowners work with ODWC to develop a habitat management plan and enter into a contract that specifies the conservation projects that will be accomplished. For more information see: <http://www.wildlifedepartment.com/wildlifemgmt/lepchcp.htm>

Through the State Wildlife Habitat Improvement Program (SWHIP), ODWC provides cost share assistance for specific habitat improvement practices. Under the SWHIP, landowners enter into 10-year contracts with ODWC for approved projects to develop, preserve, restore and manage wildlife habitat on private lands. ODWC shares part of the cost of habitat improvement work, based on allowable costs determined by the NRCS. In exchange, the landowner agrees to maintain the habitat for a period of 10 years. For more information see: <http://www.wildlifedepartment.com/wildlifemgmt/wildlifehabitat.htm>

The ODWC Quail Enhancement Program focuses on improving quail habitat and increasing the public's knowledge of bobwhite biology, habitat requirements and management. Improvements to quail habitat will also provide many benefits to LEPC, although the habitat requirements of the two species do differ in a number of ways. Technical assistance to improve habitat is available to landowners free of charge by ODWC biologists, including on-site visits and management recommendations. Any landowner in the state of Oklahoma is eligible for technical assistance, regardless of property size. For more information see: <http://www.wildlifedepartment.com/wildlifemgmt/quailenhancement.htm>.

Through the Voluntary Offset Program (VOP), developers can enter into voluntary agreements with the ODWC and make financial contributions to a habitat conservation fund to help offset acknowledged impacts to wildlife habitat from development activities. The VOP is a voluntary mechanism to accomplish offsite mitigation and has been used to offset or partially offset acknowledged impacts to LEPC habitat. Examples include two agreements and payments made by Oklahoma Gas and Electric Company in 2009 and 2010 using a ratepayer impact assessment to provide compensation for two adjacent wind facilities, and a March 2012 agreement with Chermac Energy Corporation to compensate for a planned 55 mile high voltage transmission line.

The Oklahoma LEPC Spatial Planning Tool (Horton et al. 2010) is a spatially explicit model designed to assist development planning by providing developers with information that will allow them to avoid, minimize and mitigate negative effects of development on LEPC in Oklahoma. The tool was developed through a cooperative multi-party effort to promote voluntary habitat conservation actions and to prioritize agency management actions. See

www.wildlifedepartment.com/lepcdevelopmentplanning.htm

The Oklahoma Association of Conservation Districts (OACD) has established a wildlife credit program to provide landowners with stewardship payments for work done to protect and expand the habitat of LEPC. This pilot program is funded through a NRCS Conservation Innovation Grant (CIG). See: www.okconservation.org.

In addition to these programs, ODWC is working with other agencies and organizations to coordinate delivery of conservation benefits, particularly within its delineated focal areas. ODWC, NRCS, and USFWS Partners personnel have coordinated their efforts to identify ways that various programs may be able to complement each other and provide higher levels of match to landowners than individual programs might be able to individually. They have also worked to provide “one-stop-shopping” for landowners so that whichever agency may get approached for technical assistance, the person responding can provide information on all of the available programs that the landowner might use. Coordinated management plans that include all of the programs are being standardized and applied.

ODWC has been working with the USFWS to provide a CCAA for landowners who engage in LEPC habitat improvements. The proposed landowner CCAA was listed in the Federal Register on June 25, 2012. OCWC will be the permit holder, and be able to offer management assurances to landowners who voluntarily agree to implement a LEPC management plan for their property.

Other agencies and organizations in Oklahoma are helping provide LEPC habitat. The Oklahoma Prescribed Burning Association has been working to help landowners better utilize this tool through training programs, coordination of local prescribed burning associations, and identification of liability insurance options. The Nature Conservancy offers conservation easements for interested landowners as well as managing some of its own lands for LEPC. ODWC has a number of wildlife management areas within LEPC range, and is developing management plans for these areas that emphasize the enhancement of LEPC habitat. The USFS manages the Black Kettle National Grasslands which also help provide habitat for LEPC.

Kansas

Kansas has been targeting coordinated management towards LEPC for some time. Kansas Department of Wildlife, Parks, and Tourism (KDWPT) staff has coordinated with NRCS and USFWS Partners in coordinating delivery of LEPC habitat improvements for a number of years. In September 2012 a more formal Kansas LEPC implementation team was convened. This team included numerous representatives from KDWPT and NRCS as well as representatives from USFWS Partners program, USDA FSA, Kansas State University (KSU) Extension, TNC, and the U.S. Forest Service. At this meeting, all parties agreed that coordination of programs with a concentration in focal areas was a priority. The concept of one-stop-shopping would be enhanced through development of a 1-2 page handout for landowners that all technical service providers would have that describes all of the available LEPC programs. Information on the plan and landowner opportunities would be provided on a LEPC webpage maintained by KSU Extension. The implementation team developed a map of focal areas following the guidelines from the IWG. An annual meeting of all technical service providers for LEPC will be coordinated to review available programs and to make sure that all providers are up to date on the available programs.

Three public meetings were held within the LEPC range in Kansas in late September 2012 to provide the public and especially landowners with information about development of the plan and opportunities for involvement in LEPC conservation. Input from the meetings will assist the KS Implementation Team in improving LEPC habitat.

Kansas has a number of programs available for helping improve LEPC habitat. The Federal programs (CRP, SAFE, LPCI, and USFWS Partners) are all very important for LEPC in Kansas. The U.S. Forest Service has 108,000 acres in the Cimarron National Grasslands in Kansas. The 5 year plan for these grasslands includes LEPC as one of its indicator species. These lands will be considered in focal area delineations.

KDWPT has several programs that can deliver habitat improvements to LEPC. KDWPT's Upland Game Bird – Habitat Improvement Program allows for KDWPT biologists and private landowners to work together in the development of habitat management plans. This program provides a 75% match for practices that can improve LEPC habitat. Currently the annual budget is \$120,000. The program is focused on CRP enhancements, including cost sharing on prescribed burning, light disking, food plot establishment, forb/legume interseeding, brush removal, and providing additional Sign-Up Incentive Payment or Practice Incentive Payment incentives to help increase the enrollment in several Continuous CRP practices. Additional focus has been to provide cost share for the conversion of cropland to native grass, converting cool season grasses to native warm season grass, hedgerow renovation, wetland development, and deferred grazing on native rangeland.

KDWPT secured a State Wildlife Grant (SWG) to provide cost-share assistance to private landowners interested in enhancing habitat for species of greatest conservation need, including LEPC. Those landowners approved for funding will be required to match a minimum of 25% of the total project cost. This match can be cash from non-federal source, contributions of in-kind labor (labor, equipment and

supplies) or a combination of both. This program last year had \$212,000 in funding, with 65% of the funds USFWS SWG dollars and 35% state dollars.

In partnership with FSA, NRCS, Playa Lakes Joint Venture, and others, KDWPT developed a targeted Conservation Priority Area to encourage enrollment of CRP within the LEPC current range. KDWPT provides technical assistance in planning seeding mixes and targets KDWPT WHIP cost-share towards enhancing CRP within the identified priority areas. SAFE enrollment is targeted towards LEPC through these priority areas.

The Nature Conservancy in Kansas has a Strategic Watershed Assistance Team grant from NRCS to promote EQIP and WHIP programs. They are also providing assistance to Prescribed Burning Associations such as through workshops. TNC has identified LEPC as a target species in their ecoregional plans for the Red Hills. Conservation easements are an important focus of TNC, and can help maintain LEPC habitat for the long-term. The Smokey Valley Ranch is a TNC property managed as a showcase for how a prescribed grazing program can produce habitat and grazing benefits. TNC provides outreach on EQIP and LPCI to landowners they work with.

KSU Extension has been providing public education through programs and through maintenance of a LEPC website (<http://www.ksre.k-state.edu/p.aspx?tabid=275>). KSU Extension has also been working to assist prescribed burning associations. Several Burn Coops are working within LEPC range- especially in the Red Hills, Comanche Co, and Park County. The Prescribed Fire Council of the Kansas Grazing Lands Coalition may be able to help with educational programs and other support for prescribed burning. The Comanche Pool Prairie Resource Foundation- a collaborative initiative of the USFWS Partners program is an effective habitat improvement program within LEPC range.

Colorado

CPW partners with Federal agencies in delivery of their LEPC related programs. The NRCS LPCI program has enrolled an average of 21,600 acres annually in Colorado over the last three years. The LEPC SAFE program for Colorado is available within the Action Area identified for the LPCI. Landowners may sign-up for the FSA program on a continuous basis and both 10-year and 15-year contracts are available. Approximately 7,000 acres are available for enrollment and additional allocations of acres are anticipated once available acres are used. USFWS Partners program has identified the LEPC and associated sand sagebrush as priorities in its strategic plan. Though specific dollars have not been allocated to this effort, LEPC projects have received high priority in focal areas. Annual project allocations range from \$50,000-75,000, with additional funds being resourced via grants as opportunity and need are demonstrated.

CPW is charged with increasing delivery of federal farm bill programs. This task is coordinated with partner agencies and organizations including Pheasants Forever, RMBO, and NRCS. Private Lands Wildlife Biologists are supported through cooperative funding from these agencies and organizations. Cooperative initiatives including the Private Lands Wildlife Biologist program are designed to provide

landowners with technical assistance and “one-stop shopping” for a host of federal, CPW, and non-government conservation group programs.

All known and historical leks are monitored annually. Additional reconnaissance is conducted in potentially suitable habitat to detect leks which may be currently unknown or newly established. Aerial helicopter surveys were conducted in 2011 to survey large blocks of potentially suitable habitat north of currently occupied areas in Colorado; however, no new leks were discovered.

CPW convened an implementation team meeting for LEPC that included representatives from CPW, USFWS Partners, RMBO, NRCS, U.S. Forest Service Comanche National Grasslands, Kiowa County Energy Development, and Audubon Colorado. This team has met annually in the past to discuss and coordinate LEPC management in Colorado. The team delineated LEPC focal areas for the state and reviewed proposed population goals. Public meetings on LEPC planning were held on Feb. 4, 2013 to review the listing proposal and the draft range-wide conservation plan.

CPW’s LEPC habitat improvement program (LPCHIP) was initiated in 2009. This program was specifically designed to improve and develop habitat on private lands for LEPC and other mid-grass and sand sagebrush dependent wildlife found in occupied LEPC range in southeast Colorado. Program delivery to date has been achieved through the collective and collaborative work of biologists, district wildlife managers, and the partnership farm bill biologists. Specific project identification and implementation is contracted through Pheasants Forever using their program that has been demonstrated to be efficient and effective in delivering on-the-ground conservation. Currently the LPCHIP is funded by the severance tax species conservation trust fund. Program funds are often used to provide incentives in conjunction with Federal programs to target projects that address habitat limiting factors for LEPC, almost exclusively on private lands. A small portion of funding was used for a project on the Comanche National Grasslands, administered by the U.S. Forest Service. As of June 2012, the LPCHIP implemented projects directly impacting 11,212 acres. There were an additional 7,413 acres of projects in progress and areas where there was strong landowner interest. The completed acres include 3,590 acres of CRP projects, 3,280 acres of CRP mid-contract management, 4,380 acres of grazing deferment designed to improve nesting habitat adjacent to leks, and 2,422 acres of non-CRP grass establishment.

The Nature Conservancy is currently focusing on conservation easements as one of the important tools used to protect LEPC habitat in eastern Colorado. The Conservancy is working closely with partners, including CPW and NRCS to conserve properties containing LEPC habitat. Land trusts, such as the Conservancy can apply to CPW and NRCS for funds to help with the costs associated with acquiring a conservation easement.

One of Colorado's core LEPC populations was found on the Comanche National Grasslands. CPW works closely with USFS personnel on LEPC habitat management by offering recommendations on grazing management, assisting with population monitoring on the Grasslands, and by providing equipment, materials, and manpower for LEPC habitat projects. In recent years the USFS has changed

much of their grazing management in order to provide better nesting habitat for the birds. This has included annual deferment of grazing on some pastures, reduction of stocking rates in one of the primary LEPC allotments, and conducting some patch-burn-grazing trials to assess its effectiveness as a habitat management tool for SE Colorado sand sagebrush rangelands. In partnership with CPW, the USFS has also installed large grazing exclosures around or in close proximity to its active leks. Portions within these exclosures are disked annually in order to provide patches of quality brood habitat.

Texas

Texas Wildlife and Parks Department (TPWD) provides technical assistance to landowners including development of LEPC wildlife management plans (WMP) to those interested. Implementation of a plan will allow a landowner to be included in the Texas LEPC landowner CCAA with a certificate of inclusion (CI) provided by TPWD to the landowner that will “protect the landowner from future land use restrictions that would be imposed if and when the species is listed.” Under this CCAA, “TPWD will meet with participating landowners at their request to provide continued technical assistance, including discussions of funding options, for projects that improve and maintain LPC habitat” (http://www.tpwd.state.tx.us/huntwild/lesserprairiechicken/media/lpc_ccaa.pdf). “Under this CCAA, TPWD will issue a CI to private landowners who enter into TPWD-approved WMPs for LEPC and are actively implementing conservation measures for the species. The conservation measures implemented by participating landowners would generally consist of prescribed grazing, prescribed burning, brush management, Conservation Reserve Program (CRP) and cropland management, range seeding, other upland wildlife habitat management practices, and population management techniques”.

The Landowner Incentive Program (LIP) is a TPWD program intended to help meet the needs of private, non-federal landowners wishing to enact good conservation practices on their lands for the benefit of healthy terrestrial ecosystems. LIP focuses on projects aimed at creating, restoring, protecting and enhancing habitat for migratory birds and species of greatest conservation need including the LEPC. LIP is funded through various partnerships including the U.S. Fish and Wildlife, Partners for Fish and Wildlife Program, National Fish and Wildlife Foundation and other partners. For more information see: <http://www.tpwd.state.tx.us/landwater/land/private/lip/>.

TPWD also helps coordinate other LEPC management activities within the state through partnerships with other agencies and NGOs. As a member of the Texas State Technical Action Committee, TPWD works with NRCS, FSA and other agencies and NGOs to help effectively target Farm Bill Programs for wildlife habitat. In 2011, TPWD worked with NRCS and Pheasants Forever to develop a proposal funded by the NFWF to hire three State Watershed Action Team Biologists to assist with Farm Bill program delivery and monitoring under the NRCS LPCI. In addition, TPWD recently formed the TX LEPC implementation team with representatives from TPWD, NRCS, FSA, Texas AgriLife Extension, Texas General Land Office and USFWS. The intent of this team is to promote common targeting of LEPC habitat management programs across agencies within the state and to coordinate with similar teams in other states.

New Mexico

New Mexico has private landowner programs administered by both state and Federal agencies as well as lands administered by the BLM that are contributing to LEPC habitat. Similar to other states, NRCS in New Mexico has partnered with the National Fish & Wildlife Federation, Pheasants Forever and Quail Forever to create a Strategic Watershed Action Team (SWAT) that provides specialists in the field to work with landowners and NRCS field offices. The Team assists in conducting range and habitat inventories, grazing plans, outreach, and in monitoring and evaluation of applied conservation practices. As a result of the team's efforts, ranchers and conservationists will have a better understanding of the impacts of conservation activities, and will be able to more effectively prescribe, target and implement future conservation efforts that will benefit the health and productivity of rangeland and lesser prairie-chickens.

New Mexico Department of Game and Fish (NMDGF) has recognized the importance of managing LEPC since the 1040's. A recent report (NMDGF 2011) stated: "In the 1940's the State Game Commission started to acquire properties for the purposes of conserving habitat for this species (LEPC). These acquired properties, named Prairie Chicken Areas (PCAs), were often farms and ranches that had failed during the Dust Bowl and Great Depression and were scattered throughout De Baca, Lea, and Roosevelt Counties. The basis for this purchase strategy was that wide distribution of protected areas would be more beneficial to lesser prairie-chicken conservation than conserving a large area in only one part of this species' range. Currently, there are 29 properties that encompass 27,182 acres. These properties range in size from 28 to 7,189-acres and are managed primarily to provide habitat for lesser prairie-chickens, but also to provide benefits to other wildlife species. This also includes the Sandhills Prairie Conservation Area (CA), which was acquired in 2007 and encompasses 5,285-acres." NMDGF is in the process of enrolling all of these properties in a CCAA, discussed below.

NMDGF worked with the BLM, TNC, and other partners to identify a series of LEPC core conservation areas. These are areas that have many conservation components already in place, assuring long-term benefits for LEPC. The designated core areas are:

"Core Conservation Area #1 consists of 19,150 acres owned and managed by the Grasslans Charitable Foundation (the Weaver Ranch) and eight Prairie Chicken Areas (PCAs) Managed by the New Mexico Department of Game and Fish. The PCAs total 8,455 acres. Total area in Core Conservation #1 is 27,605 acres. The BLM manages 19,355 of federal mineral estate and of that number, 11,326 acres are closed to future oil and gas leasing. Federal leases (8,029 acres) that expire will not be re-offered and the remainder of the federal mineral estate is closed to future leasing.

Core Conservation Area #2 consists of 27,966 acres owned and managed by the Nature Conservancy and seven Prairie Chicken Areas (PCAs) Managed by the New Mexico Department of Game and Fish. The PCAs total 12,717 acres. Total area in Core Conservation #2 is 40,683 acres. The BLM manages 19,736 acres of federal mineral estate and of that number, 13,676 acres are closed to future oil and gas leasing. Federal leases (6,060 acres) that expire will not be re-offered and the remainder of the federal mineral estate is closed to future leasing.

Core Conservation Area #3 (Gallinas Wells) consists of 4,727 acres in 10 Prairie Chicken Areas (PCAs) Managed by the New Mexico Department of Game and Fish. The BLM manages 4,249 of federal mineral estate and of that number, 3,251 areas are closed to future oil and gas leasing. Federal leases (998 acres) that expire will not be re-offered and the remainder of the federal mineral estate is closed to future leasing.

Core Conservation Area #4 is the BLM's Lesser Prairie-Chicken Area of Critical Environmental Concern (ACEC). The ACEC contains approximately 55,000 acres of public land. The management goal of the ACEC is to protect the biological qualities of the area with emphasis on preservation of the LEPC habitat. The ACEC is closed to future oil and gas, has no authorized livestock grazing, and off-highway vehicle use is limited to existing roads and trails.

Core Conservation Area #5 is the BLM's Mescalero Sands ACEC, consisting of nearly 8,000 acres of public land. The management goal of the ACEC is to protect the biological qualities of the area with emphasis on preservation of the LEPC habitat. The ACEC is closed to future oil and gas, closed to off-highway vehicle use, and has no authorized livestock grazing."

NMDGF also recognizes the need for linkage zones to connect these core areas, and is in the process of delineating these zones. In addition to supporting movements of LEPC, much of these zones contain active leks and LEPC populations, and do not contain substantial barriers to LEPC movements. Much of the LEPC habitat within this area receives some protection. Many of the livestock grazing allotments are enrolled in the Candidate Conservation Agreement program and the private and state lands associated with these allotments are enrolled in the Candidate Conservation Agreement with Assurances program. Approximately 60 percent of federal mineral estate is not under lease and will remain so. Mineral estate that might be acquired by the BLM under the proposed Permian Basin Land Exchange would be closed to future oil and gas leasing, per the resource allocations and decisions found in the BLM's 2008 Special Status Species Resource Management Plan Amendment. Completion of the proposed Permian Basin Land Exchange would strengthen the habitat protections in both the linkage zones and core conservation areas.

TNC also has land holdings devoted to LEPC in New Mexico. "In 2005, the Conservancy purchased the 18,500-acre Creamer Ranch in eastern New Mexico to become the Milnesand Prairie Preserve. In 2009, the Conservancy significantly expanded the preserve through its acquisition of the 9,200-acre Johnson Ranch. The preserve, now at 28,000 acres, provides superb condition—unfragmented grassland with oak shrubs providing protective cover for these ground-nesting birds." (<http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/newmexico/placesweprotect/milnesand-prairie-preserve.xml>). TNC has enrolled over 7,000 acres of its lands in the Milnesand Prairie Preserve in the NM CCAA, discussed below. This preserve is also the site of the Annual High Plains Lesser Prairie Chicken Festival that attracts visitors in April to observe mating displays of LEPC.

As reported by the USFWS (2012a:73833) "In January 2003, a working group composed of local, state, and Federal officials, along with private and commercial stakeholders, was formed to address conservation and management activities for the lesser prairie-chicken and dunes sagebrush lizard

(*Sceloporus arenicolus*) in New Mexico. This working group, formally named the New Mexico Lesser Prairie-Chicken/Sand Dune Lizard Working Group, published the Collaborative Conservation Strategies for the Lesser Prairie-Chicken and Sand Dune Lizard in New Mexico in August 2005. This Strategy provided guidance in the development of BLM's Special Status Species Resource Management Plan Amendment (RMPA), approved in April 2008, which also addressed the concerns and future management of lesser prairie-chicken and dunes sagebrush lizard habitats on BLM lands, and established the Lesser Prairie-Chicken Habitat Preservation Area of Critical Environmental Concern. Both the Strategy and the RMPA prescribe active cooperation among all stakeholders to reduce or eliminate threats to these species in New Mexico. As an outcome, the land-use prescriptions contained in the RMPA now serve as baseline mitigation (for both species) to those operating on Federal lands or non-Federal lands with Federal minerals." "Since the CCA and CCAA were finalized in December 2008, 29 oil and *gas companies have enrolled a total of 330,180 ha (815,890 ac) of mineral holdings under the CCA. In addition, 39 private landowners in New Mexico have enrolled about 616,571 ha (1,523,573 ac). There currently are additional pending mineral and ranching enrollment applications being reviewed and processed for inclusion. Recently, BLM also has closed 149,910 ha (370,435 ac) to future oil and gas leasing and closed some 342,770 ha (847,000 ac) to wind and solar development. They have reclaimed 536 ha (1,325 ac) of abandoned well pads and associated roads and now require burial of power lines within 3.2 km (2 mi) of leks. Some 52 km (32.5 mi) of aboveground power lines have been removed to date. Additionally, BLM has implemented control efforts for mesquite (*Prosopis glandulosa*) on some 148,257 ha (366,350 ac) and has plans to do so on an additional 128,375 ha (317,220 ac)."*

Threat Avoidance, Minimization, and Mitigation Programs

A second component of the LEPC conservation strategy is to provide initiatives that address various threats to the species. In particular, the threat of impacts from energy developments (wind farms, transmission lines, and oil and gas extraction) has been identified as significant concerns (USFWS 2012a). While conversion of native rangelands has been a significant impact in the past, its rate of development has slowed and the landowner habitat incentive programs discussed previously are designed to offer economic alternatives to this conversion.

Focal areas serve not only to identify areas where habitat improvements are desired to be concentrated, but also are areas where impacts from development are to be avoided or minimized. Mapping of focal areas and use of the Southern Great Plains CHAT can assist by identifying to development companies the areas of greatest concern, and encourage development into areas where impacts to LEPC will be minimal or completely avoided. Where developments do occur in LEPC habitat, measures to minimize these impacts are recommended and a program to provide for off-site mitigation established.

Existing Programs and Tools

Several programs or tools already exist to help reduce impacts to LEPC from development. These include the BLM LEPC Special Status Species Resource Management Plan that includes best

management practices for oils and gas development, an existing CCAA in NM that addressed oil and gas development, a draft best management practice agreement between ODWC and the Oklahoma Independent Petroleum Association (OIPA), wind development guidelines developed by the USFWS, wind development guidelines for CO and NM developed by PLJV, and on-going efforts for development of a wind HCP. In addition, a new oil and gas CCAA is under discussion by a number of oil and gas companies and associations with WAFWA and the USFWS.

The BLM LEPC Special Status Species Resource Management Plan (BLM 2008) not only directs BLM's land management activities for this area but also specifies guidelines for oil and gas development and other development activities. For example, it established a program where applicants for electric power lines right of ways could participate in a power line removal credit (PLRC) program. Under this program, applicants could remove 1.5 miles of idle power lines (wire and poles) within prairie-chicken habitat management units or LEPC habitat type before receiving authorization to construct 1.0 mile of new power line in similar or lower value LEPC habitat. As mentioned previously, the Plan specifies areas that are closed to new oil and gas development as well as specifying levels of allowable development in additional areas. It includes a set of Best Management Practices (BMP's) for oil and gas activities. These BMP's specify various actions including seasonal restrictions for time of day of allowable activities, reclamation and restoration requirements, fence marking, burying of power lines, and various other recommended practices.

The New Mexico CCA/CCAA allows developers and landowners to become Participating Cooperators in the agreement. The CCA/CCAA operates under the guidelines of the BLM Special Status Species Resource Management Plan Amendment (RMPA). The RMPA established foundational requirements to be applied to all future activities for Federal surface and Federal minerals (including private surface used for Federal mineral development). Each Participating Cooperator must sign a Certificate of Participation for a particular parcel of land (enrolled property), and agree to the foundational requirements of the RMPA, implement conservation measures on the enrolled property and contribute funding, land, or provide in-kind services for conservation efforts that will benefit the LPC and/or sand dune lizard either on or off-site of the enrolled property. The CP requires the Participating Cooperator to implement conservation activities including the following as appropriate (http://www.fws.gov/southwest/es/Documents/R2ES/LPC-SDL_CCA-CCAA_2008.pdf):

- Establish Plans of Development for enrolled properties,
- Remove caliche pads and roads on legacy wells where there is no responsible party,
- Construct all infrastructures supporting the development of a well (including roads, power lines, and pipelines) within the same corridor,
- Construct new infrastructures in locations which avoid occupied and suitable LPC habitat,
- Bury new distribution power lines that are planned within 2 miles of occupied LPC habitat,
- Minimize total new surface disturbance by utilizing alternative techniques such as co-locating wells, directional drilling, and interim reclamation of drill pads to minimum area necessary to operate the well,

- Provide escape ramps in all open water sources,
- Install fence markers along fences that cross through occupied habitat within 2 miles of an active lek,
- Design grazing management plans to meet habitat specific goals for individual ranches that may include stocking rates, rotation patterns, grazing intensity and duration, and contingency plans for varying prolonged weather patterns including drought, and/or
- Remove mesquite vegetation that invades into the soils preferred by LPC.

The CCAA includes mitigation payments for oil and gas developments that are assessed on a per well basis. These payments go into an account managed by a board that funds land acquisition, conservation easements, and habitat improvement programs.

TPWD also has voluntary mitigation siting guides and BMPs that can be accessed at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/habitat_assessment/tools.phtml.

In Colorado, oil and gas well permits are issued by the Colorado Oil and Gas Conservation Commission (COGCC). As of April 2009, the 1200 series COGCC rules require producers to use online resources to identify sensitive wildlife habitat and areas of restricted surface occupancy. Currently, sensitive LEPC wildlife habitat is defined as production areas that include 80% of the nesting and brood rearing habitat that surrounds leks that have been active once in the last 10 years. Restricted surface occupancy areas for LEPC are defined as areas within 0.6 miles of leks that have been active once in the last 10 years. Under COGCC rule, potential oil and gas wells identified within these areas mandates a consultation with Colorado Parks and Wildlife, where best management practices (BMPs) are provided to industry to minimize impacts to LEPC. CO has developed a set of oil and gas BMP's. These include the following provisions for LEPC:

- Consult with CPW at the earliest stage of development to review detailed maps of LPC seasonal habitats and to help select development sites.
- Conduct comprehensive development planning that provides a clear point of reference in evaluating, avoiding, and mitigating large scale and cumulative impacts.
- No surface occupancy within 0.6 mile of any active or inactive (within past 5 years) LPC leks.
- Avoid oil and gas operations within 2.2 miles of active leks and within LPC nesting and early brood-rearing habitat outside the 2.2 mile buffer.
- Select sites for development that will not disturb suitable nest cover or brood-rearing habitats within 2.2 miles of an active lek, or within identified nesting and brood-rearing habitats outside the 2.2 mile perimeter.
- Where oil and gas activities must occur within 2.2 miles of active leks, conduct these activities outside the period between March 15 and June 15.
- Restrict well site visitations to portions of the day between 9:00 a.m. and 4:00 p.m. during the lekking season (March 15 to June 15).
- Establish company guidelines to minimize wildlife mortality from vehicle collisions on roads.

- Avoid surface facility density in excess of 10 well pads per 10-square mile area (one well pad per section) in lesser prairie chicken nesting and early brood-rearing habitat (within 2.2 miles of active leks).
- When surface density of oil and gas facilities exceeds 1 well pad/section, initiate a Comprehensive Development Plan (CDP) that includes recommendations for off-site and compensatory mitigation actions.
- Phase and concentrate all development activities, so that large areas of undisturbed habitat for wildlife remain and thorough reclamation occurs immediately after development and before moving to new sites. Development should progress at a pace commensurate with reclamation success.
- Implement the species appropriate Infrastructure Layout and Drilling and Production Operations Wildlife Protection Measures found in Section II B. and Section II D. of this document.
- Locate compressor stations at least 2.2 miles away from lesser prairie chicken active and historic (within last 5 years) lek sites. When compressor stations must be sited within 2.2 miles of lesser prairie chicken active and historic (within last 10 years) lek sites, locate compressor stations farther than 0.6 mile (3200 feet) fromLPC lek sites.
- Use topographical features to provide visual concealment of facilities from known lek locations and as a noise suppressant.
- Muffle or otherwise control exhaust noise from pump jacks and compressors so that operational noise will not exceed 49 dB measured at 30 feet from the source.
- Utilize a central generator to feed the entire field via underground electrical lines.
- Design tanks and other facilities with structures such that they do not provide perches or nest substrates for raptors, crows and ravens.
- Install raptor perch deterrents on equipment, fences, cross arms and pole tops in lesser prairie-chicken habitat.
- Bury new power lines and retrofit existing power lines by burying them or installing perch guards to prevent their use as raptor perches.
- Design wastewater pits to minimize retention of stagnant surface water.
- Treat waste water pits and any associated pit containing water that provides a medium for breeding mosquitos with Bti (*Bacillus thuringiensis v. israelensis*) or take other effective action to control mosquito larvae that may spread West Nile Virus to wildlife, especially grouse.
- Use early and effective reclamation techniques, including an aggressive interim reclamation program to return habitat to use by lesser prairie-chicken as quickly as possible.
- In consultation with CPW, replace any permanently impacted, disturbed, or altered sand sagebrush habitat within identified nesting and brood rearing range through enhancement of existing or marginal sand sagebrush habitat or reclamation of altered or converted habitat within or immediately adjacent to mapped nesting or brood rearing habitat.
- Implement the species appropriate reclamation guidelines found in this document.
- When reclaiming breeding habitat, include a substantially higher percentage of forbs than used in other areas.

- Reclaim LPC habitats with native grasses including switchgrass, big bluestem, little bluestem, sand bluestem, yellow Indian grass, and prairie sandreed.
- Do not plant buffalo grass, blue grama and sideoats grama in lesser prairie chicken habitat as they will eventually dominate the resulting stand and will not provide lesser prairie chicken habitat.
- Restore appropriate native shrub species to disturbed sites.
- Do not use aggressive non-native grasses or shrubs in LPC habitat reclamation.
- Utilize native and select non-native forbs and legumes in seed mixes as they are a vital component of brood-rearing habitat. Dryland adapted varieties of alfalfa and yellow sweet clover should be the primary non-native forb species used.

In Oklahoma, OIPA worked with ODWC to develop a set of Voluntary Best Practices for oil and gas development (http://www.oipa.com/page_images/1336665235-regulatory.pdf). Preplanning is recommended to consider the location of possible developments in relation to areas of high value to LEPC as mapped by Oklahoma's LEPC Spatial Planning Tool. Avoidance of high value areas is recommended, but where development will occur in these areas, construction during the spring breeding season should be avoided, and ODWC biologists consulted to minimize impacts during pad siting. Where oil and gas development will occur in LEPC habitat, the following best practices are recommended to the extent possible:

- Maximize the use of existing corridors for new infrastructure supporting new well development (i.e. roads, power lines, pipelines, flowlines, etc.) and combine multiple operations at one site to minimize the disturbance / fragmentation of the LPCs habitat.
- Minimize surface disturbance in order to decrease fragmentation.
- Minimize the time needed to complete new construction and drilling operations, remove unnecessary equipment and infrastructure, and reclaim all portions of well sites not needed for production operations and all portions of roads not needed for vehicle travel.
- At new well sites near active leks, consider the use of low profile equipment and whenever economically feasible, consider burying distribution power lines.
- At well sites near active leks, to the extent possible, avoid conducting early morning activities between 3:00 am and 9:30 am during the mating season (March 1 to May 1).
- At well sites near active leks, to the extent possible, use noise control devices to muffle or control exhaust noise from facilities (pump jacks, compressors, etc.)
- New fencing installed that is not associated with tank batteries or other equipment on site should limit the height of the top strand to below 40 inches, limit fencing to three strands, and install fence markers or other visually detectable avoidance mechanisms.
- Remediation practices
 - When reseeding disturbed areas in high importance habitat use native grasses and forbs where possible to promote natural habitat.
 - Remove un-needed equipment, infrastructure, trash and debris from well sites.

The USFWS (2012c) developed its recommendations for wind energy guidelines. These suggested a tiered approach to wind development, where planning emphasized avoidance of sensitive areas. The guidelines contained some BMP's, though they are quite general and not specific to LEPC.

PLJV worked with the Colorado Renewables and Conservation Collaborative and the New Mexico Wind and Wildlife Collaborative to develop a set of BMP's for multiple species for each state. The BMP's recommended for LEPC were similar for both states. For wind development BMP's include avoiding development in LEPC habitat when possible (similar to USFWS wind development guidelines), or staying to the edges of large blocks of habitat if possible where development and LEPC habitat overlap. When developing wind within LEPC habitat, bury power lines and minimize fencing where possible, and avoid construction when possible during the breeding season. To offset impacts, implement off-site mitigation practices.

The wind development industry has been working on an HCP that is proposed to include LEPC. This HCP is scheduled for completion after the timelines for this range-wide plan. However, the HCP should be designed to be compatible with the recommendations in this plan.

LEPC Impact and Mitigation Metrics

As a foundation for threat avoidance, impact assessment, and quantification of mitigation credits for LEPC, a system to quantify both impacts and mitigation was developed. The metric system is designed to evaluate the ecological impacts of a proposed or implemented development considering its direct and indirect disturbances to a site, the effects of the conditions in the lands surrounding the site to its quality as LEPC habitat, and the location of the site in the larger context of LEPC populations and distributions. The metrics for quantifying mitigation benefits use the same variables as those quantifying impacts but also add a system for quantifying benefits from applying habitat management practices. These metrics provide the foundation for establishment of an off-site mitigation program that can quantify and track impact "debits" and balance these with the creation of mitigation "credits", with both debits and credits measured as changes to LEPC habitat quality. The system ensures that debits and credits are consistently evaluated from an ecological perspective and that they can provide a basis for determining net conservation benefits of mitigation actions. The metric system is designed to be rigorous and scientifically defensible, produce ecologically meaningful results for both impact and mitigation determinations, be flexible to support a number of potential mitigation opportunities, yet be as simple to apply as possible.

Various mitigation opportunities are under development to help with conservation of LEPC, and the metric system should provide the foundation for these initiatives. Opportunities include direct mitigation actions by a developer to produce and document that it has generated mitigation credits that fully offset the impact debits produced by its development activities, voluntary offset programs that allow companies to compensate agencies and organizations to conduct mitigation and generate the needed credits that offset its impacts, metric credit trading systems that provide a more formal service to companies in tracking impact and mitigation exchanges, mitigation requirements as a component of demonstrating net conservation benefits of CCAA's, HCP's or other conservation agreements, and

conservation banking that provides long-term mitigation opportunities.

The metric system operates by first determining the existing value (baseline score) of a site that may be the location for either a development activity or mitigation treatments. At each development or mitigation location, the existing vegetation conditions and ecological sites are mapped and delineated into homogeneous units (similar ecological site and existing vegetation conditions) termed evaluation units. Each evaluation unit is then assessed using general vegetation parameters to rate the conditions that are present and how these relate to nesting and brood habitat quality for LEPC. Each evaluation unit is then assessed for its setting in terms of what is present in the surrounding evaluation units and how these may influence the ability of the evaluation unit to provide nesting or brood habitat. This assessment is done for a 1 mile area out from the center of the evaluation unit in what is termed the evaluation area. Based on the assessment of the vegetation conditions within the evaluation unit and the assessment of the conditions in the surrounding evaluation area, a habitat score is determined for the evaluation unit. The effects of existing impacts on the evaluation unit are quantified and the score of the unit adjusted accordingly to produce a baseline score for the evaluation unit. This score is then multiplied by the rating of the ecological site of that unit. This rating has been pre-determined and is based on the maximum habitat quality that each ecological site has the potential to produce (see description below). The location of the evaluation unit relative to a CHAT category is then used to assign an impact or credit multiplier times the baseline score.

Quantifying impacts and benefits to LEPC habitat is influenced by several characteristics of LEPC populations and habitat. First, LEPC populations fluctuate with weather patterns and other short-term changes to their environment. In good years when weather conditions don't directly affect populations and enough precipitation is present for good vegetation growth, LEPC can reproduce rapidly and expand population sizes quickly. However, their populations can also decline rapidly following severe winter conditions, poor weather during nesting or early brood rearing, or during prolonged drought. LEPC will remain in areas supporting good habitat, and males have been shown to have a strong site fidelity to leks. However, LEPC populations can also move and with their rapid reproductive potential, can take advantage of new habitat quite rapidly, as demonstrated by the rapid expansion in range and population size that has occurred in Kansas where substantial patches of native grass CRP have been established. While maintaining existing good habitat is desirable, it is also quite feasible to create new habitat for LEPC and to expect the species to respond rapidly to favorable habitat conditions. A second consideration is that LEPC habitat is not static, even under consistent weather conditions. As discussed previously, LEPC habitat in areas that have received recent disturbance (previous 1-3 years) such as fire or moderate grazing pressure tend to produce greater cover of forbs and associated insects producing good brood habitat (e.g., Jones 2009). After several years, desirable grasses and shrubs recover from the disturbance improving the quality of nesting habitat. Over time, shrub cover may become too dense, reducing grass cover and lowering the quality of the site for both broods and nesting until it again burns or is subjected to another disturbance. Thus, LEPC habitat is dynamic and either natural or prescribed disturbances appropriate to the specific site are important to maintaining LEPC habitat quality. Finally, LEPC habitat can change in quality with weather patterns. During drought

years grasses may not grow tall enough to provide the desired structure for high quality nesting habitat. Forb production may be reduced by drought, reducing the quality of brood habitat. As these weather patterns vary annual, the quality of a site as LEPC habitat can fluctuate significantly from year to year. While sites with the preferred vegetation composition will always be higher in value to LEPC than sites with less preferred vegetation, the actual quality of the site for nesting or brood rearing is variable. These factors need to be considered in developing a metric system to quantify development impacts or mitigation benefits to LEPC habitat.

The metric system measures baseline conditions and then quantifies changes to these baseline conditions on an annual basis either after the development occurs or after mitigation practices are applied. Improvements to habitat are considered annually, and are not linked to measures that can fluctuate considerable with weather differences. Thus, while LEPC require good structure of vegetation for nesting, this is not directly measured because it can change substantially from year to year because of weather. Site habitat variables are used that tend to be more consistent through weather patterns, although even these will show some fluctuations with weather patterns. In this way, changes to baseline vegetation conditions can be measured and tracked and used to quantify impact debits or mitigation credits. However, a primary quantification of mitigation credits is achieved through tracking of the implementation of prescriptive management practices that have a proven record of improving LEPC habitat. To receive credit, the application of these practices must be done according to specific requirements for improving LEPC habitat and be part of an overall LEPC management plan for a mitigation site.

As mentioned, because of the dynamics of LEPC habitat, there is a time component to impact and mitigation evaluations. Impacts debits are determined as changes to the baseline score for a duration of time that the impact is present. Mitigation credits are created based on positive changes to the baseline score of an evaluation unit due to changes in the plant community at the site or that are produced through the application of management practices over time. Thus, this temporal component (Figure 3) is an important consideration in an LEPC metric system. For this reason, debits and credits are expressed on an annual basis. In this way, a debit or credit is the change in value of one acre of LEPC habitat from its baseline score for one year, and will range from 0-1. If perfect habitat (baseline score of 1.0) is immediately and completely altered as LEPC habitat, this will generate 1 debit for each year that this condition persists. Similarly, if a mitigation program improves a site of 0 baseline value to a 0.5 value for 10 years, this would produce 5 credits for each acre improved.

An additional component incorporated into the metric system is an assessment of the potential of an evaluation unit to be LEPC habitat. Not all locations have the potential to support high quality LEPC habitat. Soils and other environmental features are significant determinants of the plant species that can occur at a specific location and thus the plant community that can be supported. Different plant communities have different potentials for LEPC habitat quality. NRCS has developed a classification system of ecological sites (<http://esis.sc.egov.usda.gov/Welcome/pgReportLocation.aspx?type=ESD>) that relate to mapped soils and describe the various plant communities that can be supported on each

ecological site. Each site can be evaluated for its potential quality as LEPC habitat. The LEPC habitat potential of each ecological site occurring within LEPC range is listed in Appendix X. The baseline score of a site is multiplied by this rating for determination of impacts. In this way, sites that have higher potential for LEPC habitat will create more impact debits than sites that have lower habitat potential, encouraging development to occur on the lower potential sites. Similarly, mitigation practices and the credits they generate are multiplied by the ecological site rating. In this way, more credits will be generated by applying an LEPC improvement practice to a site that can respond better to this practice than for a site that has lower habitat response potential.

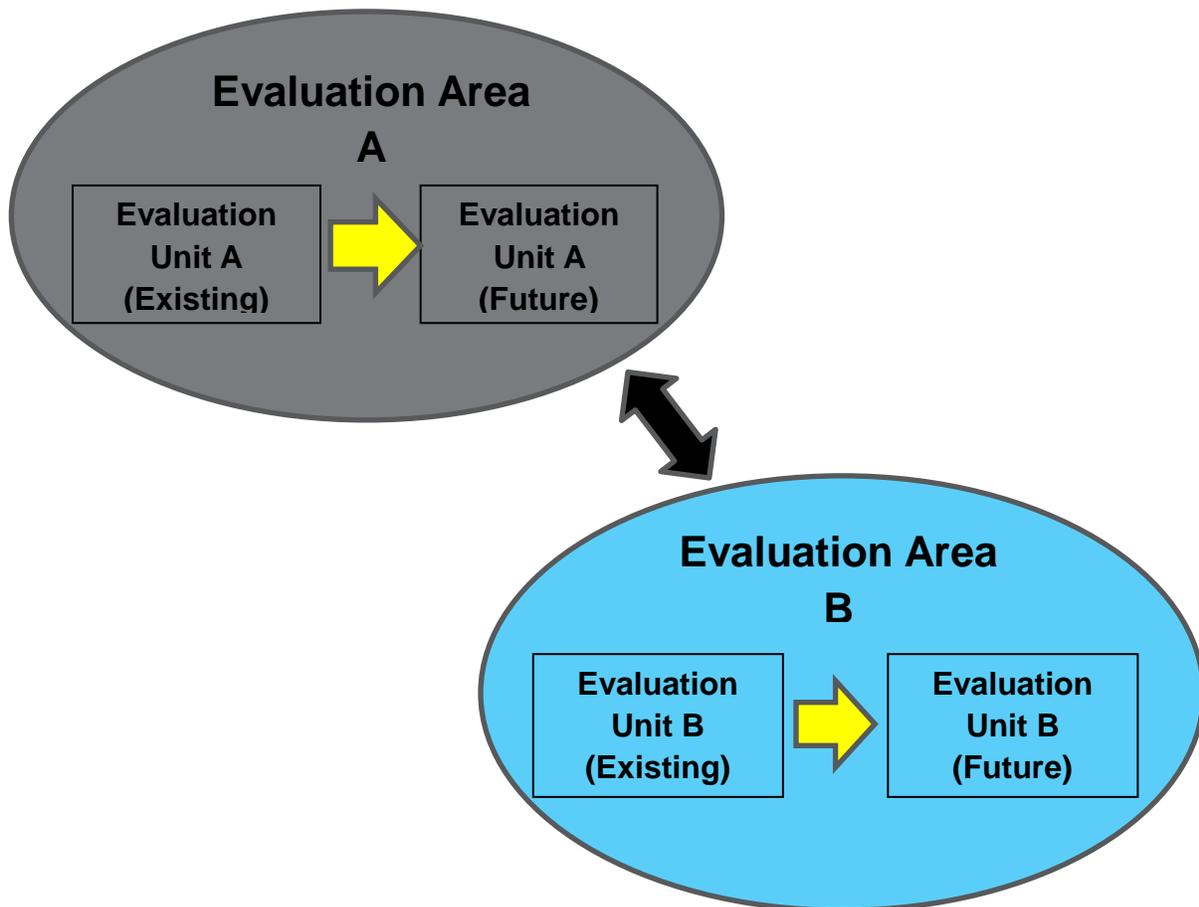


Figure 3. Impact debit and mitigation credit depiction with existing (baseline) conditions and future (resulting) conditions for an impact and mitigation area. (After Haufler and Suring 2011).

A User's Manual for the LEPC Metric System is attached as Appendix X. The manual describes how the metric system can be applied to a site, provides example calculations, and provides detailed descriptions of use of mitigation practices for generating credits. Below, an overview of the metric system is presented.

Baseline Habitat Variables

Three habitat variables are used to quantify the vegetation conditions of an evaluation unit. The amount of total vegetation cover, expressed as absolute cover, is the first variable. Absolute cover is the actual amount of the ground that has vegetation occurring above it. An evaluation unit with >45% cover is considered to provide optimum LEPC habitat conditions for both nesting and brood habitat. Lesser amounts of cover of vegetation are discounted in value. The second habitat variable is the relative cover of different groups of plant species. Relative cover is the percentage of the total absolute cover of all vegetation that is comprised of one group of plant species. Specifically, the cover of preferred species of grasses and shrubs (native tall warm season grasses, sand shinnery oak, and sand sagebrush) in an evaluation unit is determined as a percentage of the total vegetation cover. Optimum sites are those having >75% of the vegetation present comprised of preferred species. The third habitat variable is whether or not the site has trees present. Optimal habitat will not have any trees >3 ft. tall present in the unit. The values assigned to each of these three variables are determined, and the evaluation unit is assigned the value of the lowest score for the three variables. Each variable is considered to work independently in affecting the quality of the site as LEPC habitat, and the variable that has the lowest score will have the greatest limiting influence on the use of the site by LEPC, so that score is used.

The vegetation value of an evaluation unit is then considered in the context of the vegetation conditions that surround the evaluation unit (neighboring evaluation units). A 1 mi. distance from the centroid of the evaluation unit is used to assess the surrounding evaluation area. The evaluation area is evaluated for how much of the area is in native vegetation or native grass CRP. If >75% of the evaluation unit is in these preferred conditions, the evaluation unit receives a maximum score for this variable. Similarly, the evaluation area is assessed for the quality of nesting or brood habitat in the surrounding evaluation units. The reason for this is that one small patch of even high quality vegetation (e.g., 20 acres of good vegetation) will not provide high quality nesting or brood habitat if it is surrounding by low quality conditions- the evaluation unit would be too small to function well as LEPC habitat. By considering the amount and quality of the evaluation area as nesting and brood habitat, the evaluation unit will be weighted higher or lower in quality. The score of the lowest value of the 3 vegetation variables described above are multiplied by a variable that assesses the amount of LEPC habitat in the evaluation area and assigns points to the evaluation area based on this relationship.

The final rating of the evaluation unit considers if the surrounding area supports a mix of conditions for both nesting and brood rearing habitat. If a good juxtaposition (close proximity of both habitat needs; King 1938) and interspersion (a good intermixing of the two habitat needs) of nesting and brood habitat is present, then the evaluation unit will get maximum points for this variable.

In this manner, described in more detail in the User's Manual, each evaluation unit in a development or mitigation area receives a baseline score between 0 and 50, which is then standardized on a 0-1 scale to represent the baseline amount of habitat units present with this amount being the quality of the evaluation unit (0-1) times the amount of acres in the unit. So if an evaluation unit received 35 points from the above assessment and was 100 acres in size, it would have 70 baseline units present.

Quantification of Impacts

Impacts from developments will be assessed both for their direct changes to the quality of LEPC habitat at an impact site and to their indirect effects on avoidance of surrounding areas by LEPC due to the presence of structures or human activities. Impacts from existing structures or activities will be determined and the baseline scores of evaluation units reduced where impacts are estimated to occur. New proposed or implemented impacts will be quantified by reductions to baseline scores of evaluation units caused by the direct and indirect impacts of the development. Direct impacts change the conditions of a site will become its own evaluation unit. Avoidance behavior impacts will be determined based on impact buffers placed around the impact. Buffer distances were recommended by the science team using the best available science (Hagen et al. 2010, 2011), acknowledging that many of these buffer distances lack good empirical data, and may need to be adjusted as substantial new information becomes available. Table 4 lists the recommended impact buffers.

Table 4. Recommended impact buffers for human structures and disturbances.

Type of Impact	Buffer distance feet (meters)
Oil and gas pads	984 (300)
Wind farms and towers	3281 (1000)
Transmission lines	1968 (600)
Distribution lines	656 (200)
Tall vertical structures (>99 ft)	3281 (1000)
Gravel roads	328 (100)
Paved roads	2460 (750)
Commercial buildings	3281 (1000)
Residential buildings (houses)	656 (200)

All avoidance impacts within 100m are assigned a complete avoidance. For buffers larger than 100m, the buffer width will be divided into thirds, with the first (closest) band receiving a 100% reduction in LEPC habitat value, the second band receiving a 67% reduction in habitat value, and the third band receiving a 33% reduction in value. Examples of impact debit calculations are provided in the Mitigation User's Manual (Appendix X).

Impact debits are quantified from both the changes to conditions from the footprint of the development (direct impacts) as well as the decrease in quality of the surrounding area based on the buffer distances in Table x (indirect impacts). Impacts debits are assessed for each year that the impact is present. The mitigation system assigns impacts for a minimum of 30 years and considers permanent impacts to be a 100 years for impact debit calculations. If impacts are removed prior to the minimum 30 years (e.g., an oil well only operates for 20 years and then is reclaimed) a credit for the additional 10 years of assessed debits will be issued, and can be applied against another development.

Generation of Credits

Mitigation credits can be generated in several ways. First, treatments that change the vegetation amounts or compositions within an evaluation unit will change the baseline level of credits.

Improvements to vegetation that change the value of the variable that has the lowest score for the evaluation unit will increase the value of the unit based on its multiplication times the evaluation of nesting and brood habitat in the surrounding evaluation area. The value of the evaluation unit will rise to the value of the next most limiting variable for the evaluation unit. When all three variables are at a score of 10, no further credits can be generated by improvements to the vegetation conditions of the evaluation unit. Evaluation unit scores are also influenced by the quality of the evaluation area, so changes to the conditions in the surrounding area can change scores for an evaluation unit either positively or negatively. The biggest factor is the quality of nesting and brood habitat in the evaluation area. This variable influences half the value of any evaluation unit, as it has the potential of contributing up to 25 of the 50 available points in the baseline score. So, increasing the quality of nesting and brood habitat in surrounding evaluation units can dramatically increase the score of an evaluation unit. Changing the amounts of native grassland or planted grassland in the surrounding area can also change the score of an evaluation unit, as will changing the interspersion or juxtaposition of nesting and brood habitat. Changes to the score of the evaluation unit created by changes to the vegetation conditions within the unit or the evaluation area will accrue or be debited for 10 years following the change, or for the duration of an agreement to maintain those improvements. In this way, changes to the evaluation area that may not be under the control of a landowner owning an evaluation unit will not create permanent debits or credits to the landowner. If the changes are a planned activity by the landowner and a management agreement is in place, then the landowner can claim credit for these changes for the duration of the agreement.

A second way that credits can be generated is by removing an existing development or disturbance. The score of an evaluation unit will be lessened by the avoidance behavior buffers applied around existing developments, and the value of the baseline condition decreased by the effect of these buffers. If an existing development is removed, such as removing an oil well and reclaiming the pad and road, then the acres of the footprint of the road and pad would be a new evaluation unit and would receive credits for the changes to the vegetation of these reclaimed sites, while the surrounding acres influenced by the buffer would return to their score based on their vegetation conditions and those in the surrounding evaluation area. Credits created by the removal of existing developments will accrue to either the landowner or an identified party to be credited with the reclamation work for a duration of 10 years. In this way, an incentive is provided for removing existing developments.

A third way that credits can be generated is by application of approved prescriptive management treatments to an evaluation unit. To earn credits through this method, a landowner must enter into at least a 5 year agreement to manage the evaluation unit according to a LEPC management plan developed by an approved technical service provider. Entering into a mitigation agreement will earn a landowner an initial signing credit equal to the baseline score of the evaluation unit times the proportional length of the agreement, where a permanent agreement will earn 100%, a 30 year agreement 30%, a 10 year agreement 10%, and a 5 year agreement 5% of the baseline score. Each year that the landowner applies the treatments specified in the LEPC management plan for the unit, the landowner will receive credits according to the weighting of that treatment. Treatments must follow the guidelines specified for each specific practice as detailed in the Mitigation User's Manual and as

specified in the LEPC management plan for the evaluation unit. For example, application of prescribed grazing according to the guidelines for a grazing plan for LEPC and as specified in a LEPC management plan for the evaluation unit would receive 15 points (0.15 credits) per acre in the evaluation unit per year that the management plan is followed. Similarly, prescribed burning following similar guidelines would receive 10 points for a specified duration (4-7 years depending on ecoregion) following this treatment for the acres burned, while tree removal would receive up to 10 points/year for 5 years. Removing or marking of fences near leks will receive 5 points when this work is done, while thinning overly-dense sand shinnery oak or controlling invasive species using herbicides as specified in the guidelines for this practice can each earn 5 points. In this way, credits can be generated each year that a property is properly maintained or improved according to the LEPC management plan for the property.

Mitigation credits are generated and quantified using equivalent metrics for how impacts debits are calculated, with the one difference being that credits generated by improvements to an evaluation unit can be created through the implementation of approved management practices that have a strong foundation for their positive effect on LEPC habitat quality. Assigning credits based on implementation of practices provides a practical means of quantifying habitat improvements that avoids the complexities of directly tracking habitat changes that often fluctuate more on an annual basis from differences in weather patterns than as influenced by the management practices. Application of the approved practices according to the guidelines for their use in the LEPC Mitigation system and following an approved LEPC management plan assures that the highest quality habitat is consistently being provided from any property regardless of the weather conditions in any one year. Further, tracking the implementation of practices is far less cumbersome than detailed measurements of vegetation changes that would need to occur annually within each unit and measure a substantial number of plots to account for variability in a unit. Vegetation monitoring of each unit is part of the mitigation system but is designed to monitor the long-term trends and to provide data to adjust the vegetation parameters in the baseline evaluation scores such as overall composition of preferred species of plants in the unit rather than changes to such parameters as grass heights or forb cover values that fluctuate annually but influence habitat quality.

A final way that credits can be generated is by converting non-habitat areas such as agricultural fields to native grassland by seeding these areas and maintaining them as grasslands. CRP has been an effective program of the FSA in doing this in parts of LEPC range, particularly in Kansas where native warm season grasses were emphasized in the seed mixtures. LEPC populations have responded very well in these areas. The mitigation system provides credits for implementing similar practices. This will put into place a system for reversing the impacts of agricultural fragmentation in key locations, and provide a system that can supplement CRP or replace it should it not be authorized in the future. Credits are generated for seeding an area to native grasses as well as for maintaining these areas as grasslands. Credits are also generated in such conversions by the changes created to the baseline conditions that would have a 0 value as an agricultural field.

Vegetation Monitoring in Mitigation Units

Vegetation monitoring, as indicated above, is required as part of the impact/mitigation tracking system. The vegetation monitoring required for the NRCS LPCI program is the minimum vegetation sampling required for mitigation monitoring. More detailed monitoring including detailed species compositions, vegetation heights, and similar measures of a site are encouraged. In addition, monitoring of vegetation responses to specific practices as well as LEPC population monitoring will be conducted, as discussed below.

CHAT Category Weightings for Debits and Credits

Impact debits and mitigation credits are further weighted based on their location within CHAT categories. The more important a location to LEPC population goals the higher its weighting and the more debits or credits that the location generates. This encourages development to locate in areas of lower importance to LEPC (thus generating fewer or even zero debits) and encourages mitigation to occur in higher quality areas by generating more credits for conducting the same habitat improvements in these areas than in areas of lower importance to population distributions. In addition, debits are weighted at twice the weight of credits, creating a 2:1 mitigation: impact ratio. This ratio is needed for several reasons. First, the current population size estimated in 2012 was approximately 37,000 birds while the desired population goal is 67,000 birds, almost a 2:1 desired increase. For this increase to occur, habitat quality must double, especially in key population areas, and the 2:1 mitigation to impact ratio reflects this need. Second, mitigation must generate a net benefit to the species if it is to provide a foundation for mitigation tools such as CCAA's, VOP's, or HCP's. The 2:1 ratio assures that a net benefit is being produced. Third, some credits are generated by providing assurances that existing LEPC habitat will be maintained for the long-term. This is important to providing certainty that such high quality areas will exist and provide known source locations for future populations. However, these areas are maintaining habitat quality but not increasing habitat quality. Requiring a 2:1 ratio assures that LEPC populations will be attaining a net overall gain in long-term population certainty. Finally, mitigation programs must generate more mitigation credits than impact debits to justify the financial and personnel commitments to administer the programs. If credits only match debits, then the monies and efforts expended to simply balance habitat gains and losses could be better applied to efforts to improve habitat, but with the 2:1 ratio, net improvements to LEPC habitat is provided.

A final consideration in generating mitigation credits, there is an expectation that mitigation credits will be generated on sites that have ending habitat scores that are equal to or greater than the habitat scores at the impact sites. In this way, impacts to 100 acres of high quality habitat cannot be replaced with slight increases (0.1) in quality to 1000 acres of low habitat quality. This expectation is included so that impacts to high quality habitat that may be a source area for population expansions is not mitigated with a much larger amount of low quality habitat that may function as population sinks during years with poor weather conditions or other factors.

The recommended weightings of the different CHAT categories are listed in Table 5.

Table 5. Weightings of impact debits and mitigation credits for LEPC categories from the Southern Great Plains Crucial Habitat Assessment Tool.

CHAT Category	CHAT Name	Impact Multiplier	Mitigation Multiplier
1	Focal area	10	5
2	Irreplaceable and Linkage Zones	7	3.5
3	Limiting	5	2.5
4	Significant	3	1.5
5	Unknown	1	1
6	Common	0	0

A final weighting incentive is proposed that would add a mitigation multiplier of 7 to a mitigation site that is greater than 10,000 acres in size and located within a focal area. This provides a bonus for improvements to large blocks of habitat in key locations.

Opportunities for Application of the Mitigation System

The mitigation metrics and their weightings within different CHAT categories provide a foundation and operational guidelines for evaluating impacts and commensurate mitigation benefits. This system can provide the needed assurances that net benefits will be provided to LEPC through mitigation actions designed to offset impacts to LEPC. Various possible applications or tools are available or proposed for its application.

From the mitigation side of the equation, off-site mitigation can provide offsets to impacts in a number of ways. As presently proposed, mitigation offsets are voluntary programs whose benefits can be quantified through application of the metrics to document benefits being provided to LEPC. For some applications (CCAA's, HCP's) companies are seeking assurances that they can continue to operate as they propose at present in exchange for their voluntary actions to improve LEPC habitat. The metric system provides a way to demonstrate that the desired conservation benefits of such agreements are being produced. On the credit side, various programs may be developed to provide credits and thus benefits to LEPC. These will require the ability to track debit and credit generation to assure that mitigation benefits are produced according to the mitigation guidelines. Programs may seek a recognized credit-trading framework or may develop formal conservation bank(s) for LEPC.

One use of the mitigation system is for companies or other developers to use the metrics to conduct mitigation activities on their own property or to directly work with other landowners to improve LEPC habitat and to document that the mitigation actions they are applying are creating sufficient mitigation credits to offset the impacts they have incurred through their development activities. The metrics provide the tool to measure and track these actions and to document to others that desired mitigation benefits have been produced. In this way, companies have the option of creating their own mitigation "market" through application of the mitigation system.

Creation of two separate mitigation trading markets is envisioned through use of the mitigation system. It is desirable to have some mitigation actions occurring as permanent activities at known locations. The establishment of strongholds, discussed below, emphasizes these types of locations although with even further stipulations concerning sizes and locations. To create this market, 25% of the impact debits created by developments must be offset in long-term credits (30+ year agreements). Initial credits will be earned for the baseline credits present at the mitigation site. The initial credits generated will be prorated based on the length of the agreement. Permanent agreements (assigned a 100 year duration) will receive full credit for each credit generated. Shorter term agreements will generate proportionally less (30 year agreement generates 30% of the initial long-term credit). Shorter term mitigation options can offset the remaining 75% of the debits. A minimum 5 year agreement is required to enter the short-term mitigation market. As discussed above, the initial "signing" bonus provides credits based on the length of the agreement, with a 10 year agreement receiving a 10% of the baseline credits under the short-term market. Because the two markets operate under different requirements for debits to be matched with credits, it is expected that the long term market will have credits of significantly greater value than the short term market.

Split estates are a recognized problem. Where landowners can provide assurances for protections from both surface and mineral disturbances a 50% credit bonus will be provided to the above credits in the long term market. If only surface rights are guaranteed in the agreement, then any mineral developments that occur on the property will be expected to repay all of the credits impacted by this disturbance.

Application of the metric system can occur through voluntary offset programs or more formal CCAA's or HCP's. Various oil and gas interests are working on a CCAA. They propose to have WAFWA be the permit holder and to issue certificates of inclusion to companies that meet the CCAA requirements. A description of this CCAA and its Certificate of Inclusion (CI) are attached as Appendix X. Requirements for inclusion in the CCAA would be adherence to a set of BMP's applicable to operations within LEPC range as specified in the CI and application of the mitigation system. An upfront creation of credits associated with an issuance of a certificate of inclusion could then be used as initial offsets for the first developments which would be required to be offset with additional credits before additional developments proceed. The specifics of this system and how it could be linked to the two proposed mitigation markets is still being discussed. Similarly, wind energy and transmission impacts could be developed through similar instruments.

One or more conservation banks could be established to help address the need for creating the long-term credits. Credit trading systems could be established to address the shorter term generation of credits.

Establishing Strongholds

The USFWS (2012b) indicated the desirability of establishing voluntary LEPC strongholds. Strongholds are areas of high quality habitat at least 25,000 acres in size with permanent conservation easements that ensure their continued management for LEPC. The USFWS (2012b) indicated that one or more

strongholds totaling at least 25,000-50,000 acres should be established in each ecoregion. Establishment of these voluntary strongholds as a subset of focal areas would help provide certainty for the continued persistence of LEPC.

Monitoring and Adaptive Management

Several LEPC monitoring programs are planned to continue. The range wide aerial survey of LEPC discussed in the population status section is planned to continue. It is conducted range-wide using a standard method so it provides the first consistent survey of LEPC status throughout the occupied range. This survey will provide both population estimates on an annual basis as well as good population trend information, so will be an excellent monitoring tool for the overall status of LEPC populations. In addition, comparisons of the amounts of LEPC habitat improvement work conducted within the 15 by 15 km. survey blocks will provide an assessment of LEPC population responses to these cumulative practices.

NRCS in cooperation with several universities is evaluating both vegetation and LEPC population responses to practices implemented as part of the LPCI. Vegetation monitoring is being conducted by participants in the LPCI, and while not greatly detailed, will provide good information on basic plant community responses to various LPCI practices. In addition, LEPC telemetry studies of selected populations will allow for analysis of responses of these populations to management practices and other factors.

Various components of LEPC ecology remain poorly documented by empirical data. As mentioned, LEPC avoidance of human structures and activities has relatively little empirical data for determining impact buffers. Questions remain about densities of LEPC in habitat conditions of varying quality. Questions also remain about the effectiveness of different sizes of LEPC habitat blocks and their habitat quality in relation to sustainability of LEPC populations. Even broader questions remain including how will climate change affect LEPC? Will its primary effects be from increased temperatures, decreased annual precipitation, prolonged droughts, or increased storm intensities during critical times of the year? LEPC responses to specific management practices applied within each ecoregion need much better data. Movement capabilities and habitat characteristics that support movements through linkage zones are very poorly understood. These and many other questions need additional research.

As new information becomes available, this plan needs to be modified. When substantial new information on a specific component of the plan becomes available, that part of the plan should be adjusted to incorporate the new findings. The entire plan should be reviewed every 5 years. During that review, a plan revision should be discussed, and the plan revised based on this assessment of needed changes.

Conservation Strategy Summary and PECE Evaluations

The above conservation strategy is designed to provide LEPC the habitat needed to maintain the population with good numbers and distribution of birds. The greatest need is for habitat quality to be improved within sizable blocks of habitat well distributed throughout LEPC range. The habitat

improvement component of the conservation strategy is designed to do this. While increased focus on LEPC on Federal lands might be enhanced through listing of the species, these lands already have LEPC as a high priority, and with the exception of NM, represent such a small part of the land base as to be a minor contributor to the habitat needs of the species. All existing programs have been coordinated to provide focused delivery of habitat improvements through landowner assistance and incentive programs. These programs can only be encouraged through voluntary programs, with economic incentives being a primary tool to effect change. The effectiveness of these programs is felt to be maximized when landowners perceive any potential negative consequences of their actions to their legitimate land uses to be minimized, the condition that would exist with the species remaining unlisted under the ESA.

The second component of the conservation strategy is designed to avoid, minimize, and mitigation new impacts to LEPC. The designation of focal areas and other CHAT categories highlights to development companies the areas where impacts to LEPC will be greatest and thus avoided, as well as areas where developments can occur with no or low levels of impacts to LEPC. By engaging most or substantial numbers of developers in conservation tools such as CCAA's, developers will be provided with greater certainty that their developments in appropriate locations can proceed, while developments that occur within LEPC areas will use practices that minimize their impacts and provide for replacement of their impacts through mitigation. The effectiveness of these programs will depend on the level of engagement of development companies in either these formal agreements or in equivalent voluntary offset programs.

The USFWS (2012a) presented its evaluation of the PECE criteria for listing. In this proposed rule it stated "The primary factors supporting the proposed threatened status for lesser prairie-chicken are the historical, ongoing, and probable future impacts of cumulative habitat loss and fragmentation. These impacts are the result of: conversion of grasslands to agricultural uses; encroachment by invasive woody plants; wind energy development; petroleum production; and presence of roads and manmade vertical structures including towers, utility lines, fences, turbines, wells, and buildings." The conservation strategy applies incentive programs to improve LEPC habitat on private lands and to encourage conversion of agricultural lands back to native grasslands. It accomplishes this both through voluntary landowner incentive programs as well as through the ability for landowners to engage in mitigation programs where incentives are provided through the purchase of mitigation credits that the landowner can generate. Similarly, the conservation strategy emphasizes the restoration of LEPC habitat that has been invaded by woody plants through both the voluntary incentive programs and the mitigation system. Impacts and fragmentation from developments are addressed through the various conservation tools such as CCAA's, HCP's, and VOP's, and the effectiveness of these programs is promoted and measured through the mitigation system. In summary, the conservation strategy is designed to improve conditions created by past changes to LEPC habitat, and to reduce or eliminate future threats to the species.

Additional Action Steps

To be added later, as appropriate

Acknowledgements

Numerous agencies, organizations and individuals are all working to prepare this conservation plan. A final listing will be provided in future drafts.

Literature Cited

- Ahlborn, G. G. 1980. Brood-rearing habitat and fall-winter movements of Lesser Prairie Chickens in eastern New Mexico. Thesis. New Mexico State University, Las Cruces, New Mexico, USA.
- Applegate, R. D., and T. Z. Riley. 1998. Lesser Prairie-Chicken management. *Rangelands* 20:13-15.
- Bell, L. A. 2005. Habitat use and growth and development of juvenile lesser prairie chickens in southeast New Mexico. Thesis. Oklahoma State University, Stillwater, Oklahoma, USA.
- Bell, L. A., S. D. Fuhlendorf, M. A. Patten, D. H. Wolfe, and S. K. Sherrod. 2010. Lesser Prairie Chicken hen and brood habitat use on sand shinnery oak. *Rangeland Ecology and Management* 63:478-486.
- Bent, A. C. 1932. Life histories of North American gallinaceous birds. U.S. National Museum Bulletin 162.
- Bidwell, T. E., S. Fuhlendorf, B. Gillen, S. Harmon, R. Horton, R. Manes, R. Rodgers, S. Sherrod, and D. Wolfe. 2003. Ecology and management of the lesser prairie-chicken in Oklahoma. Oklahoma State University Extension Circular E-970, Oklahoma Cooperative Extension Unit, Stillwater, Oklahoma, USA.
- BLM. 2008. Special status species record of decision and approved resource management plan amendment. Pecos Dist. Office, Roswell, NM. 110 pp.
- Campbell, H. 1972. A population study of lesser prairie chickens in New Mexico. *Journal of Wildlife Management* 36:689-699.
- Cannon, R. W, and F. L. Knopf. 1979. Lesser prairie-chicken responses to range fires at the booming ground. *Wildlife Society Bulletin* 7:44-46.
- Copelin, F. F. 1963. The lesser prairie-chicken in Oklahoma. Oklahoma Department of Wildlife Technical Bulletin 6, Oklahoma City, Oklahoma, USA.
- Crawford, J. A. 1974. The effects of land use on lesser prairie chicken populations in west Texas. Dissertation. Texas Tech University, Lubbock, Texas, USA.
- _____, and E. G. Bolen. 1976a. Effects of land use on lesser prairie-chickens in Texas. *Journal of Wildlife Management* 40:96-104.
- _____, and _____. 1976b. Fall diet of lesser prairie chickens in west Texas. *Condor* 78:142-144.
- Davis, C. A., T. Z. Riley, R. A. Smith, H. R. Suminski, and M. J. Wisdom. 1979. Habitat evaluation of lesser prairie chickens in eastern Chaves County, New Mexico. Department of Fish and Wildlife Science, New Mexico Agriculture Experiment Station, Las Cruces, New Mexico, USA.

- _____. C. G. Ahlborn, S. S. Merchant, and D. L. Wilson. 1981. Evaluation of lesser prairie chicken habitat in Roosevelt County, New Mexico. Final report to New Mexico Department of Game and Fish, Contract 516-67-05. New Mexico State University, Las Cruces, New Mexico, USA.
- Davis, D. M. 2009. Nesting ecology and reproductive success of Lesser Prairie-Chickens in shinnery oak-dominated rangelands. *Wilson Journal of Ornithology* 121:322-327.
- Davis, D. M., R. E. Horton, E. A. Odell, R. D. Rodgers, and H. A. Whitlaw. 2008. Lesser Prairie Chicken Conservation Initiative. Lesser Prairie-Chicken Interstate Working Group. Unpublished Report, Colorado Division of Wildlife, Fort Collins, CO. 121pp.
- Davison, V. E. 1940. An 8 year census of lesser prairie-chickens. *Journal of Wildlife Management* 4:55-62.
- Dixon, C. E. 2011. A spring without moisture, how did it effect lesser prairie chickens and their habitat in eastern New Mexico? Abstract in: Prairie Grouse Technical Council 29th meeting.
- Doerr, T. B., and F. S. Guthery. 1983. Effects of tebuthiuron on lesser prairie-chicken habitat and food. *Journal of Wildlife Management* 47:1138-1142.
- Donaldson, D. D. 1969. Effect on Lesser Prairie Chickens of brush control in western Oklahoma. Dissertation. Oklahoma State University, Stillwater, Oklahoma, USA.
- Duck, L. G., and J. B. Fletcher. 1944. A survey of the game and furbearing animals of Oklahoma. State Bulletin 3, Oklahoma Game and Fish Department, Oklahoma City, Oklahoma, USA.
- Elmore, D., T. Bidwell, R. Ranft, and D. Wolfe. 2009. Habitat evaluation guide for the Lesser Prairie-Chicken. E-1014. Oklahoma Cooperative Extension Service, Division of Agricultural Sciences and Natural Resources, Oklahoma State University, Stillwater, Oklahoma. 26pp.
- Fields, T. L. 2004. Breeding season habitat use of Conservation Reserve Program (CRP) land by lesser prairie chickens in west central Kansas. Thesis. Colorado State University, Fort Collins, Colorado, USA.
- Fuhlendorf, S. D., A. J. Woodward, D. M. Leslie Jr., and J. S. Shackford. 2002. Multiscale effects of habitat loss and fragmentation on lesser prairie-chicken populations. *Landscape Ecology* 17:601-615.
- Garton, E. O. 2012. An Assessment of Population Dynamics and Persistence of Lesser Prairie-Chickens. Unpublished manuscript. Western Association of Fish and Wildlife Agencies. Giesen, K. M. 1991. Population inventory and habitat use by lesser prairie-chickens in southeast Colorado. Federal Aid in Wildlife Restoration Report W-152-R, Colorado Division of Wildlife, Colorado, USA.
- _____. 1994a Breeding range and population status of lesser prairie-chickens in Colorado. *Prairie Naturalist* 26: 175-182.
- _____. 1994b. Movements and nesting habitat of lesser prairie-chicken hens in Colorado. *Southwestern Naturalist* 39:96-98.
- _____. 1998. Lesser prairie-chicken. *In* The birds of North America, No. 364 (A. Poole and F. Gills, editors). The Birds of North America, Inc., Philadelphia, Pennsylvania, USA.
- Hagen, C. A. 2003. A demographic evaluation of lesser prairie-chicken populations in southwest Kansas: survival, population viability, and habitat use. Dissertation. Kansas State University, Manhattan, Kansas, USA.

- _____. 2010. Impacts of energy development on prairie grouse ecology: a research synthesis. Transactions of the 75th North American Wildlife and Natural Resources Conference 75:96-103.
- _____, and K. M. Giesen. 2005. Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/364>.
- _____, B. A. Grisham, C. W. Boal, and D. A. Haukos. In review. A meta-analysis of lesser prairie-chicken nesting and brood rearing habitats: implications for habitat.
- Hagen, C. A., J. C. Pitman, B. K. Sandercock, D. H. Wolfe, R. J. Robel, R. D. Applegate, and S. J. Oyler-McCance. 2010. Regional variation in mtDNA of the Lesser Prairie-Chicken. Condor 112:29-37.
- _____, J. C. Pitman, T. M. Loughin, B. K. Sandercock, R. J. Robel, and R. D. Applegate. 2011. Impacts of anthropogenic features on habitat use by Lesser Prairie-Chickens. Pages 63-76 in B. K. Sandercock, K. Martin, and G. Segelbacher (editors). Ecology, conservation, and management of grouse. Studies In Avian Biology (no. 39), University of California Press, Berkeley, California, USA.
- _____, _____, B. K. Sandercock, R. J. Robel, and R. D. Applegate. 2007. Age-specific survival and probable causes of mortality in female Lesser Prairie-Chickens. Journal of Wildlife Management 71:518-525.
- _____, G. C. Salter, J. C. Pitman, R. J. Robel, and R. D. Applegate. 2005. Lesser prairie-chicken brood habitat in sand sagebrush: invertebrate biomass and vegetation. Wildlife Society Bulletin 33:1080-1091.
- _____, B. K. Sandercock, J. C. Pitman, R. J. Robel, and R. D. Applegate. 2009. Spatial variation in Lesser Prairie-Chicken demography: a sensitivity analysis of population dynamics and management alternatives. Journal of Wildlife Management 73:1325-1332.
- Hamerstrom, F.N. Jr., and F. Hamerstrom. 1973. The greater prairie-chicken in Wisconsin - highlights of a 22 year study of counts, behavior, movements, turnover, and habitat. Wisconsin Dept. Natural Resources. Technical Bulletin Number 64. Madison, WI.
- Haufler, J., D. Davis and J. Caulfield. 2012. Oklahoma lesser prairie chicken conservation plan a strategy for species conservation. May 25, 2012 draft. Ecosystem Management Research Institute, Seeley Lake, Montana. 87 pp.
- Haufler, J. B., and L. H. Suring. 2011. A metric system for evaluating off-site mitigation for ecosystem services and wildlife habitat in sagebrush ecosystems. Pages 265-277 in: Wambolt et al, compilers. 15th Wildland Shrub Symposium Proceedings. S. J. and Jessie E. Quinney Natural Resources Research Library, Logan, UT.
- Haukos, D. A. 1988. Reproductive ecology of lesser prairie-chickens in west Texas. Thesis. Texas Tech University, Lubbock, Texas, USA.
- _____. 2011. Use of tebuthiuron to restore sand shinnery oak grasslands of the Southern High Plains. M. N. Hasaneen, editor. ISBN: 978-953-307-744-4, InTech, Available from: <http://www.intechopen.com/books/herbicides-mechanisms-and-mode-ofaction/>
- _____, and L. M. Smith. 1989. Lesser prairie chicken nest site selection and vegetation characteristics in tebuthiuron-treated and untreated sand shinnery oak in Texas. Great Basin Naturalist 49:624-626.

- Henika, F. S. 1940. Present status and future management of the prairie chicken in Region 5. Special Report: Texas Game, Fish, and Oyster Commission, Division of Wildlife Restoration, Project 1-R.
- Hoffman, D. M. 1963. The lesser prairie chicken in Colorado. *Journal of Wildlife Management* 27:726-732.
- Horak, G. J. 1985. Kansas prairie chickens. *Wildlife Bulletin* 3, Kansas Fish and Game Commission, Pratt, Kansas, USA.
- Horton, R. E. 2000. Distribution and abundance of lesser prairie-chicken in Oklahoma. *Prairie Naturalist* 32:189-195.
- Horton, R., L. Bell, C. M. O'Meilia, M. McLachlan, C. Hise, D. Wolfe, D. Elmore and J.D. Strong. 2010. A spatially-based planning tool designed to reduce negative effects of development on the Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) in Oklahoma: A multi-entity collaboration to promote Lesser Prairie-Chicken voluntary habitat conservation and prioritized management actions. Oklahoma Department of Wildlife Conservation. Oklahoma City, Oklahoma. 79pp. Available online at: <http://www.wildlifedepartment.com/lepcdevelopmentplanning.htm>
- Hubbard, J. P. 1978. Revised check-list of the birds of New Mexico. New Mexico Ornithological Society Publication Number 6, Albuquerque, New Mexico, USA.
- Hunt, J. L. 2004. Investigation into the decline of the lesser prairie-chicken (*Tympanuchus pallidicinctus* Ridgway) in southeastern New Mexico. Dissertation. Auburn University, Auburn, Alabama, USA.
- Jackson, A. S., and R. DeArment. 1963. The lesser prairie chicken in the Texas Panhandle. *Journal of Wildlife Management* 27:733-737.
- Jamison, B. E. 2000. Lesser prairie-chicken chick survival, adult survival, and habitat selection and movements of males in fragmented rangelands of southwestern Kansas. Thesis. Kansas State University, Manhattan, Kansas, USA.
- _____, J. A. Dechant, D. H. Johnson, L. D. Igle, C. M. Goldade, and B. R. Eulis. 2002a. Effects of management practices on grassland birds: lesser prairie-chicken. Northern Prairie Wildlife Research Center, Jamestown, North Dakota, USA.
- _____, R. J. Robel, J. S. Pontius, and R. D. Applegate. 2002b. Invertebrate biomass: associations with lesser prairie-chicken habitat use and sand sagebrush density in southwestern Kansas. *Wildlife Society Bulletin* 30:517-526.
- Jarnevich, C. S., and M. K. Laubhan. 2011. Balancing energy development and conservation: a method utilizing species distribution models. *Environmental Management* 47:926-936.
- Jensen, W. E., D. G. Robinson, Jr., and R. D. Applegate. 2000. Distribution and population trend of lesser prairie-chicken in Kansas. *Prairie Naturalist* 32:169-175.
- Johnson, K., H. Smith, G. Sadoti, T. Neville and P. Neville. 2004. Habitat use by nesting lesser prairie-chickens in southeastern New Mexico. *Southwestern Naturalist* 49:334-343.
- Jones, R. E. 1963. Identification and analysis of lesser and greater prairie chicken habitat. *Journal of Wildlife Management* 27:757-778.
- _____. 1964. Habitat used by lesser prairie chicken for feeding related to seasonal behavior of plants in Beaver County, Oklahoma. *Southwestern Naturalist* 9:111-117.

- Jones, R. S. 2009. Seasonal survival, reproduction, and use of wildfire areas by Lesser PrairieChickens in the northeastern Texas Panhandle. Thesis. Texas A&M University, College Station, Texas, USA.
- King, R. T., 1938. The essentials of wildlife range. *Journal of Forestry* 36:457-464.
- Larsson, L. C., C. L. Pruett, D. H. Wolfe, and M. A. Patten. 2012. Fine-scale habitat selection by the lesser prairie-chicken. *Southwestern Naturalist*: in press.
- Leonard, J. P. 2008. The effects of shinnery oak removal on lesser prairie-chicken survival, movement, and reproduction. Thesis. Texas A&M University. College Station, Texas, USA.
- Ligon, J. S. 1961. *New Mexico birds and where to find them*. University of New Mexico Press, Albuquerque, New Mexico, USA.
- Locke, B. A. 1992. Lek hypothesis and the location, dispersion, and size of lesser prairie chicken leks. Dissertation. New Mexico State University, Las Cruces, New Mexico, USA.
- Lyons, E. K., R. S. Jones, J. P. Leonard, B. E. Toole, R. A. McCleery, R. R. Lopez, M. J. Peterson, and N. J. Silvy. 2011. Regional variation in nesting success of Lesser Prairie-Chickens. Pages 223-232 in B. K. Sandercock, K. Martin, and G. Segelbacher (editors). *Ecology, conservation, and management of grouse*. *Studies In Avian Biology* (no. 39), University of California Press, Berkeley, California, USA.
- Martin, A. C., H. S. Zim, and A. L. Nelson. 1951. *American wildlife and plants: A guide to wildlife food habits*. Dover Publications, Inc., New York, NY.
- McDonald, L., J. Griswold, T. Rintz, and G. Gardner. 2012. Results of the 2012 range-wide survey of lesser Prairie-chickens (*Tympanuchus pallidicinctus*). Unpublished manuscript. Western Association of Fish and Wildlife Agencies.
- Merchant, S. S. 1982. Habitat-use, reproductive success, and survival of female lesser prairie chickens in two years of contrasting weather. Thesis. New Mexico State University, Las Cruces, New Mexico, USA.
- New Mexico Department of Game and Fish. 2011. *Prairie chicken areas and Sandhills Prairie Conservation Area, White Paper*. Unpublished report.
- Neville, P., T. Neville, and K. Johnson. 2005. Lesser prairie-chicken habitat map for portions of Eastern New Mexico. Publication No. 05-GTR-285. Natural Heritage New Mexico, Museum of Southwestern Biology, University of New Mexico. Albuquerque, New Mexico, USA.
- Oberholser, H. C. 1974. *The birdlife of Texas*. Volume 1. University of Texas Press, Austin, Texas, USA.
- Olawsky, C., Smith, L., & Pettit, R. (1988). Effects of shinnery oak control on early summer diet and condition of lesser prairie-chickens. *Research Highlights 1987 Noxious Brush and Weed Control; Range, Wildlife, & Fisheries Management* 18: 29. Lubbock: Texas Tech University, College of Agricultural Sciences and Natural Resources.
- Patten, M. A., D. H. Wolfe, E. Shochat, and S. K. Sherrod. 2005. Habitat fragmentation, rapid evolution, and population persistence. *Evolutionary Ecology Research* 7:1-15.
- Peterson, R.S., and C.S. Boyd. 1998. Ecology and management of sand shinnery communities: a literature review. USDA Forest Service General Technical Report. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO, USA. 44 pp.

- Pitman, J. C, C. A. Hagen, R. J. Robel, T. M. Loughin, and R. D. Applegate. 2005. Location and success of lesser prairie-chicken nests in relation to vegetation and human disturbance. *Journal of Wildlife Management* 69:1259-1269.
- _____, C. A. Hagen, B. E. Jamison, R. J. Robel, T. M. Loughin, and R. D. Applegate. 2006. Nesting ecology of lesser prairie-chickens in sand sagebrush prairie of southwestern Kansas. *Wilson Journal of Ornithology* 118:23-35.
- Pruett, C. L., J. A. Johnson, L. C. Larsson, D. H. Wolfe, and M. A. Patten. 2011. Low effective population size and survivorship in a grassland grouse. *Conservation Genetics* 12:1205-1214.
- Pruett, C. L., M. A. Patten, and D. H. Wolfe. 2009. Avoidance behavior of prairie grouse: implications for wind and energy development. *Conservation Biology* 23:1253-1259.
- Riley, T. Z. 1978. Nesting and brood rearing habitat of lesser prairie chickens in southeastern New Mexico. Thesis. New Mexico State University, Las Cruces, New Mexico, USA.
- _____, C. A. Davis, M. Ortiz, and M. J. Wisdom. 1992. Vegetative characteristics of successful and unsuccessful nests of lesser prairie chickens. *Journal of Wildlife Management* 56:383-387.
- _____, _____, M. A. Candelaria, and H. R. Suminski. 1994. Lesser Prairie-Chicken movements and home ranges in New Mexico. *Prairie Naturalist* 26:183-186.
- Rondeau, R., and K. Decker. 2010. Lesser Prairie Chicken habitat assessment, Comanche National Grasslands. Prepared for U. S. Forest Service. Colorado Natural Heritage Program, Colorado State University. 22pp.
- Sell, D. L. 1979. Spring and summer movements and habitat use by lesser prairie chickens in Yoakum County, Texas. Thesis. Texas Tech University, Lubbock, Texas, USA.
- Smith, R. A. 1979. Fall and winter habitat of Lesser Prairie chickens in southeastern New Mexico. New Mexico State University, Las Cruces. 71pp.
- Snyder, W. A. 1967. Lesser prairie chicken. Pages 121-128 *in* New Mexico Wildlife Management. New Mexico Department of Game and Fish, Santa Fe, New Mexico, USA.
- Suminski, H. R. 1977. Habitat evaluation for lesser prairie chickens in eastern Chaves County, New Mexico. Thesis. New Mexico State University, Las Cruces, New Mexico, USA.
- Sullivan, R. M., J. P. Hughes, and J. E. Lionberger. 2000. Review of the historical and present status of the lesser prairie-chicken (*Tympanuchus pallidicinctus*) in Texas. *Prairie Naturalist* 32:177-188.
- Schwilling, M.D. 1955. A study of the lesser prairie-chicken in Kansas. Job completion report, Kansas Forestry, Fish and Game Comm., Pratt. 51 pp.
- Taylor, M. A. 1979. Lesser prairie chicken use of man-made leks. *Southwest Naturalist* 24:706-707.
- _____, and F. S. Guthery. 1980a. Status, ecology, and management of the lesser prairie chicken. USDA Forest Service General Technical Report RM-77, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado, USA.
- _____, and _____. 1980b. Fall-winter movements, ranges, and habitat use of lesser prairie-chickens. *Journal of Wildlife Management* 44:521-524.
- _____, and _____. 1980c. Fall-winter movements, ranges, and habitat use of Lesser Prairie-chickens. *Journal of Wildlife Management* 44:521-524.

- Thacker, E. T., R. L. Gillen, S. A. Gunter, and T. L. Springer. 2012. Chemical control of sand sagebrush: implications for lesser prairie-chicken habitat. *Rangeland Ecology and Management* 65:516–522.
- Thompson, M. C., and C. Ely. 1989. *Birds in Kansas. Volume 1.* University of Kansas Museum of Natural History. Public Education Service Number 11.
- Toole, B. E. 2005. Survival, seasonal movements, and cover use by Lesser Prairie Chickens in the Texas Panhandle. Thesis. Texas A&M University, College Station, Texas, USA.
- U.S. Fish and Wildlife Service. 2012a. Endangered and Threatened Wildlife and Plants; Listing the Lesser Prairie-Chicken as a Threatened Species. *Federal Register* Volume 77, No. 238:73827-73888.
- _____. 2012b. Conservation needs of the lesser prairie-chicken. Technical White Paper.
- _____. 2012c. U.S. Fish and Wildlife Service Land Based Wind Energy Guidelines. OMB Control No, 1018-0148. U.S. Fish and Wildlife Service, Washington, D.C.
- Wildlife Management Institute. 1999. Lesser prairie-chicken (*Tympanuchus pallidicinctus*). Fish and Wildlife Management Leaflet No. 6. Natural Resources Conservation Service, Wildlife Habitat Management Institute, Madison, Mississippi, USA.
- Wisdom, M. J. 1980. Nesting habitat of lesser prairie chickens in eastern New Mexico. Thesis. New Mexico State University, Las Cruces, New Mexico, USA.
- Wolfe, D. H., M. A. Patten, and S. K. Sherrod. 2003. Factors affecting nesting success and mortality of Lesser Prairie-Chickens in Oklahoma. ODWC Federal Aid In Wildlife Restoration Project W-146-R Final Report. 23pp.
- Wolfe, D. H., M. A. Patten, E. Shochat, C. L. Pruett, and S. K. Sherrod. 2007. Causes and patterns of mortality in lesser prairie-chickens *Tympanuchus pallidicinctus* and implications for management. *Wildlife Biology* 13 (Suppl 1): 95-104.
- Woodward, A. J., S. D. Fuhlendorf, D. M. Leslie Jr., and J. Shackford. 2001. Influence of landscape composition and change on lesser prairie-chicken (*Tympanuchus pallidicinctus*) populations. *American Midland Naturalist* 145:261-274.

Appendices