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In Reply Refer To:
FWS/R2/OKES/

May 3, 2022

Memorandum

To: Regional Director, Southwest Regional Office, Albuquerque, New Mexico

Through: Assistant Regional Director – Ecological Services, Southwest Regional Office, Albuquerque, New Mexico

From: Field Supervisor, Oklahoma Ecological Services Field Office, Tulsa, Oklahoma

Subject: Intra-Service Section 7 Conference Opinion on Issuance of an Amended Enhancement of Survival Permit Associated with the Amended Oklahoma Agricultural Candidate Conservation Agreement with Assurances for Lesser Prairie-Chickens

This memorandum represents the U.S. Fish and Wildlife Service's (Service) intra-Service conference opinion on the proposed amendment to the Oklahoma Department of Wildlife Conservation's (ODWC) section 10(a)(1)(A) Enhancement of Survival Permit (Permit) associated with an amendment to their existing Oklahoma Agricultural Candidate Conservation Agreement with Assurances (CCAA), pursuant to section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531 *et seq*; Act). The ODWC has proposed to increase the enrollment acreage cap of the CCAA, from 400,000 acres to 1,000,000 million acres, and amend their Permit to increase the incidental take authorization for the lesser prairie-chicken (*Tympanuchus pallidicinctus*; LEPC) on enrolled lands.

Currently, the LEPC is proposed for Federal listing as threatened in the Northern Distinct Population Segment (DPS) and endangered in the Southern DPS. A DPS is a vertebrate population, or group of populations that is discrete from other populations of the species and significant in relation to the entire species. The Service encourages cooperative conservation efforts for proposed species because they may warrant future protection under the Act. A CCAA provides an effective mechanism for the cooperative conservation of rare or imperiled species including species that are candidates for protection and proposed for listing under the Act. The CCAA and its proposed amended Permit will address incidental take of the LEPC should the species become listed during the term of the CCAA.

The Service considered the potential effects of the amendment to the Permit on the LEPC and other federally-listed and proposed species and any candidates for Federal listing that are known to occur within the action area. The species considered were the endangered whooping crane (*Grus americana*), the threatened Arkansas River shiner (*Notropis girardi*) and its designated critical habitat, the threatened piping plover (*Charadrius melodus*), and the candidate monarch butterfly (*Danaus plexippus*). The Service determined the proposed action would have no effect on the piping plover and would not jeopardize the continued existence of the monarch butterfly. We also determined the proposed action “may effect, but is not likely to adversely affect,” the Arkansas River shiner and whooping crane and not likely to adversely modify the Arkansas River shiner’s designated critical habitat. Rationales and concurrences for these determinations are provided in Appendix A.

This conference opinion is based on information provided in the amended CCAA, the Species Status Assessment (SSA) Report for the LEPC (Service 2021), the NEPA Screening Form and Environmental Action Statement (Service 2022), telephone conversations with ODWC and Service experts, field investigations, and other sources of information. Literature cited in this conference opinion is not a complete bibliography of all literature available on the species of concern, the effects of the proposed action, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file in the Service's Oklahoma Ecological Services Field Office in Tulsa, Oklahoma.

CONFERENCE OPINION

DESCRIPTION OF THE PROPOSED ACTION

Regulations implementing the Act (50 CFR 402.02) define “action” as “all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies of the United States or upon the high seas.” The following is a summary of the proposed action, and a detailed description can be found in the Oklahoma Agricultural Candidate Conservation Agreement with Assurances (CCAA) and proposed amendment language. The Oklahoma Department of Wildlife Conservation (ODWC) has requested an amendment to their existing section 10(a)(l)(A) Enhancement of Survival Permit (Permit) (TE72923A-1) associated with the amended CCAA for the lesser prairie-chicken (*Tympanuchus pallidicinctus*; LEPC) in Oklahoma. The purpose of the proposed amendment is to increase the enrollment cap from the current maximum of 400,000 acres to a maximum of 1,000,000 acres across 14 counties in Oklahoma, thus increasing the net conservation benefit of the CCAA for the LEPC. The Service has carefully considered the requested amendment. The proposed amendments to the CCAA are as follows:

<u>Section II. Planning Area, Covered Area, and Enrolled Lands</u>

Paragraph 1, Page 3

- Amendment #1 January 25, 2013: "ODWC's goal is to enroll a minimum of 400,000 acres under this CCAA during its 25-year duration."

- Amended to read as: "ODWC's goal is to enroll a maximum of 1 million acres under this CCAA during its 25-year duration."

<u>Section IV. Background and Description of Existing Conditions</u>

Paragraph 16, Page 12-13

- Amendment #1 January 25, 2013: “The goal of this CCAA is to enroll 400,000 acres during its 25-year duration.”

- Amended to read as: “The goal of this CCAA is to enroll a maximum of 1 million acres that meet the suitable habitat standard for lesser prairie-chickens during its 25-year duration."

Section VII. Type of Take/Level/Impacts

Paragraph 4, Page 25

- Amendment #1 January 25, 2013: "The goal of this CCAA is to enroll a minimum of 400,000 acres. Over the 25-year life of the CCAA, it is feasible to assume that the goal of 400,000 acres may be enrolled. Assuming the objective is reached, the CCAA would influence about 40% of the occupied portion of the EOR in Oklahoma. If, on average, LEPC densities are about two birds per square mile in good quality habitat, there could be as many as 1,250 LEPCs within the targeted enrollment/implementation area of this CCAA and an overall population of about 3,125 birds within the entire planning area."

- Amended to read as: "The goal of this CCAA is to enroll a maximum of 1 million acres of suitable habitat for lesser prairie chickens during its 25-year duration. This CCAA would seek to influence the full extent of the estimated occupied range (EOR) in Oklahoma. If, on average, LEPC densities in the mixed grass ecoregion are approximately 5,202, there could be as many as 3,125 birds within the entire planning area. Maximum enrollment will increase the net conservation benefit to the LEPC population in Oklahoma andcontribute to the species' conservation across the entirety of its range."

Paragraph 5, Page 25

- Amendment #1 January 25, 2013: "Thus the total number of LEPC that might reasonably be expected to occur within the targeted 400,000 acres encompassed by this agreement would be about 804 birds."

- Amended to read as: "Thus the total number of LEPC that might reasonably be expected to occur within the acres encompassed by this agreement would be about 3,125 birds."

Paragraph 6, Page 26

- Amendment #1 January 25, 2013: "Under a worst case scenario, all 804 birds might be taken in the form of harm, harassment, or direct mortality. However, because the CCAA is a conservation program developed for the benefit of the LEPC, the worst case scenario is not anticipated to occur. Lacking a more precise estimate of incidental take, we anticipate that no more than 5% of nests with eggs or broods/year and no more than 5% of LEPCs/year would be taken on enrolled lands due to the implementation of conservation measures and from ongoing otherwise lawful agricultural, recreational, and limited- development activities. Based on current conditions, we assume that 804 LEPCs might occur on the 400,000 acres expected to be enrolled over the life of the program and that these 804 birds, under optimum conditions, would construct about 402 nests/year. Therefore, we anticipate that, on average, no more than 20 nests with eggs or broods/year would be taken in the form of mortality. We also anticipate that no more than an average of 40 LEPCs/year would be taken in the form of mortality. As the number of LEPCs increase in Oklahoma due to the CCAA and other similar conservation programs, as is expected, an increase in the amount of authorized incidental take will be considered by the Service if requested by the ODWC through a formal amendment."

- Amended to read as: "Under a worst case scenario, all 3,125 birds might be taken in the form of harm, harassment, or direct mortality. However, because the CCAA is a conservation program developed for the benefit of the LEPC, the worst case scenario is not anticipated to occur. Lacking a more precise estimate of incidental take, we anticipate that no more than 5% of nests with eggs or broods/year and no more than 5% of LEPCs/year would be taken on enrolled lands due to the implementation of conservation measures and from ongoing otherwise lawful agricultural, recreational, and limited-development activities. Based on current conditions, we assume that 3,125 LEPCs might occur on the acres expected to be enrolled over the life of the program and that these 3,125 birds, under optimum conditions, would construct about 1,562 nests/year. Therefore, we anticipate that, on average, no more than 78 nests with eggs or broods/year would be taken in the form of mortality. We also anticipate that no more than an average of 156 LEPCs/year would be taken in the form of mortality.

Action Area

The action area is defined (50 CFR 402.02) as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The Service has determined that the action area for this project pertains to non-federal lands in Oklahoma encompassed by the current distribution of the LEPC, those non-federal lands that are unoccupied, but potentially suitable LEPC habitat, and those non-federal lands that could provide habitat should the current population and distribution of the LEPC increase. In particular, the Planning Area, as described in the CCAA, includes all the following Oklahoma counties: Alfalfa, Beaver, Beckham, Cimarron, Custer, Dewey, Ellis, Harper, Major, Roger Mills, Texas, Washita, Woods, and Woodward (Figure 1). Covered areas are eligible non-federal lands within the Planning Area that provide suitable habitat for the LEPC or have the potential to provide suitable LEPC habitat with the implementation of conservation measures. Enrolled lands (or properties) are those lands within the covered area that would be included under the CCAA and the Permit through the process of landowners signing and ODWC issuing the certificates of inclusion (CI). Conservation measures that would be maintained or newly implemented that could directly or indirectly effect the LEPC and its habitat would occur entirely within the Planning Area. Therefore, for the purposes of this conference opinion, the action area includes all the Oklahoma counties listed above and identified in Figure 1.

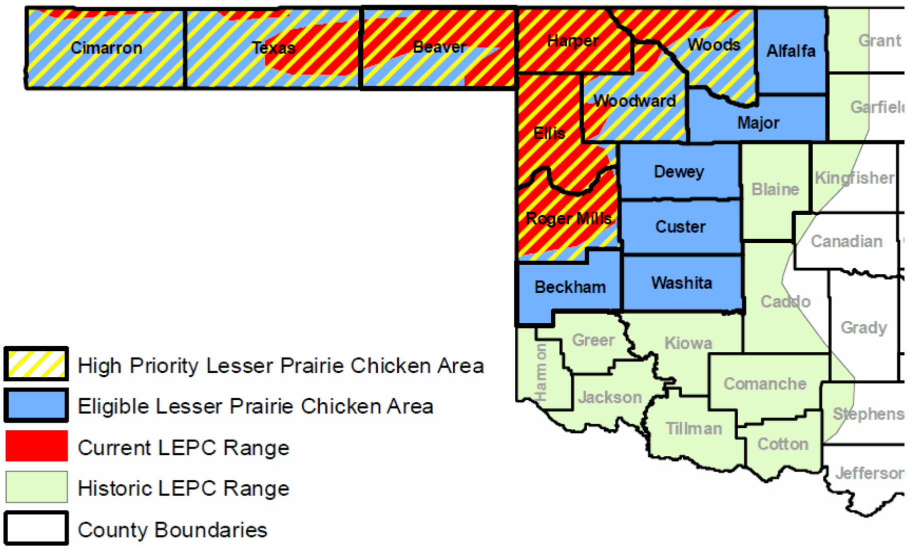

Figure 1. The Planning Area (or Eligible Area) and High Priority Areas for the CCAA, and current and historical LEPC range.*

*The Planning Area is represented by the blue counties and the yellow crosshatched counties. The High Priority Areas are represented by the yellow crosshatched counties.

Conservation Measures

The following summary list of conservation measures are those currently available for consideration under the existing CCAA during development of wildlife management plans (WMPs) for LEPC habitat conservation, restoration and/or enhancement. The conservation measures would carry forward unchanged in the amended CCAA. The list is a synthesis of available information and reflects the current understanding of the LEPCs habitat requirements and population responses to available habitat. Sources for the list of conservation measures also include Bidwell and Peoples (1991) Mote *et al*. (1999), Jamison *et al*. (2002), Bidwell (2002), Hagen *et al.* (2004), and Riley (2004). Background information and additional detail can be found within these resources. Ultimately, the technical standards followed during implementation of conservation measures for each property will be determined by the funding source utilized.

The CCAA conservation measures implemented or maintained are intended to conserve, restore, and/or enhance LEPC habitat so that progress toward sustainable population levels can occur. Use of these measures (and associated minimization practices) also is intended to reduce any unfavorable impacts to LEPC arising from the management and utilization of the enrolled lands.

Although all seasonal habitat requirements of LEPC are necessary for their conservation and recovery, available data indicate that increasing breeding success (*i.e.*, nest success, recruitment) is the primary key to increasing numbers of LEPC (and perhaps therefore, distribution) (Hagen *et al*. 2004). As a result, conservation measures implemented to improve, recover, and/or enhance LEPC habitat should focus on providing suitable nesting and brood-rearing habitat components such as areas with light to moderate grazing pressure and dominant native shrub cover. The conservation practices outlined below are structured to first restore and then maintain native prairie habitats as nesting and brood-rearing habitat.

The full descriptions for conservation actions can be found in the existing CCAA. The specific WMP implemented on a particular non-federal property need not include every single conservation measure identified here. Flexibility exists within all techniques at the discretion of those involved in the ODWC-approved WMP process. It also is important to recognize that an enrolled property that already has suitable LEPC habitat and would be managed "as is" or be further improved would also constitute an approved conservation measure within the CCAA provided that the conservation measure would result in an overall high conservation benefit for the LEPC and would not prevent the standard of the CCAA policy from being met. The list is organized by general management technique for ease of use and includes:

<u>Habitat Management Measures</u>

- Fire and grazing management to produce desired habitat conditions for all life stages and seasonal uses for LEPC
  - Stocking rates. Stocking rates varied between light to moderate to provide simultaneous representation of multiple plant succession states.
  - Fire frequency. Prescribed burns scattered across the project area or in large blocks totaling 20 to 30% of the overall project area per year.
  - Habitat diversity. Three to four different plant successional states present at any given time.
  - Fencing. Minimization or removal of fencing.

- Herbicide application/treatment as a tool to maintain cover and food producing plants

- Habitat conversion to conservation cover (native grasses and forbs)
  - Haying. Deferred haying near known leks until breeding and nesting activities are completed. Hay cut in a manner that allows birds to flush or escape harm.
  - Conservation Reserve Program (CRP). Implementation of Farm Services Agency (FSA) mid-contract management practices to replicate native grassland conditions.
  - Brush management. Native shrubs interspersed with native bunch grasses to provide high quality LEPC habitat.
  - Range planting. Improvement of degraded areas to the rangeland conditions preferred by the LEPC.

<u>Upland Habitat Wildlife Management</u>

- Cultivation and tillage practices. Conservation tillage approaches, combined with minimal pesticide use, to provide additional and supplemental food supplies for the LEPC.
- Food plots. Small plots planted with supplemental food to provide food resources to LEPC during fall and winter.
- Other. Soil disturbance to stimulate growth of native foods for the LEPC. Management of overgrown vegetation on lek sites to enhance the value and use of the lek.

Minimization Practices

Where a conservation measure is anticipated to result in adverse effects to the LEPC, minimization practices have been identified and made a part of that measure to eliminate or minimize the potential adverse effects of the identified measure. Minimization practices associated with specific conservation measures are provided in the original CCAA and would carry forward unchanged in the amended CCAA.

Changed Circumstances

Various factors are out of the control of the landowners and will be addressed broadly by the conservation measures. These factors include wildfire, drought, floods, tornados, and energy development. Should such factors occur, the landowner, ODWC, and the Service will meet and evaluate the situation on a case by case to determine the necessary management actions to address the changed circumstances, as discussed below.

Wildfire, flooding, or tornado impacts affecting single or limited numbers (fewer than 10% of the total number of CIs in effect at the time) of individual CIs will be handled on a case by case basis by the ODWC, Service, and the individual landowners to determine the management practices to be applied. If a wildlife, tornado, or flooding event destroys or effectively eliminates more than 50% of LEPC habitat covered by one or more CIs, to the extent that the ability to reach the protected habitat objective is not possible within the CCAA time frame, ODWC will notify the Service within 30 days of that determination. Within 90 days of notification, the affected parties will meet and evaluate the conservation measures and identify potential actions which could be employed to address the change in circumstances. The parties (ODWC/Service) will meet with the CI holder and develop habitat restoration plans to be implemented voluntarily on an agreed upon schedule. Adaptive management approaches will maximize the likelihood of success.

Prolonged droughts over much of western Oklahoma may create conditions that reduce seasonally available habitat beyond normal annual variation and cause changed circumstances on the landscape. Prolonged periods of drought are defined here as precipitation amounts 15% or more below the long term average for 2 or more successive growing seasons. In this event, the ODWC will notify the Service within 30 days of that determination. Within 90 days of notification, the parties will meet and evaluate the drought conditions and, if opportunities exist, employ changes to the conservation measures to address local conditions.

The parties will identify potential actions to address the change in circumstances for a given parcel of land. The parties will meet with CI holders that graze their lands to evaluate if current livestock grazing practices should be temporarily modified and if the CI holder would be willing to do so. Conservation measures that may be used to address drought conditions include grazing deferment, rotation, or other management changes designed to retain residual and live vegetation; development of grass banks for use during drought conditions; development of additional water sources for livestock and LEPC; and prescribed fire management or similar vegetation management to minimize effects of additive impacts.

Much, if not all, of the Planning Area identified in this CCAA has, or is believed to have, the potential for energy development. In cases where the landowner controls only surface rights and is required to open their lands to energy development after the CI is signed, all efforts to avoid and minimize adverse impacts to the LEPC and its habitat will be made. Determination of the impact of energy development on individual CIs will be made by the ODWC through the monitoring process. Modifications or additions to management practices may be adopted for the individual CI, in concert with the CI holder, based on the adaptive management approach and the circumstances on each CI. If, however, extensive development of energy resources begins to occur where the landowner does not hold the mineral rights, and the mineral owner or energy developer is unwilling to voluntarily implement appropriate conservation measures on sufficient habitat areas, and the ODWC estimates that the ability to achieve the habitat protection targets could be compromised, then a changed circumstance is deemed to be in effect. The ODWC will notify the Service within 30 days of that determination. Within 90 days of that notification, the parties will meet and evaluate existing circumstances and determine if opportunities exist to modify the conservation measures to address the habitat conservation target.

The parties may determine that the cumulative energy development affects the potential to reach the habitat protection objectives. The parties would seek to develop additional or modified conservation measures that could be applied outside the CCAA process or additional conservation measures to be considered by the CI holders or in future CIs. If the landowner or the ODWC are unable get the energy developer to implement the recommended conservation measures, that portion of acreage affected by the changed circumstances may be excluded from the conservation land, but if it is out of the landowner's control, the landowner’s incidental take coverage will remain for the enrolled landowner's activities within the CCAA.

STATUS OF THE SPECIES

The LEPC is the only Covered Species addressed in the amendment to the CCAA and this conference opinion. This section provides a concise review of pertinent information on the species, including a species description, status and occurrence, life history, habitat requirements, population trends, and threats. For more comprehensive information regarding these subjects, refer to the Service's Species Status Assessment (SSA) for the LEPC (Service 2021) for the LEPC.

Species Description

Hagen and Giesen (2005) describe the LEPC as a medium-sized grouse with a total body length of 15−16 inches. Plumage is generally similar for both sexes throughout the year, with alternating dark (brown) and light (buffy white) bands. The chin and throat are largely unmarked, and the tail is short, rounded, and brownish black. During courtship, males exhibit bright yellow eye-combs above the eye and dull red esophageal "air sacs" on the sides of the neck. Males also have a tuft of elongated feathers (pinnae) on each side of the neck that they hold erect during courtship displays. The pinnae in females are shorter. Immature birds are similar in appearance to adults. The weight of male LEPC averages 1.65 pounds (lbs), while that of females' averages 1.57 lbs (Robb and Schroeder 2005). The LEPC is similar in appearance to the greater prairie-chicken (*Tympanuchus cupido*), which occurs primarily to the east of the LEPC range. Hybridization has been recorded where their ranges overlap.

Species Status and Occurrence

The LEPC has been considered for Federal listing under the Act since 1997 (62 FR 36482 [July 8, 1997]) and was briefly listed as threatened in 2014 (79 FR 19973 [April 10, 2014]) until the ruling was overturned in court (U.S. District Court for the Western District of Texas 2015) and Federal protection for the species was removed (81 FR 47047 [July 20, 2016]). In response to a new listing petition, on June 1, 2021, the Service proposed to list two distinct population segments of the LEPC. The Northern DPS is being proposed as threatened with a 4(d) rule and the Southern DPS is being proposed as endangered (Figure 2.). While we have proposed to list two distinct population segments of the LEPC, we did not break out the discussion of the basic biological needs, threats, and the effects of covered activities by DPS within this conference opinion because they are the same across ecoregions.

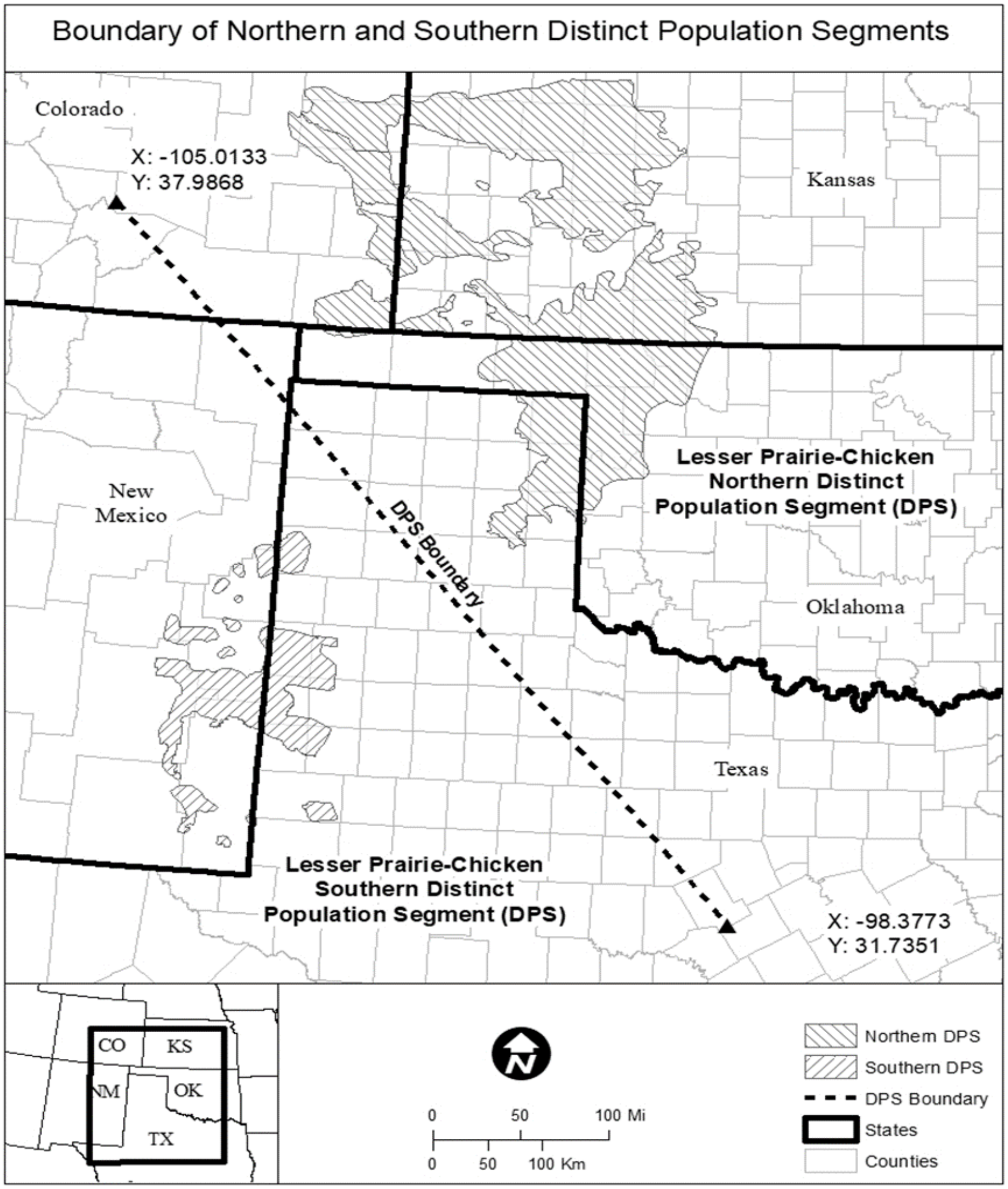

Figure 2. LEPC proposed Distinct Population Segments

The LEPC currently inhabits sand sagebrush (*Artemisia filifolia*), sand shinnery oak (*Quercus havardii*), and mixed grass vegetation communities within the southern Great Plains in portions of Colorado, Kansas, New Mexico, Oklahoma, and Texas (Service 2021). The species' historical range was approximately 115,000,000 acres, not all of which was occupied or had the ability to support LEPCs (Figure 3.). Within the LEPCs current estimated occupied range there are a total of 21,000,000 acres, of which we estimate a maximum of 4,000,000 acres or 18% is potential habitat (Service 2021). The causes for this reduction in range between the LEPC's historical and current status are primarily attributed to habitat loss, fragmentation, and degradation (Service 2021). The Service (2021) summarized the primary habitat loss, fragmentation, and degradation factors as conversion of native prairie to cropland; long-term fire suppression that has led to tree invasion; grazing management and herbicide spraying practices that have reduced habitat quality; and the development of oil and gas, wind, transmission, distribution lines, and roads.

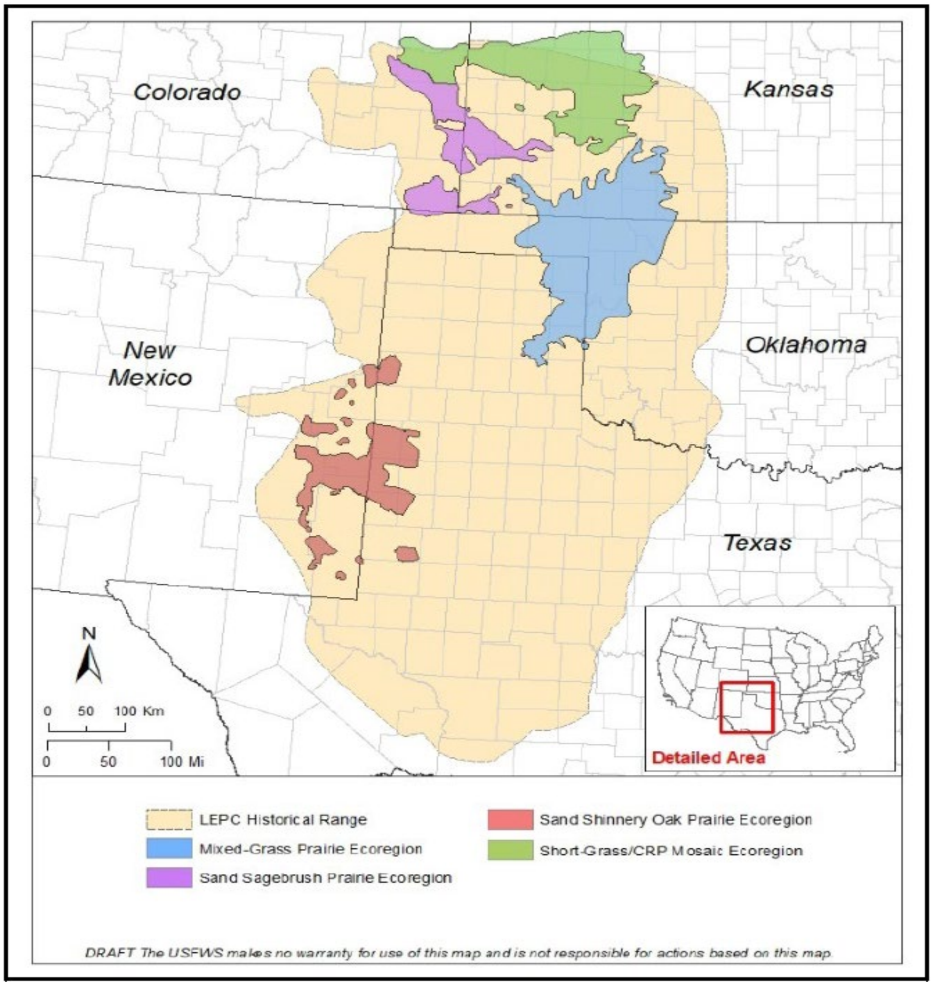

Figure 3. Estimated historical range and the four identified ecoregions within the LEPC's current range (Service 2021).

Life History and Demographics

During the breeding season (generally mid-March through May), male LEPC congregate on lek sites (communal display grounds) and perform courtship displays to attract females for mating. Yearling males attend leks, but older males secure the majority of mating opportunities (Hagen and Giesen 2005). Males generally display during the first few hours of daylight. Displays involve some combination of erected feathers, exposed bare skin of bright colors, a dance, and bubbling or clucking vocalizations.

LEPC have relatively high fidelity to lek sites, with males primarily using established leks year after year, and females tending to select these traditional leks rather than newer or temporary leks (Haukos and Smith 1989). The number of males on leks and/or the density of leks are often used to evaluate population status (Hagen and Giesen 2005).

Females begin to breed the year after hatching and raise only one successful brood per season (Hagen and Giesen 2005). Nest initiation occurs from mid-April through late May, typically within two weeks of lek attendance and copulation (Bent 1932, Copelin 1963, Snyder 1967, Merchant 1982, Haukos 1988, Behney *et al*. 2010). Clutch size is commonly 10–12 eggs, and less for re-nesting females (Hagen and Giesen 2005). Hatching peaks in late May through mid-June throughout the range (Copelin 1963, Merchant 1982). If the first clutch is lost from predation or abandonment, females can attempt to nest again, with chicks hatching mid-June through early July (Merchant 1982, Pitman *et al*. 2006, Haukos and Boal 2016). Hatching success for the first clutch averages greater than 90% (Copelin 1963, Merchant 1982, Pitman 2003), but droughts and hot, dry weather can negatively affect hatching success (Merchant 1982). After hatching, chicks are brooded by the female until about mid-July (Van Pelt *et al*. 2013). Average brood size reported in various studies range from 3.5 to 7.8 (Hagen and Giesen 2020). The critical reproduction period for LEPC range-wide is from March 1 to July 15, with some latitudinal variation (Van Pelt *et al*. 2013).

Nest success and chick survival to the first breeding season has been identified as a key parameter affecting LEPC population growth rates (Hagen *et al*. 2009). Cooler spring temperatures and increased precipitation could enhance nest survival by increasing food and cover for LEPC (Grisham *et al*. 2013). Annual survival also affects LEPC population growth rates. Annual survival rates vary based on sex, age, season, and habitat type which ranges from 0.30 in New Mexico (Campbell 1972) and Kansas (Hagen *et al*. 2007) to 0.60 in Kansas (Hagen *et al*. 2005; see Table 6.1 in Haukos and Zavaleta 2016).

Lesser prairie-chickens are not known to migrate (Hagen and Giesen 2005); rather, in autumn and winter, the birds assemble in mixed-gender flocks. Therefore, LEPC annual habitat needs include breeding habitat, nesting habitat, brood-rearing habitat, and autumn/winter habitat all located relatively close to one another.

Habitat Characteristics

Lesser prairie-chickens are a landscape level species that use various habitat types to satisfy particular life requirements. Lesser prairie-chicken habitat use follows Johnson's (1980) order of habitat selection where the first selection is the extent of potentially available habitat within their range. The range of the LEPC is divided into four regions based on the dominant type of vegetation used by the birds in each region. These include: Shinnery Oak Prairie, Sand Sagebrush Prairie, Mixed Grass Prairie, and Shortgrass/CRP Mosaic (Figure 4). Within each of these regions, LEPC select areas to place their home ranges (*e.g*., second order of selection [Johnson 1980]). The extent of these home ranges incorporates the use of different habitats during various seasons; however, in general the species requires relatively large parcels of intact native grassland and shrubland, and it has been speculated at least 25,000 acres of contiguous high-quality habitat may be required to maintain self-sustaining populations (Bidwell 2002). Van Pelt *et al*. (2013) summarized research with a range of purposes and state that the minimum habitat patch size to support LEPC is not clear but mention several studies that have speculated habitat mosaics ranging from 1,200–25,000 acres of continuous native rangelands could be capable of sustaining a viable population. More specifically in Kansas, 19,407 acres of habitat that contained 77% grassland were more likely to be used by LEPC than areas with less grassland (Sullins *et al*. 2019).

The habitats that LEPC select within individual home ranges (*e.g*., third order [Johnson 1980]) varies based on seasons and regions. Preferred habitat for the LEPC includes native short- and mixed-grass prairies with a shrub component dominated by sand sagebrush or shinnery oak (Taylor and Guthery 1980a, Service 2010) to provide summer shade, winter protection, and supplemental food (Service 2010). The absence of trees and other relatively tall woody vegetation is characteristic of these grassland ecosystems, except areas along watercourses (Service 2010, Lautenbach *et al*. 2017). Habitats are characterized by grasses of short to medium stature, particularly sand bluestem (*Andropogon hallii*), little bluestem (*Schizachyrium scoparium*), buffalo grass (*Buchloe dactyloides*), various dropseeds (*Sporobolus* spp.), and various gramas (*Bouteloua* spp.).

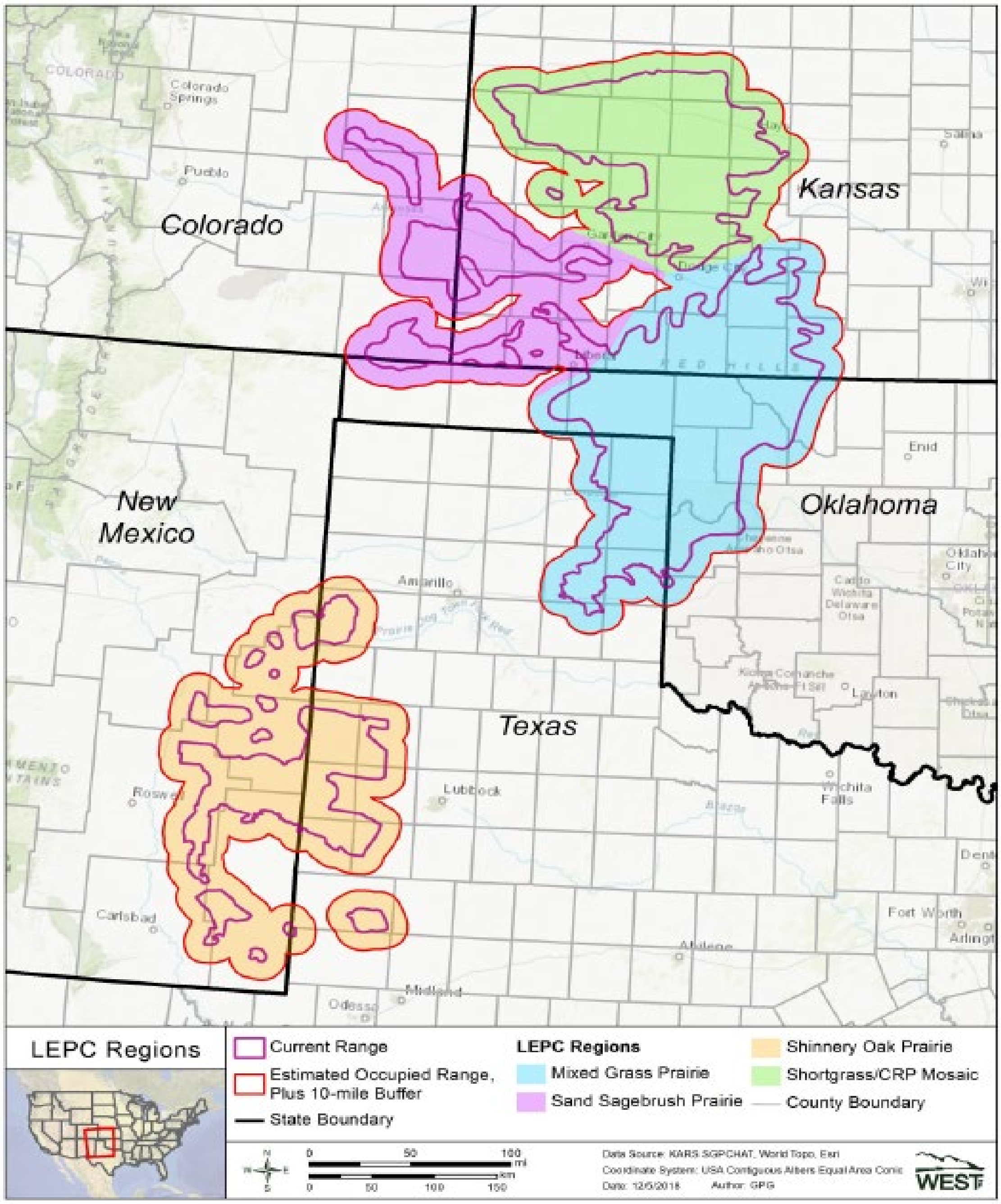

Figure 4. Regions delineated for the LEPC and currently estimated occupied range (Van Pelt *et al*. 2013).

At the site-specific scale or fourth order of selection (Johnson 1980), LEPC use of habitats is specific to the species' life history needs. Van Pelt *et al*. (2013) divided LEPC habitat into four components necessary to fulfill the species' life history needs. These components include leks (breeding habitat), nesting habitat, brood habitat, and autumn/winter habitat which occur close to one another. Van Pelt *et al*. (2013) provides summaries of habitat components required by LEPC, as described below in more detail.

<u>Leks</u>

Lek sites are characterized by relatively sparse vegetation generally less than 4 inches in height, and are often located on a knoll, ridge, or grama flat. Disturbed areas can also be used, including roads, abandoned oil and gas well pads, areas around livestock watering facilities, and areas subjected to herbicide treatments. Generally, a landscape that supports LEPC contains sufficient lek habitat. Thus, lek habitat is not considered a limiting factor, and habitat management to provide for lek sites is not considered necessary.

The LEPC exhibits site fidelity to lek sites, with most use occurring within 3.1 miles of leks (Winder *et al*. 2015). All existing population indices are derived from estimates of lek density and the number of males and females attending leks; therefore, monitoring leks is important for managing local populations. Traditional lek surveys can only provide a rough population index due to uncertainties in detections >1 mile from leks under certain conditions (Butler *et al*. 2010, Holt and Butler 2019), and uncertainty in lek attendance rates by grouse (Wann *et al*. 2019, Fremgen *et al*. 2019). However, the presence of birds at a lek does not consistently correlate with the quality of surrounding habitat for nesting, brood-rearing, and wintering, unless the population trend is known, preferably over a 5 to10- year period that captures annual fluctuations in response to drought and rainfall patterns. Evidence of a stable or increasing population at a lek or group of leks only reveals minimum habitat quality exists in the area (Van Pelt *et al*. 2013). However, recent evidence from a 4-year study conducted in Kansas and Colorado that quantified the amount and composition of habitat within 3.1 miles of 62 lek sites found a positive correlation between lek attendance and the proportion of grassland in the surrounding landscape (Gehrt *et al*. 2020).

<u>Nesting Habitat</u>

Lesser prairie-chicken nest and brood survival are generally considered the most critical population parameters for LEPC sustainability at a local level (Haukos and Zavaleta 2016). Thus, habitat conditions that promote nesting and brood-rearing success are key, specifically the vegetative composition and structure that provides visual obstruction to nesting and brooding birds (Gehrt *et al*. 2020). Increased vegetation height and cover density have been found to increase nest success in sand sagebrush, sand shinnery oak, and CRP grasslands. The management of vegetation height and density to provide visual obstruction could help increase the amount of suitable LEPC nesting habitat (Gehrt *et al*. 2020). While improving vegetation characteristics to support increased survival in local populations will help support persistence of existing LEPC, failure to couple these actions with efforts to address the scale of availability of total usable space will not address the primary threat of habitat loss and fragmentation (Fuhlendorf *et al*. 2017b).

A number of researchers have found most female LEPC nest within 2.0 miles of leks (Haukos and Zavaleta 2016), although not necessarily the lek where mating occurred (Pitman *et al*. 2006). Most year-round female space use occurs within 3.1 miles of leks (Winder *et al*. 2015). Hagen *et al*. (2013) suggest vegetation management for nesting should be focused around 1 mile from occupied leks. Thus, locations of leks can serve as an indicator of where existing nesting habitat is located and where improvements to nesting habitat could increase nesting success (Van Pelt *et al*. 2013).

<u>Brood Habitat</u>

Young broods have relatively limited mobility; therefore, quality brood habitat must occur close to nesting habitat. The interspersion of nesting and brood habitat is important for providing optimal habitat conditions (Van Pelt *et al*. 2013). Giesen (1998) suggested approximately 1,000 feet represented the maximum distance for movement between nesting and brood habitat.

The preferred vegetation characteristics varies among regions but in general have a more dominate herbaceous component than nesting sites (Hagen *et al*. 2013). Van Pelt *et al*. (2013) cited various studies to assert that brood habitat typically has a higher amount of forb cover and less grass cover than nesting sites. This habitat is usually associated with higher levels of insect abundance and provided vegetation cover that allowed chicks to move comparatively easily on the ground. Active sand dunes (dunes that physically change size, shape, or location due to wind), with shrubs, especially within sand shinnery oak or sand sagebrush vegetation types, are relatively common in brood-rearing habitat. Some studies suggest habitat disturbance by burning, grazing, and herbicide treatment could improve brood habitat. In addition, adults and broods have been found to use shrubs and shinnery oak for shade during the summer (Bell *et al*. 2010). Woodward *et al*. (2001) suggested that shrubland communities could provide year-round food and cover and are less influenced by climate and grazing than herbaceous-dominated communities.

Autumn/Winter Habitat

Van Pelt *et al*. (2013), citing Giesen (1998), state while individuals range across larger areas during the autumn and winter months, individual LEPC occupy the same general vegetation types used during nesting and brood rearing, and remain in close proximity to leks. Agricultural fields with waste grains were used if located close enough to mixed-grass, sand sagebrush, or sand shinnery oak utilized for resting and roosting locations (Taylor and Guthery 1980a). Van Pelt *et al*. (2013) suggested specific management for autumn and winter habitat was not necessary, so long as nesting and brood habitat of comparatively high quality was present due to the overlap in habitat requirements.

Current Habitat and Recent Population Trends by Ecoregion

Short-Grass/CRP Ecoregion

Prairies of the Short-Grass/CRP Ecoregion have been significantly altered since European settlement of the Great Plains. Much of these prairies have been converted to other land uses such as cultivated agriculture, roads, power lines, petroleum production, wind energy, and transmission lines. Some areas have also been altered due to woody vegetation encroachment. Within this ecoregion, it has been estimated that about 73% of the landscape has been converted to cropland with 7% of the area in CRP (Dahlgren *et al*. 2016). Using geospatial analysis, we were able to explicitly account for habitat loss and fragmentation and quantify the current condition of this ecoregion for the LEPC. Of the sources of habitat loss and fragmentation which have occurred, conversion to cropland has had the single largest impact on land cover in this ecoregion (Table 1). We estimated approximately 1,023,894 acres, or 16% of the ecoregion, in potential usable unimpacted areas with 60% or greater potential usable unimpacted land cover within one mile (Table 2).

Prior to the late 1990s, LEPC in this ecoregion were thought to be largely absent (or occurred sporadically in low densities) (Hagen and Giesen 2005, Rodgers 1999). We do not know what proportion of the eastern Short-Grass/CRP Ecoregion in Kansas was historically occupied by LEPC (Hagen 2003), and surveys in this ecoregion only began in earnest in 1999 (Dahlgren *et al*. 2016,). Rodgers and Hoffman (2005) reported that most CRP lands in Kansas were seeded using a warm season native grass mix, often dominated by little bluestem (*Schizachyrium scoparium*) with significant amounts of sideoats grama (*Bouteloua curtipendula*) and/or switchgrass (*Panimum virgatum*) and lesser amounts of other species. Starting in 1997, the CRP often included seed mixtures that contained introduced and native forbs, and they reported that stands reached 14–32 inches in height (Rodgers and Hoffman 2005). This is largely due to CRP being an idle lands program with contractual limits to the type, frequency, and timing of management activities, such as burning, haying, or grazing. As a result of these factors, CRP often provides the vegetative structure preferentially used by lesser prairie-chickens for nesting. Fields (2004) and Fields *et al*. (2006) surmised that the availability of CRP lands, especially CRP lands with interseeded or original seed mixture of forbs, in the State of Kansas resulted in the increased population abundance and occupancy of the LEPC in this ecoregion.

Table 1. Results of LEPC geospatial analysis by ecoregion and range-wide estimating total area in acres, potential usable area, potential usable unimpacted area, spaces with 60% or greater potential usable unimpacted area within one mile (1.6 km), and proportion of the total ecoregion of each total for spaces with 60% or greater potential usable unimpacted areas within one mile (1.6 km).

Ecoregion	(All Results in Acres) Ecoregion Total Area	Potential Usable Area	Potential Usable Unimpacted Area	Potential Usable Unimpacted Area (60% within 1 mile)	Percent of Total Area
Short-Grass/CRP	6,298,014	2,961,318	1,985,766	1,023,894	16.3%
Mixed-Grass	8,527,718	6,335,451	2,264,217	994,483	11.7%
Sand Sagebrush	3,153,420	1,815,435	1,358,405	1,028,523	32.6%
Shinnery Oak	3,850,209	2,626,305	1,423,417	1,023,572	26.6%
Range-wide Totals	21,829,361	13,738,509	7,031,805	4,070,472	18.6%

Table 2. Estimated areas of current direct and indirect impacts, by impact source, and the proportion (%) of the total area of the Short-Grass/CRP Ecoregion estimated to be impacted (Table 1.). Impacts are not necessarily cumulative because of overlap of some impacted areas by more than one impact source.

Short-Grass/CRP Ecoregion		
Impact Sources	Acres	% of Ecoregion
Cropland Conversion	2,333,660	37%
Petroleum Production	248,146	4%
Wind Energy Development	145,963	2%
Transmission Lines	436,650	7%
Woody Vegetation Encroachment	284,175	5%
Roads	1,075,931	17%
Total Ecoregion Area	6,298,014	

The northern section of this ecoregion is the only portion of the LEPC's range where co-occurrence with greater prairie-chicken occurs. Hybridization rates of up to 5% have been reported (Pitman 2013), and that rate seemed to be stable across multiple years of Kansas Department of Wildlife, Parks and Tourism (KDWPT) surveys at the time, though sampling is limited where the species co-occur (Pitman 2013). Limited additional work has been completed to further assess the rate of hybridization. Dahlgren *et al*. (2016) expressed concerns about the implications of genetic introgression (*i.e*., dilution) of LEPC genes, and the fact that potential effects are poorly understood (Dahlgren *et al*. 2016). Subsequently Oyler-McCance *et al*. (2016) summarized the evidence of hybridization of greater prairie-chicken and LEPC, including a discussion that introgression seems to be occurring through females because of failure of hybrid males to breed due to conflated sexually selected traits between the species (Galla and Johnson 2015). The apparent female-biased introgression is probably magnified because most breeding at leks is completed by a limited number of males in this lek system (Bain and Farley 2002). Unresolved issues include whether hybridization reduces fitness, alters behavior or morphological traits in either a positive or negative way and the historical occurrence and rate of hybridization.

Hagen *et al*. (2017), estimated historical trends in LEPC abundance from 2001 to 2016 in the Short-Grass/CRP Ecoregion using population reconstruction methods, with the aerial survey results from 2016 selected as the initial population size. The mean population estimate increased from a minimum of about 14,000 males in 2001 and peaked at about 21,000 males in 2011.

Aerial surveys have been conducted to estimate LEPC population abundance since 2012 and results indicate that the Short-Grass/CRP Ecoregion has the largest population size (Nasman *et al*. 2020) of the four ecoregions. Average estimates from 2015 to 2020 are 16,957 birds (90% confidence intervals (CI): 13,605, 35,350), making up about 62% of the rangewide LEPC total. Recent years have suggested modest increases. Approximate distribution of lek locations as reported by the Western Association of Fish and Wildlife Agencies (WAFWA) observed occupied at least once by LEPC between 2015 and 2019 (Nasman *et al*. 2020) are included in Appendix E, Figure E.7 of the LEPC SSA (Service 2021).

<u>Mixed-Grass Prairie Ecoregion</u>

Much of the Mixed-Grass Prairie Ecoregion was severely fragmented originally by homesteading, which subdivided tracts of land into small parcels of 160–320 acres in size (Rodgers 2016). As a result of these small parcels, road and fence densities are higher compared to other ecoregions and, therefore, increase habitat fragmentation and pose higher risk for collision mortalities than in other ecoregions (Wolfe *et al*. 2016). Fragmentation has also occurred due to oil and gas development, wind energy development, transmission lines, highways, and expansion of invasive plants such as eastern red cedar (*Juniperus virginiana*). Conservation Reserve Program (CRP) fields occupy between 10 and 20% of the Mixed-Grass Ecoregion, and these lands in Oklahoma and Northeastern Panhandle of Texas are dominated by exotic grasses (Wolfe *et al*. 2016). A major concern for LEPC populations in this ecoregion is the loss of grassland due to the rapid westward expansion of the eastern red cedar (Natural Resources Conservation Service [NRCS] 2016). Oklahoma Forestry Services estimated the average rate of expansion of eastern red cedar in 2002 to be 762 acres per day (Wolfe *et al*. 2016).

Using the geospatial analysis described in Section 3.2 of the LEPC SSA (Service 2021), we were able to explicitly account for habitat loss and fragmentation and quantify the current condition of this ecoregion for the LEPC. Of the sources of habitat loss and fragmentation which have occurred, encroachment of woody vegetation had the largest impact, with conversion to cropland, roads, and petroleum production also having significant impacts on land cover in this ecoregion (Table 3). We estimated there are approximately 994,483 acres or 12% of the ecoregion located within potential usable unimpacted areas with 60% or greater potential usable unimpacted land cover within one mile (Table 1).

The Mixed-Grass Ecoregion historically contained the highest LEPC densities (Wolfe *et al*. 2016). Hagen *et al*. (2017) estimated historical trends in LEPC abundance from 1965–2016 in the Mixed-Grass Ecoregion using population reconstruction methods. The mean population estimate was around 30,000 males in the 1970s and 1980s. Population estimates declined in the 1990s and peaked again in the early 2000s at around 25,000 males, before declining and remaining at its lowest levels, less than 10,000 males in 2012, since the late 2000s.

Aerial surveys have been conducted to estimate LEPC population abundance since 2012, and results in the Mixed-Grass Prairie Ecoregion from 2012 through 2020 indicate this ecoregion has the second highest population size (Nasman *et al*. 2020) of the four ecoregions. Average estimates from 2015 to 2020 are 6,135 birds, representing about 22% of the range-wide total. Results show minimal variation in recent years. Approximate distribution of lek locations as reported by WAFWA (www.sgpchat.org, accessed in July 2020 in LEPC SSA, Service 2021) observed occupied at least once by LEPC at least once between 2015 and 2019 are included in the LEPC SSA Appendix E, Figure E.7 (Service 2021).

Table 3. Estimated areas of current direct and indirect impacts, by impact source, and the proportion (%) of the total area of the Mixed-Grass Ecoregion estimated to be impacted (Table 1). Impacts are not necessarily cumulative because of overlap of some impacted areas by more than one impact source.

Mixed-Grass Ecoregion		
Impact Sources	Acres	% of Ecoregion
Cropland Conversion	1,094,688	13%
Petroleum Production	859,929	10%
Wind Energy Development	191,571	2%
Transmission Lines	576,713	7%
Woody Vegetation Encroachment	2,047,510	24%
Roads	1,732,050	20%
Total Ecoregion Area	8,527,718	

Sand Sagebrush Ecoregion

Prairies of the Sand Sagebrush Ecoregion have been influenced by a variety of activities since European settlement of the Great Plains. Much of these grasslands have been converted to other land uses such as cultivated agriculture, roads, power lines, petroleum production, wind energy, and transmission lines. Some areas have also been altered due to woody vegetation encroachment. Haukos *et al*. (2016) concluded only 26% of historical sand sagebrush prairie is available as potential nesting habitat for LEPC. Using the geospatial analysis described in Section 3.2 of the LEPC SSA (Service 2021), we were able to explicitly account for habitat loss and fragmentation and quantify the current condition of this ecoregion for the LEPC. Of the sources of habitat loss and fragmentation that have occurred, conversion to cropland has had the single largest impact on land cover in this ecoregion (Table 4). We estimated there are approximately 1,028,523 acres or 33% of the ecoregion that occur in potential usable unimpacted areas with 60% or greater potential usable unimpacted land cover within 1 mile (Table 1). In addition, habitat loss due to the degradation of the rangeland within this ecoregion continues to be a limiting factor for LEPC, and most of the existing birds within this ecoregion persist primarily on CRP lands.

This region supported large numbers of LEPC in the past, with a single flock detected in Seward County, Kansas, estimated to potentially contain more than 15,000 birds (Bent 1932). The estimated population size is believed to have peaked at over 85,000 males in the 1970s (Garton et al. 2016). This population has been in decline since the late 1970s. Most of the decline has been attributed to habitat deterioration and conversion of sand sagebrush to intensive row crop agriculture facilitated by an increase in center pivot irrigation innovations (Jensen *et al*. 2000).

Environmental conditions in this ecoregion can be extreme, with stochastic events impacting LEPC populations. As an example, during an extreme blizzard event in Prowers County, Colorado, during 2006–2007, it was estimated that about 80% of the LEPC died overwinter and there was about a 75% reduction of LEPC population in the Colorado portion of the ecoregion (Haukos *et al*. 2016). Drought conditions from 2011–2014 have expedited population declines (Haukos *et al*. 2016).

Table 4. Estimated areas of current direct and indirect impacts, by impact source, and the proportion (%) of the total area of the Sand Sagebrush Ecoregion estimated to be impacted (Table 1). Impacts are not

necessarily cumulative because of overlap of some impacted areas by more than one impact source.

Sand Sagebrush Ecoregion		
Impact Sources	Acres	% of Ecoregion
Cropland Conversion	994,733	32%
Petroleum Production	163,704	5%
Wind Energy Development	0	0%
Transmission Lines	167,240	5%
Woody Vegetation Encroachment	68,147	2%
Roads	446,316	14%
Total Ecoregion Area	3,153,420	

Hagen *et al*. (2017) estimated historical trends in LEPC abundance from 1965 to 2016 in the Sand Sagebrush Ecoregion using population reconstruction methods. The mean population estimate peaked at over 90,000 males between 1970 to 1975 and declined to its lowest level of fewer than 1,000 males in recent years.

Aerial surveys have been conducted to estimate LEPC population abundance since 2012 and results in the Sand Sagebrush Prairie Ecoregion from 2012 through 2020 indicate that this ecoregion has the lowest population size (Nasman *et al*. 2020) of the four ecoregions. Average estimates from 2015 to 2020 are 1,215 birds (90% CI: 196, 4,547) representing about 4% of the rangewide LEPC total. Recent results have been highly variable, with 2020 being the lowest estimate reported. Although the aerial survey results show 171 birds in this ecoregion in 2020 (without confidence intervals because the number of detections were too low for statistical analysis), ground surveys in this ecoregion in Colorado and Kansas detected 406 birds, so we know the current population is larger than indicated by the aerial survey results (Rossi and Fricke, Pers. Comm. from Service 2021). Approximate distribution of lek locations as reported by WAFWA observed occupied at least once by LEPC at least once between 2015 and 2019 (Nasman *et al.* 2020) are included in the LEPC SSA Appendix E, Figure E.7 (Service 2021).

Shinnery Oak Prairie Ecoregion

The Shinnery Oak Ecoregion is geographically disconnected from populations elsewhere in the species distribution. With the exception of LEPC areas owned by the New Mexico State Game Commission and federally owned Bureau of Land Management (BLM) lands in New Mexico, the majority of Shinnery Oak Prairie on the Southern High Plains is privately owned (Grisham *et al*. 2016a). Nearly all the area in the Texas portion of the ecoregion is privately owned and managed for agricultural use and petroleum production (Haukos 2011). The remaining patches of shinnery oak prairie have become isolated, relict communities because the surrounding grasslands have been converted to row crop agriculture or fragmented by oil and gas exploration and urban development (Peterson and Boyd 1998). Additionally, mesquite (*Prosopis* spp.) encroachment within this ecoregion has played a significant role in available space for the LEPC. Prior to the late 1990s, approximately 100,000 acres of sand shinnery oak in New Mexico and approximately 1,000,000 acres of sand shinnery oak in Texas were lost due to the application of tebuthiuron and other herbicides for agriculture and range improvement (Peterson and Boyd 1998). Technological advances in irrigated row crop agriculture have led to recent conversion of shinnery oak prairie habitat to row crops in Eastern New Mexico and West Texas (Grisham *et al*. 2016).

Using the geospatial analysis described in Section 3.2 of the LEPC SSA (Service 2021), we were able to explicitly account for habitat loss and fragmentation and quantify the current condition of this ecoregion for the LEPC. Of the sources of habitat loss and fragmentation which have occurred, cropland conversion, roads, and encroachment of woody vegetation had the largest impacts on land cover in this ecoregion (Table 5). We estimated there are approximately 1,023,572 acres or 27% of the ecoregion occur in potential usable unimpacted areas with 60% or greater potential usable unimpacted land cover within 1 mile (Table 1).

Table 5. Estimated areas of current direct and indirect impacts, by impact source, and the proportion (%) of the total area of the Shinnery Oak Ecoregion estimated to be impacted (Table 1). Impacts are not necessarily cumulative because of overlap of some impacted areas by more than one impact source.

Shinnery Oak Ecoregion		
Impact Sources	Acres	% of Ecoregion
Cropland Conversion	540,120	14%
Petroleum Production	161,652	4%
Wind Energy Development	90,869	2%
Transmission Lines	372,577	10%
Woody Vegetation Encroachment	617,885	16%
Roads	742,060	19%
Total Ecoregion Area	3,850,209	

Hagen *et al*. (2017) estimated historical trends in LEPC abundance from 1969–2016 in the Shinnery Oak Ecoregion using population reconstruction methods. The mean population estimate ranged between about 5,000 to 12,000 males through 1980, increased to 20,000 males in the mid-1980s and declined to around 1,000 males in 1997. The mean population estimate peaked again to approximately 15,000 males in 2006 and then declined again to fewer than 3,000 males in the mid-2010s.

Aerial surveys have been conducted to estimate LEPC population abundance since 2012, and results in the Shinnery Oak Ecoregion from 2012 through 2020 indicate that this ecoregion has the third highest population size (Nasman *et al*. 2020) of the four ecoregions. Average estimates from 2015 to 2020 are 3,077 birds, representing about 11% of the range-wide total. Recent estimates have varied between fewer than 1,000 birds in 2015 to more than 5,000 birds in 2020. Approximate distribution of lek locations as reported by WAFWA observed occupied at least once by LEPC at least once between 2015 and 2019 (Nasman *et al*. 2020) are included in the LEPC SSA Appendix E, Figure E.7 (Service 2021).

Threats

The range of the LEPC has been substantially reduced by habitat loss, fragmentation, and degradation resulting from a variety of ongoing factors. Because the species requires relatively large parcels of intact native grassland and shrubland, often over 20,000 acres to maintain self-sustaining populations, habitat loss and alteration has increased the species risk of extinction. In addition, the life history of the species, primarily the lek breeding system and behavioral avoidance of vertical structures that increase predation risk, make LEPC especially vulnerable to ongoing impacts occurring on the landscape, particularly at the species' currently reduced range-wide population. Within the LEPC SSA, the Service concluded LEPC lacked sufficient redundancy and resilience to ensure the species' viability from present and future threats, although some populations appeared to be sufficiently stable to ensure the species' persistence in the near term (Service 2021). This section provides a general overview of influences negatively impacting the LEPC. For a more comprehensive analysis and estimations of usable land cover for the LEPC which has been impacted by these influences, refer to the LEPC SSA (Service 2021).

Habitat Loss, Fragmentation, and Degradation

The grasslands of the Great Plains are among the most threatened ecosystems in North America (Samson *et al*. 2004) and have been impacted more than any other major ecosystem on the continent (Samson and Knopf 1994), and temperate grasslands are also one of the least conserved ecosystems (Hoekstra *et al*. 2005). The vast majority of the LEPC range (over 95%) occurs on private lands that have been in some form of agricultural production since at least the early 1900s. Past land cover evaluations have estimated grassland loss in the Great Plains at approximately 70% (Samson *et al*. 2004), with nearly 23 million acres of grasslands in the United States lost between 1982 and 1997 alone (Samson *et al*. 2004). As a result, available habitat for grassland species, such as the LEPC, has been much reduced and fragmented compared to historical conditions across its range.

The following sections provide a discussion and quantification of the influence of habitat loss and fragmentation from difference sources of disturbance on the grasslands of the Great Plains and more specifically allow us to characterize the current condition of LEPC habitat.

Conversion of Grassland to Cropland

At the time the LEPC was determined to be taxonomically distinct from the greater prairie-chicken in 1885 and shortly after, much of the historical and current range was beginning to be altered as human settlement of the Great Plains progressed and grasslands were being used for agriculture (Bartuszevige and Daniels 2016). Between 1915 and 1925, considerable areas of prairie had been plowed in the Great Plains and planted to wheat (Laycock 1987). As a result, by the 1930s the LEPC had begun to disappear from areas where it had been considered abundant, with populations nearing extirpation in Colorado, Kansas, and New Mexico, and populations were reduced in Oklahoma and Texas (Bent 1932, Davison 1940, Lee 1950, Baker 1953, Oberholser 1974, Crawford 1980). Additional areas of previously unbroken grassland were brought into cultivation in the 1940s, and enhancement in farming techniques (for example, center pivot irrigation) caused additional increases in conversion in the 1970s and 1980s (Laycock 1987, Laycock 1991). Conversion of grassland to cultivated agricultural lands has been regularly cited as an important cause in the range-wide decline in abundance and distribution of LEPC populations (Copelin 1963, Jackson and DeArment 1963, Crawford and Bolen 1976a, Crawford 1980, Taylor and Guthery 1980b, Braun *et al*. 1994, Mote *et al*. 1999).

Because cultivated grain crops may have provided increased or more dependable winter food supplies for LEPC (Braun *et al*. 1994), the initial conversion of smaller patches of grassland to cultivation may have been temporarily beneficial to the short-term needs of the species as primitive and inefficient agricultural practices made grain available as a food source (Rodgers 2016). Sharpe (1968) believed that the presence of cultivated grains may have facilitated the temporary occurrence of LEPC in Nebraska. However, as conversion increased, more recent information suggests that landscapes having greater than 20 to 37% cultivated grains may not support stable LEPC populations (Crawford and Bolen 1976a). More recently, Ross *et al*. (2016b) found a response to the gradient of cropland to grassland land cover. Specifically, they found abundances of LEPC increased with increasing cropland until a threshold of 10% cropland was reached and then abundance declined with increasing cropland cover. This indicates that a relatively small amount of cropland could have a positive influence on LEPC abundance, but levels of conversion to cropland which exceed 10% are detrimental to the LEPC. While LEPC may forage in agricultural croplands, croplands do not provide for the habitat requirements of the species' life cycle (cover for nesting and thermoregulation), and thus they avoid landscapes dominated by cultivated agriculture, particularly where small grains are not the dominant crop (Crawford and Bolen 1976a).

Petroleum and Natural Gas Production

Petroleum and natural gas production have occurred over much of the estimated historical and current analysis areas of the LEPC. Oil exploration began as early as the late 1800s in the Great Plains and commercial production began as early as the 1880s. By 1920, oil and gas production had dramatically increased on the Great Plains. As demand for energy has continued to increase nationwide so has oil and gas development in the Great Plains. In Texas, for example, Timmer *et al*. (2014) stated that active oil and gas wells in the LEPC occupied range had increased by more than 80% over the previous decade. Oil and gas development involves activities such as surface exploration, exploratory drilling, field development, and facility construction, as well as access roads, well pads, and operation and maintenance. Associated facilities can include compressor stations, pumping stations, and electrical generators. Activities such as well pad construction, seismic surveys, access road development, power line construction, and pipeline corridors can all result in direct habitat loss by removal of vegetation used by LEPC. As documented in other grouse species, consequential habitat loss also occurs from avoidance of vertical structures, noise, and human presence (Weller *et al.* 2002), which all can influence LEPC behavior in the general vicinity of oil and gas development areas. These activities affect LEPC by disrupting reproductive behavior (Hunt and Best 2004) and through habitat loss and fragmentation (Hunt and Best 2004). Numerous studies demonstrate the impacts that anthropogenic features, such as oil and gas wells, have on the LEPC by affecting the behavior of individuals and altering the way in which they use the landscape (Hagen *et al*. 2011, Pitman *et al*. 2005, Hagen 2010, Hunt and Best 2004, Plumb *et al*. 2019, Sullins *et al*. 2019, Peterson *et al*. 2020).

Wind Energy Development and Power Lines

Wind power is a form of renewable energy increasingly being used to meet current and projected future electricity demands in the United States. Much of the new wind energy development to meet these anticipated demands is likely to come from the Great Plains states because they have high wind resource potential, which exerts a strong, positive influence on the amount of wind energy developed within a particular state (Staid and Guikema 2013). In both 2018 and 2019, the wind industry added over 7,500 and 9,100 megawatts nationwide of new capacity, respectively (American Wind Energy Association [AWEA] 2019, AWEA 2020). Wind energy has now surpassed hydroelectric power production to become the largest source of renewable energy capacity in the country. In 2019, three of the five LEPC states, Colorado, New Mexico, and Kansas, were within the top 10 states nationally for fastest growing states for wind generation in the past year (AWEA 2020a). The Great Plains is one of the leading regions for wind energy development, with three of the states from the range of the LEPC occurring in the top four of installed capacity in 2019. There is substantial information (Southwest Power Pool 2020) indicating interest by the wind industry in developing wind energy within the range of the LEPC, especially if additional transmission line capacity is constructed. The entire estimated historical range of the LEPC occurs in areas determined to have average wind speeds exceeding what is recognized as necessary for large-scale wind energy development (21.3 feet per second, at 262 feet high) (Department of Energy [USDOE] National Renewable Energy Laboratory 2010).

The average size of installed wind turbines continues to increase (USDOE 2015a, AWEA 2020a,). Wind energy developments range from 20 to 400 towers, each supporting a single turbine. Review of previous annually reported metrics of wind energy developments indicates a continued increase in all size aspects of wind energy developments (AWEA 2014, AWEA 2015, AWEA 2016, AWEA 2017, AWEA 2018, AWEA 2019, AWEA 2020). Roads are necessary to access the turbine sites for installation and maintenance. One or more electrical substations, where the generated electricity is collected and transmitted on to the power grid, also may be built depending on the size of the wind energy development. Considering the initial capital investment, and that the service life of a single turbine is at least 20 years (USDOE 2008), we expect most wind energy developments to be in place for at least 30 years.

Hagen *et al*. (2004) recommended that wind turbines and other large vertical structures be placed greater than 1.6 miles from known or potentially occupied LEPC habitat. Hagen *et al*. (2010) reported the effects of anthropogenic features on displacement and demographics of several species of prairie grouse by compiling and analyzing existing data from 22 studies (which included data on various kinds of development) that reported quantitative data on prairie grouse response to energy development. This report suggested that prairie grouse appear to be tolerant of disturbances beyond minimum distances of less than 1.1 miles in many cases. Additionally, Hagen *et al*. (2011) used minimum behavioral avoidance distances based on Monte Carlo simulations of data obtained from 226 radio-marked female LEPC in Kansas to recommend a distance of greater than or equal to 0.9 mile to account for the impact of wind energy development until empirical data are available.

Manier *et al*. (2014) reported recommended buffer distances for greater sage-grouse based on the energy development category (which included wind energy). The minimum and maximum values at which effects from energy development were observed in the scientific literature were 2.0 miles and 12 miles, respectively. Manier *et al*. (2014) also reported proposed values for potential conservation buffer distances based on multiple sources ranging from 3 to 5 miles. Lastly, the Rangewide Conservation Plan identified a 2,188-feet impact radius for use within their mitigation strategy to account for the indirect effects of wind turbines.

The effects of wind energy development on the LEPC must also take into consideration the influence of the transmission lines critical to distribution of the energy generated by wind turbines. Transmission lines can traverse long distances across the landscape and can be both above ground and underground, although the majority of transmission lines are erected above ground. Most of the impacts to LEPC associated with transmission lines are with the above ground systems. Support structures vary in height depending on the size of the line. Most high-voltage power line towers are 98 to 125 feet high but can be higher if the need arises. Local distribution lines are usually much shorter in height but still contribute to fragmentation of the landscape. Local distribution lines, while more often are erected above ground, can be placed below ground.

The physical footprint of transmission line installation is typically much smaller than the effect of the transmission line infrastructure itself. Transmission lines can indirectly lead to alterations in LEPC behavior and space use (avoidance), decreased lek attendance, and increased predation on LEPC. Transmission lines, particularly due to their length, can be a significant barrier to dispersal of prairie grouse, disrupting movements to feeding, breeding, and roosting areas. Pruett *et al*. (2009a) also summarizes evidence for avoidance behavior associated with transmission lines in prairie grouse. Both lesser and greater prairie-chickens avoided otherwise usable habitat near transmission lines and crossed these power lines much less often than nearby roads, suggesting that power lines are a particularly strong barrier to movement (Pruett *et al*. 2009a). Because LEPC avoid tall vertical structures like transmission lines and because transmission lines can increase predation rates, leks located in the vicinity of these structures may see reduced attendance by new males to the lek, as was reported by Braun *et al*. (2002) for sage-grouse. Decreased probabilities of use by LEPC was shown with the occurrence of more than 0.09 mile of major roads, or transmission lines within a 1.2 mile radius (Sullins *et al*. 2019).

<u>Woody Vegetation Encroachment</u>

Selected LEPC habitat is characterized by expansive regions of treeless grasslands interspersed with patches of small shrubs (Giesen 1998). Prior to extensive Euro-American settlement, frequent fires and grazing by large, native ungulates helped confine trees like eastern red cedar to river and stream drainages and rocky outcroppings. However, settlement of the Southern Great Plains altered the historical ecological context and disturbance regimes. The frequency and intensity of these disturbances directly influenced the ecological processes, biological diversity, and patchiness typical of Great Plains grassland ecosystems, which evolved with frequent fire and ungulate herbivory and that maintained prairie habitat for LEPC (Collins 1992, Fuhlendorf and Smeins 1999).

Once these historical fire and grazing regimes were altered, the processes which helped maintain extensive areas of grasslands ceased to operate effectively. Following Euro-American settlement, fire suppression allowed trees, such as eastern red cedar, to begin invading or encroaching upon neighboring grasslands. Increasing fire suppression that accompanied human settlement, combined with government programs promoting eastern red cedar for windbreaks, erosion control, and wildlife cover, facilitated the expansion of eastern red cedar distribution in grassland areas (Owensby *et al*. 1973, DeSantis *et al*. 2011). Within the southern- and western-most portions of the estimated historical and occupied ranges of LEPC in Eastern New Mexico, Western Oklahoma, and the South Plains and Panhandle of Texas, honey mesquite (*Prosopis glandulosa*) is another common woody invader within these grasslands (Riley 1978, Boggie *et al*. 2017). Mesquite is a particularly effective woody invader in grassland habitat due to its ability to produce abundant, long-lived seeds that can germinate and establish in a variety of soil types and moisture and light regimes (Lautenbach *et al*. 2017). Though not as widespread as mesquite or eastern red cedar, other tall, woody plants, such as redberry or Pinchot juniper (*Juniperus pinchotii*), black locust (*Robinia pseudoacacia*), Russian olive (*Elaeagnus angustifolia*), and Siberian elm (*Ulmus pumila*) can also be found in grassland habitat historically and currently used by LEPC and may become invasive in these areas.

Invasion of grasslands by certain opportunistic woody species, like eastern red cedar and mesquite, cause otherwise usable grassland habitat to no longer be used by LEPC and contributes to the loss and fragmentation of grassland habitat (Lautenbach 2017, Boggie *et al*. 2017). More specifically, in Kansas LEPC were found to be 40 times more likely to use areas that had no trees than areas with 1.6 trees per acre, and no nests were placed in areas with a tree density greater than 0.8 trees per acre, at a scale of 89 acre (Lautenbach 2017). Similarly, within the Shinnery Oak Ecoregion, Boggie *et al*. (2017) document that LEPC space use in all seasons is altered in the presence of mesquite, even at densities of less than 5% canopy cover. Woody vegetation encroachment has a direct effect on LEPC by making the area not usable. In addition, Boggie *et al*. (2017, mesquite) and Lautenbach (2017, eastern red cedar) documented that woody vegetation encroachment also contributes to indirect habitat loss and increases habitat fragmentation because LEPC are less likely to use areas adjacent to trees.

<u>Roads and Electrical Distribution Lines</u>

Roads and distribution power lines are linear features on the landscape that contribute to loss and fragmentation of LEPC habitat and fragment populations as a result of behavioral avoidance. Specifically, Plumb *et al*. (2019) found that as distance increased from 0 to 1.9 miles away from roads, the relative probability of LEPC home range placement and space used increased by 1.66 times; this ultimately led the authors to suggest a buffer of more than 1,148 feet for secondary roads. Sullins *et al*. (2019) finds evidence to suggest decreased probability of use for areas with greater than 5 miles of county roads within a 1.2-mile radius and greater than 0.1 mile of major roads. Additionally, roads are known to contribute to lek abandonment when they disrupt the important habitat features (such as affecting auditory or visual communication) associated with lek sites (Crawford and Bolen 1976b). Some mammalian species known to prey on LEPC, such as red fox (*Vulpes vulpes*), raccoons (*Procyon lotor*), and striped skunks (*Mephitis mephitis*), have greatly increased their distribution by dispersing along roads (Forman and Alexander 1998, Forman 2000, Frey and Conover 2006).

Traffic noise from roads may indirectly impact LEPC. Because LEPC depend on acoustical signals to attract females to leks, noise from roads, oil and gas development, wind turbines, and similar human activity may interfere with mating displays, influencing female attendance at lek sites and causing young males not to be drawn to the leks. Within a relatively short period, leks can become inactive due to a lack of recruitment of new males to the display grounds.

Depending on the traffic volume and associated disturbances, roads also may limit LEPC dispersal abilities. LEPCs have been shown to avoid areas of usable habitat near roads (Pruett *et al*. 2009a, Plumb *et al*. 2019) and in areas where road densities are high (Sullins *et al*. 2019). Lesser prairie-chickens are thought to avoid major roads due to disturbance caused by traffic volume and, perhaps behaviorally, to avoid exposure to predators that may use roads as travel corridors. However, the extent to which roads constitute a significant obstacle to LEPC movement and space use is largely dependent upon the local landscape composition and characteristics of the road itself.

Local electrical distribution lines are usually much shorter in height than transmission lines but can still contribute to habitat fragmentation through similar mechanisms as other vertical features described in this document. Local distribution lines, while more often are erected above ground, can be placed below ground to minimize effects to LEPC. Distribution lines are similar to transmission lines with the exception to height of poles and electrical power carried through the line. Plumb *et al.* (2019) found that for LEPC within their study, as distance increased from 0 to 1.9 miles away from roads the relative probability of home range placement and space used increased by 1.54 times; this ultimately led the authors to suggest a buffer of greater than 1,800 feet for power lines. In addition to habitat loss and fragmentation, electrical power lines can directly affect prairie grouse by posing a collision hazard (Leopold 1933, Connelly *et al*. 2000). There were no datasets available to quantify the total impact of distribution lines on the landscape for the LEPC.

Other Factors

<u>Livestock Grazing</u>

Grazing has long been an ecological driving force throughout the ecosystems of the Great Plains (Stebbins 1981), and much of the untilled grasslands within the range of the LEPC is currently grazed by livestock and other animals. Historically, the interaction of fire, drought, prairie dogs (*Cynomys ludovicianus*), and large ungulate grazers created and maintained distinctively different plant communities in the Western Great Plains that resulted in a mosaic of vegetation structure and composition that maintained the prairie ecosystem that sustained LEPC and other grassland bird populations (Derner *et al*. 2009). As such, grazing by domestic livestock is not inherently detrimental to LEPC management and, in many cases, is needed to maintain appropriate vegetative structure through disturbance. However, grazing practices that tend to result in overutilization of forage, as well as decreasing vegetation heterogeneity (incompatible grazing), can produce habitat conditions that differ in significant ways from the historical grassland mosaic by altering the vegetation structure and composition and degrading the quality of habitat for the LEPC. The more heavily altered conditions are the least valuable for the LEPC (Jackson and DeArment 1963, Davis *et al*. 1979, Taylor and Guthery 1980a, Bidwell and Peoples 1991) and, in some cases, can result in areas that do not contain the biological components necessary to support the LEPC. It is important that grazing being managed at a given site to account for a variety of factors including past management, soils, precipitation, and other factors to ensure that the resulting vegetative composition and structure will support the LEPC as needed management will vary across the range.

Livestock also are known to inadvertently flush LEPC and trample LEPC nests (Toole 2005, Pitman *et al*. 2006). Brief flushing of adults from nests can expose eggs and chicks to predation and extreme temperatures. Trampling nests can cause direct mortality to LEPC eggs or chicks or may cause adults to permanently abandon their nests, ultimately resulting in loss of young. Although these effects have been documented, the significance of direct livestock effects on the LEPC is largely unknown and is presumed not to be significant at a population scale (Service 2021).

In summary, domestic livestock grazing (including management practices commonly used to benefit livestock production) has altered the composition and structure of grassland habitat, both currently and historically, used by the LEPC. Much of the remaining remnants of mixed-grass grasslands, while still important to the LEPC, exhibit conditions quite different from those that prevailed prior to Euro-American settlement. These changes have likely considerably reduced the suitability of remnant grassland areas as habitat for LEPC. Grazing management which has altered the vegetation community to a point where the composition and structure are no longer suitable for LEPC and can contribute to fragmentation within the landscape, even though these areas may remain as prairie or grassland. Livestock grazing, in many cases, is needed to maintain appropriate vegetative structure provided that grazing management results in a plant community diversity and structure that is suitable for LEPC.

Shrub Control and Eradication

Shrub control and eradication are additional forms of habitat alteration that can influence the availability and suitability of habitat for LEPC (Jackson and DeArment 1963). Most shrub control and eradication efforts in LEPC habitat are primarily focused on sand shinnery oak for the purpose of increasing forage for livestock grazing. Sand shinnery oak is toxic if eaten by cattle when it first produces leaves in the spring, and it also competes with more palatable grasses and forbs for water and nutrients (Peterson and Boyd 1998), which is why it is a common target for control and eradication efforts by rangeland managers. Prior to the late 1990s, approximately 100,000 acres of sand shinnery oak in New Mexico and approximately 1,000,000 acres of sand shinnery oak in Texas were lost due to the application of tebuthiuron and other herbicides for agriculture and range improvement (Peterson and Boyd 1998).

Shrub cover is an important component of LEPC habitat in certain portions of the range, and sand shinnery oak is a key shrub in the Shinnery Oak and portions of the Mixed-Grass Ecoregions. The importance of sand shinnery oak as a component of LEPC habitat in the Shinnery Oak Ecoregion has been demonstrated by several studies (Fuhlendorf *et al*. 2002, Bell 2005). In West Texas and New Mexico, LEPC have been documented to avoid nesting where sand shinnery oak has been controlled with tebuthiuron, indicating their preference for habitat with a sand shinnery oak component (Grisham *et al*. 2014, Haukos and Smith 1989, Johnson *et al*. 2004, Patten and Kelly 2010). Where sand shinnery oak occurs, LEPC use it both for food and cover. Sand shinnery oak may be particularly important in drier portions of the range due to the more severe and frequent droughts and extreme heat events, as sand shinnery oak is more resistant to drought and heat conditions than are most grass species. And since sand shinnery oak is toxic to cattle and thus not targeted by grazing, shinnery oak shrubs can provide available cover for LEPC nesting and brood rearing during these extreme weather events. Loss of this component of the vegetative community likely contributed to observed population declines in LEPC in these areas. While relatively wide-scale shrub eradication has occurred in the past, geospatial data do not exist to evaluate the extent to which shrub eradication has contributed to the habitat loss and fragmentation for the LEPC.

Influence of Anthropogenic Noise

Anthropogenic noise can be associated with almost any form of human activity, and LEPC may exhibit behavioral and physiological responses to the presence of noise. In prairie-chickens, the ‘‘boom’’ call vocalization transmits information about sex, territorial status, mating condition, location, and individual identity of the signaler and thus is important to courtship activity and long-range advertisement of the display ground (Sparling 1981). The timing of displays and frequency of vocalizations are critical reproductive behaviors in prairie grouse and appear to have developed in response to unobstructed conditions prevalent in prairie habitat and indicate that effective communication, particularly during the lekking season, operates within a fairly narrow set of acoustic conditions. Prairie grouse usually initiate displays on the lekking grounds around sunrise, and occasionally near sunset, corresponding with times of decreased wind turbulence and thermal variation (Sparling 1983). Considering the narrow set of acoustic conditions in which communication appears most effective for breeding LEPC and the importance of communication to successful reproduction, human activities that result in noises that disrupt or alter these conditions could result in lek abandonment (Crawford and Bolen 1976b). Anthropogenic features and related activities that occur on the landscape can create noise that exceeds the natural background or ambient level. When the behavioral response to noise is avoidance, as it often is for LEPC, noise can be a source of habitat loss or degradation leading to increased habitat fragmentation.

Hunting, and Other Recreational, Educational, or Scientific Use

In the late 19th century, LEPC were subject to commercial hunting (Jackson and DeArment 1963, Fleharty 1995, Jensen *et al*. 2000). Harvest throughout the species' historical range has been regulated since approximately the turn of the 20th century (Crawford 1980). Currently, the LEPC is classified as a game species in Kansas, New Mexico, Oklahoma, and Texas, although authorized harvest is no longer allowed in any of the states. Most recently in Kansas, LEPC could legally be hunted up until 2014.

A growing recreational activity that has the potential to negatively affect individual breeding aggregations of LEPC is the occurrence of public and guided bird watching tours of leks during the breeding season. The site-specific impact of recreational observations of LEPC at leks is currently unknown, but daily human disturbance could reduce mating activities, possibly leading to a reduction in total production. However, disturbance effects are likely to be minimal at the population level if disturbance is avoided by observers remaining in vehicles or blinds until LEPC naturally disperse from the lek and if observations are confined to a limited number of days and leks. Solitary leks comprising fewer than 10 males are most likely to be affected by repeated recreational disturbance.

Research and monitoring activities such as roadside surveys, aerial surveys, and lek and flush counts that tend to rely on passive sampling rather than active handling of the birds are not likely to substantially impact the LEPC at the population level, although brief flushing of adults from nests can expose eggs and chicks to predation and extreme temperatures. Aerial surveys, as currently executed, have been shown to result in birds briefly abandoning leks, but it is not expected to be a substantial effect (McRoberts *et al*. 2011). When birds are flushed, some increased energy expenditure or exposure to predation may occur, but the impacts are anticipated to be minor and of short duration that do not rise to measurable effects at the population level. Studies that involve handling of adults, chicks, and eggs, particularly those involving the use of radio transmitters, also may cause increased energy expenditure, predation exposure, or otherwise impact individual birds. However, such studies typically occur at a relatively small, localized scale; are of short duration, during the lekking rather than nesting season; last no more than a few years; and are not likely to cause an impact to LEPC populations.

Collision Mortality from Fences

Fencing is a fundamental tool of livestock management and is often essential for proper herd and grazing management. Fencing is used to confine livestock and prevent them from grazing areas such as public roads, agricultural fields, lands intended for hay production, outside of property boundaries, and those lands enrolled in some types of conservation programs. However, fencing, particularly at higher densities, can contribute to fragmentation of the landscape and hinder efforts to conserve grasslands on a landscape scale (Samson *et al*. 2004). Fencing can be particularly detrimental to the LEPC in areas, such as Western Oklahoma, where initial settlement patterns favored larger numbers of smaller parcels for individual settlers (Patten *et al*. 2005b). Fencing large numbers of small parcels increases the density of fences on the landscape, increasing the potential for LEPC to encounter fences during flight. In addition to direct mortality of LEPC through collisions during flight, fencing can also indirectly lead to mortality by creating hunting perches used by raptors and by facilitating corridors that may enhance movements of mammalian predators (Wolfe *et al*. 2007). Wolfe *et al*. (2007,) and Patten *et al*. (2005b) found high proportions of mortality to fence collisions in Oklahoma; however, the majority of studies range-wide have found little evidence that fence collisions are a large contribution to direct mortality of LEPC (Hagen *et al*. 2007, Grisham and Boal 2015, Kukal 2010, Pirius 2011, Robinson *et al*. 2016). Therefore, in most areas where the landscapes have not been fenced as intensively as in Oklahoma, fence collision risk is not as high and not likely to result in population level effects.

<u>Predation</u>

Predation is a naturally occurring process and generally does not independently pose a substantial risk to wildlife populations, including the LEPC. Natural predation can be confounding cause for species declines when populations are extremely small, when habitat conditions have been altered to create increased predatory opportunities or increased effectiveness for predators, or when the species has an abnormal level of vulnerability to predation. The LEPC's cryptic plumage and behavioral adaptations allow the species to persist under normal predation pressures. LEPC predation varies seasonally during different life stages, with higher predation during the breeding season compared to the nonbreeding season (Boal 2016). Although all age classes of LEPC may experience relatively constant, year-round risk from mammals, higher predation risk is seen during LEPC breeding season in the spring and summer from ravens (*Corvus corax*) and from various species of snakes preying on eggs and young, and during raptor migration seasons in the fall and spring from raptors preying on juveniles and adults (Boal 2016). Adults may be most susceptible to predation while on the lek when birds are more conspicuous. Both Patten *et al*. (2005b) and Wolfe *et al*. (2007) reported that raptor predation increased with lek attendance. Patten *et al*. (2005b) stated that male LEPC are more vulnerable to predation when exposed during lek displays than they are at other times of the year and that male LEPC mortality was chiefly associated with predation. However, during 650 hours of lek observations in Texas, raptor predation at leks was considered uncommon and an unlikely reason for declines in LEPC populations (Behney *et al*. 2011). Behney *et al*. (2012) further observed that the timing of lekking activities in their study area corresponded with the lowest observed densities of raptors and that LEPC contend with a more abundant and diverse assemblage of raptors in other seasons.

Rates of predation on LEPC likely are influenced by certain aspects of habitat quality such as fragmentation or other forms of habitat degradation (Robb and Schroeder 2005). As habitat fragmentation increases, usable habitat becomes more spatially restricted and the effects of terrestrial nest predators on grouse populations may increase (Braun *et al*. 1978). Nest predators typically have a positive response (*e.g*., increased abundance, increased activity, and increased species richness) to habitat fragmentation, although the effects are expressed primarily at the landscape scale (Stephens *et al*. 2003). Similarly, as habitat quality decreases through reduction in vegetative cover, predation of LEPC nests, juveniles, and adults are all expected to increase. For this reason, ensuring adequate vegetative cover and removing raptor perches such as trees, power poles, and fence posts may lower predation more than any conventional predator removal methods (Wolfe *et al*. 2007). As previously discussed, existing trees, power poles, transmission lines, fences, and other vertical structures have either contributed to additional predation on LEPC through increase of perches for avian predators, provided movement areas and hunting corridors for other predators, or caused areas of usable habitat to be abandoned by LEPC due to avoidance behavior (Hovick *et al*. 2014a). The data necessary to calculate the total effect of predation on the LEPC do not exist.

Parasites and Disease

Although parasites and diseases have the potential to influence LEPC population dynamics, little is known regarding the consequences of parasites or diseases at the LEPC population level (Peterson 2016). Past adverse impacts to LEPC populations have not been observed, although diseases and parasites have been found in LEPC (Peterson 2016). Some degree of impact from parasites and disease is a naturally occurring phenomenon for most wildlife species and is one element of compensatory mortality (the phenomenon that various causes of mortality in wildlife tend to balance each other, allowing the total mortality rate to remain constant) that operates among many species. However, there is no information that indicates parasites or disease have caused, or contributed to, the decline of any LEPC populations, and, at this time, we have no basis for concluding that disease or parasite loads are a concern to any LEPC populations.

Fire

Fire, or its absence, is understood to be one of three major ecological drivers of grasslands in the Southern Great Plains, with the remaining two being climate and grazing (Anderson 2006, Koerner and Collins 2014, Wright and Bailey 1982). Fire is an ecological process important to maintaining grasslands by itself and in coupled interaction with grazing and climate. The interaction of these ecological processes results in increasing heterogeneity on grasslands through the creation of temporal and spatial diversity in plant community composition and structure and concomitant response of wildlife (Fuhlendorf and Engle 2001, Fuhlendorf and Engle 2004, Fuhlendorf *et al*. 2017a). Some landowners working in these landscapes use fire as one of many tools to manage livestock behavior, forage quantity and quality and to increase performance of livestock (Fuhlendorf *et al*. 2017a). Acknowledging the role and importance of fire, grassland conservation recommendations often promote prescribed fire use and provide incentives to landowners' use of fire through conservation program efforts such as training and education, cost share, and planning assistance.

In general, following settlement of the Great Plains, fire management emphasized fire prevention and suppression, and often knowingly coupled with purposeful grazing pressures that significantly reduce and remove fine fuels (Sayre 2017). This approach, occurring in concert with settlement and ownership patterns that occurred in most of the Southern Great Plains, meant that the scale of management was relegated to smaller parcels than historically were affected. Smaller parcels intensively grazed and typically precluded from fire to the maximum extent resulted in landscapes generally transforming from dynamic heterogeneous configurations to largely static and homogenous plant communities. This simplification of vegetative pattern due to decoupling fire and grazing (Starns *et al*. 2019) is now seen as part of the contribution to changes in the number and size of wildfires and ultimately declines in biodiversity in the affected systems (Fuhlendorf and Engle 2001). Fire behavior has also been affected such that these increasingly large wildfires are burning under weather conditions (Lindley *et al*. 2019) that result in greater burned extent and intensity. These shifts in fire parameters and their outcomes have potential consequences for LEPC, including: (1) larger areas of complete loss of nesting habitat as compared to formerly patchy mosaicked burns; and (2) large scale reduction in the spatial and temporal variation in vegetation structure and composition affecting nesting and brood rearing habitat, thermoregulatory cover, and predator escape cover.

While LEPC evolved in a fire adapted landscape, little research (Thacker and Twidwell 2014) has been conducted on response of LEPC to altered fire regimes. Research completed to date has focused on site-specific responses and consequences. Human suppression of wildfire and the limited extent of fire use (*i.e*., prescribed fire) for management over the past century has altered the frequency, scale, and intensity of fire occurrence in LEPC habitat. These changes in fire parameters have happened simultaneously with habitat loss and fragmentation, resulting in patchy distribution of LEPC throughout their range. An increase of larger and more intense or severe wildfires as compared to historical occurrences results in increased vulnerability of isolated, smaller LEPC populations. Both woody plant encroachment and drought are additive factors that increase risk of negative consequences of wildfire ignition, as well as extended post-fire LEPC habitat effects. The extent of these negative impacts can be significantly altered by precipitation patterns following the occurrence of the fire (dry periods will inhibit or extend plant community response).

Historically, fire served an important role in maintenance and quality of habitat for the LEPC. Currently, due to a significant shift in fire regimes in the LEPC range, fire use for management of grasslands plays a locally important but overall limited role in most LEPC habitat. Concurrently, wildfire has increased as a threat, due to compounding influences of increased size and severity of wildfires and the potential consequences to remaining isolated and fragmented LEPC populations.

Insecticides

Concerns over pesticides affecting vertebrate wildlife populations have recently focused on systemic products which exert broad-spectrum toxicity (Gibbons *et al*. 2014). Recent studies have shown that neonicotinoid insecticides (a class of insecticides that share a common mode of action that targets the central nervous system of insects), which are used within the range of the LEPC, have adverse effects on non-target invertebrate species (Hallmann *et al*. 2014). Invertebrates constitute a substantial part of the diet of many bird species, including LEPC, during the breeding season and are vital for raising offspring (Hallmann *et al*. 2014). Although this has not been investigated specifically in relation to LEPC, Hallmann *et al*. (2014) illustrated that local bird populations in the Netherlands declined by 3.5% annually in areas where there was a higher concentration of the neonicotinoid imidacloprid, and this spatial pattern of decline appeared only after the introduction of imidacloprid in the mid-1990s (even after accounting for spatial differences in land use changes). Use of imidacloprid and clothianidin (two neonicotinoid insecticides) as seed treatments on some crops also poses risks to small birds, and ingestion of even a few treated seeds could cause mortality or reproductive impairment to sensitive bird species (Gibbons *et al*. 2014). Despite these concerns, no current information indicates insecticides are influencing LEPC populations.

Extreme Weather Events

Weather-related events such as drought, snow, and hailstorms can influence habitat quality or result in direct mortality of LEPC. Although hailstorms typically only have a localized effect, the effects of snowstorms and drought can often be more wide-spread and can affect considerable portions of the LEPC range. Drought is considered a universal ecological driver across the Great Plains (Knopf 1996). Annual precipitation within the Great Plains is highly variable (Wiens 1974), with prolonged drought capable of causing local extinctions of annual forbs and grasses within stands of perennial species, and recolonization is often slow (Tilman and El Haddi 1992). Grassland bird species in particular are impacted by climate extremes such as extended drought, which acts as a bottleneck that allows only a limited number of individuals to survive through the relatively harsh conditions (Wiens 1974, Zimmerman 1992). Drought also interacts with many of the other factors addressed in this report, such as amplifying the effects of incompatible grazing and predation.

Although the LEPC has adapted to drought as a component of its environment, drought and the accompanying harsh, fluctuating conditions (high temperatures and low food and cover availability) have influenced LEPC populations. Widespread periods of drought commonly result in “bust years” of recruitment. Following extreme droughts of the 1930s, 1950s, 1970s, and 1990s, LEPC population levels declined and a decrease in their overall range was observed (Lee 1950, Ligon 1953, Schwilling 1955, Hamerstrom and Hamerstrom 1961, Copelin 1963, Crawford 1980, Massey 2001, Hagen and Giesen

2005). Additionally, LEPC populations reached near record lows during and after the more recent drought of 2011 to 2013 (McDonald *et al*. 2017, Fritts *et al.* 2018).

Although LEPC have persisted through droughts in the past, the effects of such droughts are exacerbated by human land use practices such as incompatible grazing and land cultivation (Merchant 1982, Hamerstrom and Hamerstrom 1961, Davis *et al*. 1979, Taylor and Guthery 1980a, Ross *et al*. 2016) as well as the other factors that have affected the current condition and have altered and fragmented the landscape and decreased population abundances (Fuhlendorf *et al*. 2002, Rodgers 2016). In past decades, fragmentation of LEPC habitat was less extensive than it is today, and connectivity between occupied areas was more prevalent and populations were larger, allowing populations to recover more quickly; in other words, LEPC populations were more resilient to the effects of stochastic events such as drought. As LEPC population abundances decline and usable habitat declines and becomes more fragmented, their ability to rebound from prolonged drought is diminished. We are not able to quantify the impact that severe weather has had on the LEPC populations, but, as discussed above, these events have shaped recent history and influenced the current condition for the LEPC.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

Status of the Species within the Action Area

This CCAA pertains to non-federal lands in Oklahoma encompassed by the current distribution of the LEPC, those non-federal lands that are unoccupied, but potentially suitable LEPC habitat, and those non-federal lands that could provide habitat should the current population and distribution of the LEPC increase. In particular, this CCAA now includes all of the following Oklahoma counties and this area will be referred to as the Planning Area: Alfalfa, Beaver, Beckham, Cimarron, Custer, Dewey, Ellis, Harper, Major, Roger Mills, Texas, Washita, Woods, and Woodward counties. Covered areas are eligible non-federal lands within the Planning Area that provide suitable habitat for LEPC or have the potential to provide suitable LEPC habitat with the implementation of conservation measures.

This CCAA allows enrollment of lands within the Oklahoma portions of the mixed grass ecoregion. This ecoregion, along with the sand sage and the short grass ecoregions, make up the Northern DPS for the LEPC, as proposed by the Service. The Service (2021) summarized the primary habitat loss, fragmentation, and degradation factors as: conversion of native prairie to cropland; long-term fire suppression that has led to tree invasion; grazing management and herbicide spraying practices that have reduced habitat quality; and the development of oil and gas, wind, transmission, distribution lines, and roads. Refer to the LEPC SSA report for further details regarding the biological status of these three ecoregions.

Based on accounts beginning as far back as the early 1900's, the historical range is shown to encompass all or parts of 30 counties in Oklahoma (Davis *et al*. 2008). By 1961, Copelin (1963) reported LEPC from only 13 counties. By 1979, LEPC were verified in eight counties, and the remaining population fragments encompassed an estimated area totaling 1,078 square miles, a decrease of approximately 72% since 1944.

At present, the ODWC reports that the LEPC continues to persist in only nine counties (all counties within the action area except Alfalfa, Beckham, Custer, and Washita), with most occurrences documented in only six counties. The estimated range of the LEPC is estimated to be approximately 950 square miles.

Lek density is at a greatly reduced level when compared with densities observed during surveys conducted in earlier years. Between 1982 and the present, the ODWC annually estimated density of leks per area of suitable habitat in six counties. During this time period, lek density has declined from a high of 0.15 leks/square mile in 2018 to current densities of less than 0.04 lek/square mile. According to the most recent LEPC surveys, the estimated density of LEPC leks on routes was 0.01 leks/square mile.

Long-term abundance estimates suggest a history of dramatic population fluctuations. Between 1968 and 1991, the average number of birds (males only) for all leks surveyed (even if no birds were present on the lek) was included in the data analysis. These numbers ranged from a high of an average of 16.5 males/lek in 1975 to a low average of 6.6 males/lek in 1984. Beginning in 1992 and continuing through the 1999 survey period, only those leks on which birds were present (active leks) were included in data analysis. There was a noticeable decline in survey numbers from 1993 to 1995. The 9.8 birds/active lek recorded during the 1993 survey dropped to 4.6 birds/active lek in 1995. The survey numbers did rebound to 9.6 birds/active lek in 1998. In 1999, surveyors began counting all birds (females as well as males)

The ODWC is aware of 96 known historical and currently occupied leks in Oklahoma. During the mid-1990's all of these leks were active. Recent survey efforts are lacking for most of these known lek locations and the exact number of currently active or occupied leks in Oklahoma is unknown.

The Oklahoma population was estimated to be about 7,500 individuals in 1978 (Cannon and Knopf 1980) and no more than 3,000 individuals in 2000 (Horton 2000). A more recent estimate has not been conducted. Range wide aerial surveys have been conducted since 2012. However, the survey area since 2012 has been divided into four ecoregions based on habitat types, and results grouped by each state are not provided.

Factors Affecting LEPC Environment within the Action Area

Major factors affecting the LEPC in Oklahoma are conversion, degradation, and fragmentation of habitat. Because the LEPC requires large areas (2,530-24,710 acres) of intact landscapes of mixed-grass, short-grass, and shrubland habitats (Giesen 1998, Bidwell *et al*. 2002, Hagen *et al*. 2004), conversion, degradation, and fragmentation of these habitats have contributed to a significant reduction in the extent of LEPC occupied range.

Oklahoma is within the top 15 states nationally for potential wind capacity. Wind energy development and its associated infrastructure is occurring within the range of the LEPC in Oklahoma. Oklahoma ranks third, behind Texas and Iowa, in the amount of electricity generated from wind. In 2020, the State accounted for almost one-tenth of the nation's wind-powered electricity generation (U.S. EIA 2021) and wind energy accounted for 35% of Oklahoma's in-state net generation, a larger share than in all other states except Iowa and Kansas. By the end of 2020, Oklahoma had installed more than 9,300 megawatts of wind capacity (U.S. EIA 2021). The current available information demonstrates that tall vertical structures, such as wind turbines, are avoided by the LEPC and likely render otherwise suitable habitat unsuitable (Hagen *et al*. 2004, Robel *et al*. 2004, Pruett *et al*. 2009a, 2009b). The Service considers the ongoing and large-scale potential for commercial wind power development to be a high-level threat to the survival of the species in the near future.

A mapping analysis conducted by ODWC and Service personnel in 2005 revealed that 35% of the recently occupied LEPC range in Oklahoma is within areas designated by the Oklahoma Wind Power Assessment as "excellent" for wind energy development. When both the "excellent" and "good" wind energy development classes are combined, some 5% of the occupied range lies within those two classes.

When leks were examined, the same analysis revealed a nearly complete overlap on all known active and historical lek locations, based on the known active leks during the mid-1990s.

Oil and gas development continues at a high level in Oklahoma. Oil and gas development affects the LEPC by disrupting reproductive behavior (Hunt and Best 2004) and through habitat fragmentation and conversion (Hunt and Best 2004).

The invasion of remaining native habitat within LEPC range by woody species such as eastern red cedar is a growing concern. A recent time series infrared satellite mapping analysis conducted by the Oklahoma NRCS in 2005 revealed that eastern red cedar trees alone are invading native rangelands in western Oklahoma at a rate of approximately 5% per year (Eckroat 2007). Tree invasion in native rangeland has the potential to render significant portions of remaining occupied habitat unsuitable within the near term.

Overutilization of rangeland by livestock is considered detrimental to LEPC populations. Overgrazing can reduce grass height below that necessary to provide concealment of the hen and her nest to a degree that residual cover remaining in the spring is inadequate to support nesting activities. Desirable food plants also are diminished by overgrazing (Bent 1932, Davis *et al*. 1979, Cannon and Knopf 1980, Crawford 1980, Bidwell and Peoples 2004, Riley *et al*.1992, Giesen 1994).

Herbicide application (primarily 2,4-D and tebuthiuron) to reduce or eliminate shrubs from native rangelands is a common ranching practice throughout the LEPC's range. Several studies have shown that shrub removal, primarily by herbicide application, is one mechanism that may be contributing to observed declines of the LEPC (Fuhlendorf *et al*. 2002; Bell 2005; Haukos and Smith 1989).

Wire fencing is ubiquitous throughout the Great Plains in Oklahoma as the primary means of confining livestock to ranches and pastures or excluding them from areas not intended for grazing such as CRP lands, agricultural fields, and public roads. Lesser prairie-chicken mortality is known to occur due to collisions with fences. Fences also may facilitate predation by serving as travel lanes for predators, and may serve as raptor perches and facilitate hunting by avian predators (Patten *et al*. 2005a, Wolfe *et al* 2007).

Drought has been shown to impact the LEPC through its effect on seasonal growth of vegetation necessary to provide nesting and roosting cover, food, and escape from predators. Home ranges tend to be larger in drought years, and recruitment may be less likely during drought and in the year following. Along with other prairie grouse, the LEPC has a high reproductive potential in years of adequate conditions. Thus, drought conditions are unlikely to be the sole causative factor in long-term LEPC population declines.

EFFECTS OF THE ACTION

In accordance with 50 CFR 402.02, effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of all other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see §402.17).

Current activities related to agricultural practices will continue to occur within the action area covered by the CCAA. The implementation of the conservation measures described in the CCAA would reduce the adverse effects of current activities on LEPC that occur on non-Federal lands and would provide additional minimization of those adverse effects. Implementation of the CCAA will provide additional minimization of adverse effects associated with continuing activities occurring at the landscape level.

The proposed action is the amendment of the 2013 section 10(a)(l)(A) Enhancement of Survival Permit issued to ODWC for the incidental take of the LEPC in association with the addition of 600,000 acres to the CCAA. No direct effects are expected from the amendment to the Permit.

The CCAA is designed to reduce the threats to the LEPC. The purpose of the CCAA is to implement conservation measures that will reduce threats and improve habitat for the LEPC in Oklahoma, and lead to increased abundance and distribution of the species. The additional acreage added to the CCAA is expected to benefit the LEPC by encouraging private landowners to undertake conservation measures. The provision of regulatory assurances may increase participation by landowners who previously were hesitant to enter into federally-sponsored conservation programs. The CCAA, through its monitoring provisions associated with the issuance of the CI, will give a better assessment of overall LEPC habitat conditions, and should help provide the ODWC with an accurate, up-to-date representation of the species' occupied range and an index to population performance.

Although adding additional acreage to the CCAA and the associated conservation measures are expected to have an overall long-term net beneficial effect for the LEPC by providing habitat conditions that are conducive to LEPC reproduction and survival, some of the recommended conservation measures (*e.g.*, prescribed burning, brush management, site preparation for conservation cover, and upland wildlife habitat management) may result in temporary disturbance to LEPCs and have short-term adverse effects. Adverse effects also may occur due to various ongoing otherwise lawful agricultural activities (*e.g.*, crop cultivation and harvesting, livestock grazing, farm equipment operation), recreational activities (*e.g.*, hunting of other species, hiking, camping, dog training, vehicle use, viewing of LEPCs and other wildlife, or similar related activities), and limited development activities (*e.g.*, construction of a storage building/barn, installation of overhead power lines to a house, expansion, renovation or rebuilding of a house). However, these adverse effects will be offset by the reduction of threats and benefits achieved by the implementation of the conservation measures under the CCAA by a property owner to the point that when combined with those benefits that would be achieved if it assumed that conservation measures were also to be implemented on other necessary properties, the need to list the LEPC could be precluded. Where a conservation measure is anticipated to result in adverse effects, minimization practices have been identified and made a part of that action, which will eliminate or minimize the potential adverse effects of the identified action (see section VII of the CCAA for more detailed information). Flexibility in the implementation of the conservation measures and associated minimization practices would be allowed only should ODWC and the Service determine that, based on ecological considerations, the allowance of such flexibility would result in an overall high conservation benefit for the LEPC and would not prevent the standards of the CCAA policy from being met. The nature and extent of both the anticipated beneficial and short-term adverse effects of the conservation measures, and associated minimization practices, and ongoing land uses are discussed below.

The CCAA conservation measures to be implemented or maintained are intended to conserve, restore, and/or enhance LEPC habitat so that progress toward sustainable population levels can occur. Because available data indicate that increasing breeding success (*i.e.*, nest success, recruitment) is the primary key to increasing numbers of LEPC (and perhaps therefore, distribution) (Hagen *et al*. 2004), the conservation measures that would be implemented on enrolled lands would serve to first restore and then maintain native prairie habitats as nesting and brood-rearing habitat for the LEPC. Increasing the availability and quality of suitable nesting and brood-rearing habitat components on the landscape is anticipated to result in an increase in the number of successful nesting attempts and chick survival which will, in sum, result in an overall increase in the LEPC population. Use of the conservation measures and associated minimization practices also is intended to reduce any unfavorable impacts to LEPCs arising from the management and utilization of the enrolled lands.

Fire and Grazing

The use of prescribed fire and grazing is expected to help ensure that a diversity of plants and cover types, including shrubs and multiple plant successional states, remain on the landscape. Lesser prairie-chicken habitat types (*e.g*., nesting, foraging, and brood-rearing habitats) should be distributed in a mosaic over contiguous blocks of rangeland habitat. Heterogeneous or "patchy" landscapes encompassing multiple successional states that include tall grasses and shrubs (nesting habitat) in proximity to more open grasslands supporting forbs (brood-rearing habitat) with areas of short grass and bare ground (breeding habitat) support all habitat types used by LEPC throughout the year. The use of prescribed fire and a grazing system that creates heterogeneity (*i.e*., patchiness) on the landscape (or within the management unit) by maintaining middle to late stages of plant succession interspersed with early successional stages creates optimal habitat for the LEPC (Hagen *et al*. 2004). Therefore, the implementation of these conservation practices as described would be expected to provide an overall net benefit to the LEPC by restoring and enhancing habitat.

Prescribed Fire

The implementation of prescribed fire is anticipated to have some short-term adverse effects. The use of prescribed fire could impact LEPCs in several ways. Implementation of prescribed fire during late winter or early spring could disrupt LEPC breeding activities.

Prescribed fire in the winter could remove nesting and brood-rearing cover in the short term. Lesser prairie-chicken hens tend to select nest sites with greater than 75% visual obstruction in the first 13 inches and at least 50% overhead cover (Haukos and Smith 1989). Prescribed fire destroys available nesting cover in the year of burning, but nesting cover normally recovers in the following 2 to 3 years (Boyd and Bidwell 2001).

Human activity associated with the implementation of prescribed fire (human presence, vehicle use, etc.) may disturb and displace any LEPCs using the area to be burned. Prescribed burns also may temporarily increase nest depredation rates in adjacent unburned areas. Construction of fire breaks may cause temporary soil disturbance, disturbance of nesting birds, removal of cover/habitat, and encourage invasive species establishment.

Certain minimization practices would be utilized to minimize adverse effects associated with prescribed fire. Prescribed fire would not occur within 2.9 miles of an active lek during the breeding season. Prescribed fire would be avoided during the nesting season to prevent harm and harassment during this important period and the possible loss of nests with eggs or chicks. Burning from February to early March may be conducted only after birds have ceased lekking activities in the morning. Disturbance associated with this action during other seasons would be reduced with noise suppression devices on vehicles and the use existing trails and roads as travel lanes. Invasive species and noxious weeds would be controlled as they are becoming established to minimize anticipated adverse effects.

Many areas that are anticipated to undergo prescribed burning are currently not suitable LEPC habitat due to eastern red cedar encroachment and a lack of perennial grasses. Thus, implementation of prescribed burns on such properties should not result in any significant adverse impacts to LEPCs.

Prescribed Grazing Management

Prescribed grazing also is anticipated to have some short-term adverse effects. Prescribed grazing during late winter and early spring may impact individual LEPCs by disrupting breeding activities on leks. The disturbance to LEPCs, however, is expected to be minor. The LEPC likely is well acclimated to the presence of large grazing animals because they historically occurred in areas grazed by free roaming herds of bison (*Bison bison*). Grazing also may harm LEPCs by removing vegetation used as nesting or brood-rearing cover (Litton *et al*. 1994). Prescribed grazing activities also may result in the direct loss of eggs and chicks (mortality) due to trampling. Harm to LEPCs also may occur due to livestock causing nesting birds to flush and through increased soil compaction. Pitman *et al*. (2006) estimated nest loss from trampling by cattle to be about 1.9% of known nests. Displaced individuals also may have increased energy demands or be subjected to increased risk of predation.

Adverse effects associated with grazing will be minimized or avoided through routine monitoring of grazing duration and intensity. Monitoring efforts will help ensure habitat quality objectives are met and overgrazing is avoided. Pasture visits, particularly near leks and known nests during the breeding and nesting season, will be minimized. Salt and mineral supplements for cattle also will be placed in previously disturbed areas or in close proximity to structures that LEPC avoid to minimize, which will minimize the adverse effects associated with grazing.

<u>Fencing</u>

The use and installation of fences would be coordinated with other practices, such as water distribution and patch burning, to achieve desired prescribed grazing goals and minimize potential impacts to LEPC. Lesser prairie-chicken mortality is known to occur due to collisions with fences (Wolfe *et al*. 2007). Fences also may facilitate predation by serving as travel lanes for predators. Fence posts and trees along fence lines may serve as raptor perches and facilitate hunting by avian predators (Patten *et al*. 2005a, Wolfe *et al*. 2007). Although alternative measures (*e.g*., fire, mineral, water, and some electrical fences) to manage livestock grazing would be utilized where feasible, permanent barbed-wire and electric fences would be constructed when necessary to achieve management objectives. Thus, the use of fences on lands enrolled in the CCAA may contribute towards collision mortality and increased predation but may be necessary to meet broader habitat management goals.

Several minimization practices have been identified that would reduce and/or eliminate adverse effects associated with fences. Existing fences on each project area to be covered under the CCAA would be removed and/or reduced to the extent practicable. Existing unmarked fences in areas with documented collisions will be marked. Existing fences within 2.9 miles of a known lek will be marked. All new fences also would be marked and constructed as low as possible while still maintaining their functionality. One- or two-wire electric fences would be substituted for barbed-wire fences if conditions permit. Fence lines also will be kept clear of brush and trees, which should reduce hunting by avian predators. When no longer needed, fences would be removed.

<u>Brush and Tree Management</u>

Management of brush and trees through mechanical or chemical means may be necessary. Although native brush species (not trees) are a component of high quality native LEPC habitat, extensive areas of brush and trees with little or no interspersed native warm season bunch grasses provides limited habitat value for the LEPC. Trees and similar forms of woody (non-herbaceous or succulent) plants, such as eastern red cedar, black locust *(Robinia pseudoacacia*), Osage orange (*Maclura pomifera*), and mesquite have expanded into and invaded grasslands used by LEPC due to fire suppression. Careful management or removal of brush and tree species will help restore enrolled properties to desired conditions.

Herbicides would be used only when habitat goals cannot be achieved by other means such as prescribed fire and grazing. Tebuthiuron will not be used to treat desirable shrubs unless other conservation measures would not achieve desired results. Where grazing management (*i.e*., stocking rate) is appropriate for the productive capabilities of the land and fire is periodically used to direct grazing and balance shrub canopy and height, herbicides should only be necessary to control invasive nonnative plants such as Bermuda grass (*Cynodon dactylon*), Old World bluestems (*Poaceae*), Russian olive (*Elaeagnus angustifolia*), autumn olive (*Elaeagnus umbellate*), and other exotic species. Because these plants are of limited or no value to the LEPC, reducing their density on the landscape should increase the value of the habitat for LEPC.

Limited herbicide application also may be used on shinnery oak to temporarily reduce shinnery oak competition with grasses. Applications which reduce shinnery oak cover to less than 20% are considered detrimental to LEPC. However, herbicides would be used only at dosages that would defoliate shinnery oak and not kill it. Application also would follow natural landscape patterns and large block and linear applications would be avoided. Annual reporting requirements of the CCAA include an evaluation of the use of herbicides on shinnery oak. This evaluation is required to ensure application rates defoliate but do not kill shinnery oak. Should evaluations indicate the use of herbicides is killing rather than defoliating shinnery oak, Service and ODWC biologists will utilize this information to inform decisions regarding the use of herbicides on shinnery oak in all future WMPs.

The use of herbicides to chemically control brush and shrubs could disturb any LEPCs in the area during application. Because herbicidal brush control typically suppresses forb growth immediately after treatment (Jackson and DeArment 1963, Peterson and Boyd 1998), important fall and winter food resources may temporarily be impacted. These practices also may result in the loss of insect food sources due to the reduction of certain plant species.

Minimization practices will be implemented that will serve to avoid or reduce these adverse effects. Because treatment would not occur during the mating/nesting season, adverse effects during this important time period will be avoided. Fall and winter food resources suppressed by the use of herbicides, should recover within a year of treatment. Problem areas will receive spot treatment as opposed to broadcast application and, when necessary to minimize adverse effects, only portions of a ranch/pasture would be treated rather than the entire ranch at once. These minimization practices will minimize the loss of cover and plant and insect food resources.

Mechanical techniques to manage brush have the potential to adversely affect LEPCs in the short term. Mechanical brush control, such as mowing or roller chopping, may impact individual LEPCs and possibly result in direct mortality by destroying nests with eggs. Creation of brush piles could serve as raptor perches or shelter for other predators. To avoid and/or minimize these effects, treatment during nesting season would be avoided. The creation of brush piles also would be avoided or minimized. Any brush piles created would be burned as soon as possible.

<u>Non-native Plant Removal</u>

Some enrolled lands will contain areas of cropland, introduced grasses and other introduced forages, and similarly disturbed sites (*e.g*., roads and well pads). The preferred habitat of the LEPC is native short- and mixed-grass prairies having a shrub component dominated by sand sagebrush or shinnery oak (Giesen 1998; Bidwell *et al*. 2002; Hagen *et al*. 2004). Areas that have been converted to cultivated cropland and monocultures of introduced grasses provide poor quality habitat for the LEPC (Crawford and Bolen 1976a; Ripper and VerCauteren 2007).

Therefore, these areas would be targeted for restoration. A specific mixture of native warm season bunch grasses, forbs and shrubs that are deep-rooted, drought-resistant, responsive to management with grazing and prescribed fire, and adapted to the appropriate ecological site will be utilized. Restoration of converted rangeland using native warm season grasses and forbs will restore habitat to rangeland conditions preferred by LEPC.

The renovation of existing sub-optimal habitat such as CRP fields consisting of introduced grasses, may have negative short term impacts on the LEPC. Although LEPC use of areas requiring re-vegetation is expected to be minimal, renovation typically involves plowing and/or herbicide application (Lutz *et al*. 1994), which may harass and/or harm LEPCs using these habitats temporarily. Re-vegetation would be avoided during the mating/nesting season which would serve to avoid such adverse effects during this important time period.

Haying

Haying may temporarily disturb and displace any LEPCs utilizing the field being harvested. As birds flee the action of the machinery, lack of escape cover also may increase risk of capture by birds of prey. Haying also may temporarily remove brood-rearing habitat. Harvesting/cutting may not leave adequate heights of residual vegetation or allow adequate time for sufficient regrowth following harvest. Haying also may cause destruction of nests. However, certain haying methods (*e.g.*, time of year/avoid nesting season, harvest from inside out, initiate cutting on one side of a field and work back and forth across the field) would be utilized for enrolled properties to minimize these potential adverse effects and help ensure that the harvested sites provide suitable LEPC habitat in the winter and following spring.

Watering Facilities

Many artificial watering facilities (*e.g.*, impoundments and stock tanks) occur within the LEPC range in Oklahoma. Watering facilities likely will occur on enrolled properties. Direct mortality due to drowning is anticipated to be rare. However, under specific conditions, stock tanks may pose a drowning hazard to LEPCs. The use of windmills and associated power lines also may displace LEPCs (LEPCs may avoid the elevated structures) and may pose a collision risk. Modification of watering facilities may minimize these adverse effects. Suitable escape ramps will be used to minimize the drowning risk. Where determined necessary by ODWC and Service biologists to minimize adverse effects (displacement and collision), solar powered equipment will be used to eliminate windmill towers and/or associated power lines. Alternatively, associated power lines may be buried.

Cultivation Conservation Techniques

Conservation tillage approaches such as minimum till, mulch till, or no-till, combined with minimal pesticide use may be used on enrolled lands. These cultivation practices will provide additional and supplemental food supplies for LEPC (Litton *et al*. 1994). Cropland tillage practices that leave sufficient stubble (12 inches or more in height) and waste grain on the soil surface during winter periods enhance food availability for the LEPC (NRCS 2001). While not routinely necessary for survival of LEPC, during prolonged periods of abnormally extreme winter conditions (*e.g.*, deep snow or ice cover for multiple subsequent days), these cropland areas also may provide a temporary food source and enhance survival of LEPC. Cultivation tillage may temporarily disturb and displace any LEPCs utilizing the area. The application of insecticides to control grasshoppers and other pests may reduce food supplies or cause toxicity if treated insects are consumed.

Strip discing (fallow discing) and similar light, small-scale, shallow forms of soil disturbance may be used to stimulate growth of native foods for LEPC. To minimize potential adverse effects, discing would not be conducted immediately adjacent to leks. Strip discing may destroy existing food and cover and temporarily disturb and/or harm LEPCs using the area.

Upland Habitat Management

Small food plots also may be used in very limited circumstances. Food plots are not an appropriate substitute for proper habitat management. The replacement of native prairie with annual food plots may impact LEPCs by eliminating nesting and brood-rearing habitat. However, small plots planted in supplemental foods (*i.e.*, food plots) when and where native food sources are not available may be beneficial.

Development of conservation cover and upland wildlife habitat management may have temporary adverse effects on LEPCs. These practices may increase nest depredation rates in adjacent undisturbed habitats, depending on the amount of cover developed or disturbed.

Monitoring activities associated with the implementation of conservation measures may include lek counts, rangeland inventories, and photo point sampling, among other techniques. While human disturbance during the LEPCs breeding season can cause lek abandonment (Crawford and Bolen 1976b), the impacts of monitoring activities are not expected to be detrimental to LEPC populations if care is taken to avoid repeated lek disturbances.

Disturbance by Humans

The collection of injured birds also may result in adverse effects. Rescue of individuals anticipated to be taken in accordance with Permit conditions may result in further injury or mortality of the injured animals. The services of known rehabilitators would be utilized in these instances. The Service also will implement measures to minimize this take, which may include trapping/capturing and relocating to suitable habitat off-site. Necropsy of any deceased individuals would occur to determine cause of mortality and take steps to reduce or eliminate the causal agent in the future.

The ODWC may elect to include/enroll portions of a landowner's property as either conservation lands or non-conservation lands. When certain areas of a particular property contain unsuitable habitat or activities that are incompatible with conservation lands, ODWC may consider these lands as non-conservation lands. Accordingly, in addition to habitat restoration activities, landowners enrolled in the CCAA are anticipated to continue to implement various ongoing otherwise lawful agricultural operations (e.g., crop cultivation and harvesting, farm equipment operation), recreational activities (e.g., hunting of other species, dog training, hiking, camping, vehicle use, hiking, camping, viewing of LEPCs and other wildlife, or similar activities), and limited construction activities (e.g., construction of a storage building/barn, installation of overhead power lines to a house, expansion, renovation or rebuilding of a house) not specifically for the benefit of the LEPC on portions of their enrolled property. These ongoing otherwise lawful activities may temporarily impact or displace LEPCs. Predation risk also may increase if temporary disturbances cause LEPCs to flee to other areas that lack adequate cover. Under rare circumstances, the destruction of nests and/or LEPC mortality may occur due to agricultural, recreational and other related activities such as the operation of vehicles and farm equipment.

Wind Development

Wind power development would be incompatible with areas to be enrolled as conservation lands because inclusion of wind turbines in the CI would not have a conservation benefit to the LEPC. Hence, such development will not be allowed on conservation lands. However, the inclusion of limited infrastructure (electrical lines, substations, roads, single household wind turbine, etc.), will be considered on a case-by-case basis by ODWC. Inclusion of limited wind power infrastructure would be allowed only if they are determined not to preclude the enrolled property from meeting the CCAA policy standard.

Recent research has demonstrated that LEPCs exhibit a behavioral avoidance of many artificial, human-made structures (*e.g.*, power lines, wells, buildings, paved roads, and wind turbines), with the avoidance distance influenced by the type of development (Robel 2002, Hagen *et al*. 2004, Robel *et al*. 2004, Wolfe *et al*. 2007). The inclusion of wind power infrastructure may render habitat that otherwise would be suitable as unsuitable and reduce the amount of land available on those properties for habitat restoration and enhancement opportunities.

Changed Circumstances

Various factors are out of the control of the landowners and will be addressed broadly by the changed circumstances (see CCAA). These factors include wildfire, drought, floods, tornados, and energy development. Should such factors occur, the landowner, ODWC, and the Service will meet and evaluate the situation on a case by case basis to determine the necessary management actions to address the changed circumstances. For example, measures that may be used to address drought conditions include grazing deferment, rotation, or other management changes designed to retain residual and live vegetation; development of grass banks for use during drought conditions; development of additional water sources for livestock and the LEPC; prescribed fire management or similar vegetation management to minimize effects of additive impacts. Development and implementation of such measures through adaptive management should serve to minimize any adverse effects associated with the changed circumstances.

Should the ODWC or landowner determine that any planned action would result in authorized take of the LEPC in the form of direct mortality or injury, the ODWC and landowner will provide the Service the opportunity to further evaluate that planned action before it is implemented and take occurs. Notification that such take may occur will be provided to the Service at least 30 days in advance of the action. This notification requirement of the CCAA will provide the Service with a reasonable opportunity to implement measures to minimize that take.

CUMULATIVE EFFECTS

Cumulative effects are those "effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area" considered in this conference opinion (50 CFR 402.02).

Non-federal actions that could negatively impact the LEPC are reasonably certain to occur within the action area. These will typically include agriculture, grazing activities, wind power development and associated transmission lines, non-federal tribal activities, and development of oil and gas resources. Conversion of CRP lands to croplands also could negatively impact the LEPC. Each of these future activities could contribute to cumulative effects on the LEPC in the action area. However, because these activities do not have a federal nexus, we do not currently have access to planning information which would provide the scope and location of these activities such that we could accurately predict the magnitude of impact of these non-federal actions on the LEPC. The extent to which such actions on non-enrolled lands may continue to negatively affect the LPC or limit the effectiveness of the CCAA is not known.

However, conservation benefits in the form of restoration and/or maintenance of LEPC habitat as a result of the CCAA are expected to increase and reestablish LEPC populations in the action area, and thus eliminate or reduce the effects of other activities that negatively impact the species. Because existing populations are so fragmented across the LEPC range, enhancement in Oklahoma also may contribute to enhancement of populations (via connectivity of habitat) in Texas and Kansas. If landowners not enrolled in the CCAA work cooperatively with the ODWC and other natural resource agencies to develop and implement conservation measures similar to those outlined in the CCAA, threats to the LEPC would be further reduced.

CONCLUSION

After reviewing the current status of the LEPC, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our conference opinion that the action, as proposed, is not likely to jeopardize the continued existence of the LEPC. We base this conclusion on the following:

1. The amendment of the CCAA will increase the landscape level conservation program, which will result in re-colonization of suitable habitats by the LEPC.
2. The conservation measures included in the CCAA are designed to reduce the major habitat-related threats to the LEPC in Oklahoma, which is expected to lead to increased distribution and abundance of the species in the action area.
3. Adverse impacts associated with implementation of conservation measures under the CCAA are expected to be minor, temporary, and should be offset and exceeded with beneficial and long-lasting effects to the LEPC and its habitat.
4. Future habitat fragmentation will be reduced and connectivity between existing populations should be restored.

The conclusions of this conference opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any conservation measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined (50 CFR § 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined (50 CFR § 17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The prohibitions against taking the species found in section 9 of the Act do not apply unless the species is listed. However, the Service will implement the reasonable and prudent measures below. If this conference opinion is adopted as a biological opinion following a listing of the LEPC, these measures, with their implementing terms and conditions, will be non-discretionary.

Amount or Extent of Take

The Service anticipates incidental take of the LEPC will result from implementation of the CCAA on all enrolled lands throughout the action area. Incidental take is expected to result from habitat enhancement and restoration activities (*e.g.*, prescribed burning, prescribed grazing, upland wildlife habitat management, conservation cover) and monitoring activities necessary to implement the CCAA. Incidental take also is anticipated to occur on enrolled lands as a result of ongoing otherwise lawful agricultural operations (*e.g*., crop cultivation and harvesting, livestock grazing, farm equipment operation), recreational activities (*e.g*., hunting of other species, dog training, hiking, camping, vehicle use, viewing of LEPCs or other wildlife, and other similar activities) and limited construction (*e.g*., construction of a storage building/barn, installation of overhead power lines to a house, expansion, renovation or rebuilding of a house). Take must be incidental to otherwise lawful ongoing activities on enrolled lands in the action area and consistent with implementation of the CCAA and the landowner's CI.

Incidental take in the form of harm may result from disturbance incidental to habitat improvement projects required to benefit the LEPC, and from other ongoing otherwise lawful agricultural, recreational, limited development, and other related activities. Direct take, in the form of incidental killing of adults, juveniles, chicks, or eggs, also may result from the implementation of conservation measures such as brush management practices, prescribed fire and grazing, fencing, and the collection of injured animals. Direct take, in the form of mortality, also may occur due to ongoing otherwise lawful agricultural, recreational, and other related activities, such as the operation of vehicles and/or farm equipment. Some negligible disturbance is also possible from habitat monitoring activities.

The estimated anticipated level of incidental take associated with this CCAA is directly related to the number of landowners and amount and habitat quality of acreages covered under the management plans linked to this agreement. Accurately estimating the total number of participants is impossible at this time. However, the maximum amount of incidental take anticipated to occur with the amendment of this agreement can be roughly estimated using the full extent of the Estimated Occupied Range (EOR) of the LEPC in the planning area, which is 1 million acres. If, on average, LEPC densities are about 2 birds per square mile in good quality habitat, there could be as many as 3,125 birds within the entire planning area.

Because only a portion (25%) of the planning area is occupied and habitat quality for the LEPC varies considerably throughout the planning area, the actual number of LEPCs within the planning area is expected to be much less than 3,125 birds. Nasman *et al*. (2021) estimates there are 5,202 (90% CI [1,662/10,441]) LEPCs in the mixed grass ecoregion.

The actual estimated incidental take by landowners enrolled under this agreement and the resulting adverse effects to the LEPC are expected to be minimal. The primary purpose of the agreement is to place habitat protection and enhancement measures on enrolled lands. These measures are intended to have a long-term beneficial effect to the LEPC. We also anticipate that over the life of this agreement, planned habitat improvements would lead to increases in the number of LEPCs occurring within the planning area. Accurately predicting the actual improvement in LEPC numbers is difficult. Precisely quantifying the actual level of take is equally difficult.

Although Pitman *et al*. (2006) provided an estimate on the quantity of LEPC nests lost from trampling by cattle (about 1.9% of known nests), similar data for other activities anticipated to result in some form of incidental take are not available. Under a worst case scenario, all 3,125 birds might be taken in the form of harm, and direct mortality. However, because the CCAA is a conservation program developed for the benefit of the LEPC, the worst case scenario is not anticipated to occur. Lacking a more precise estimate of incidental take, we anticipate that no more than 5% of nests with eggs or broods/year and no more than 5% of LEPCs/year would be taken on enrolled lands due to the implementation of conservation measures and from ongoing otherwise lawful agricultural, recreational, and limited-development activities. Based on current conditions, we assume that 3,125 LEPCs might occur on the acres expected to be enrolled over the life of the program and that these 3,125 birds, under optimum conditions, would construct about 1,562 nests/year. Therefore, we anticipate that, on average, no more than 78 nests with eggs or broods/year would be taken in the form of mortality. We also anticipate that no more than an average of 156 LEPCs/year would be taken in the form of mortality.

Effect of the Take

In the accompanying conference opinion, we have determined that the level of anticipated take is not likely to result in jeopardy to the Northern DPS of the LEPC. The estimated population of 3,125 LEPC in Oklahoma is approximately only 11% of the total estimated number of LEPC in the Northern DPS. Take of 156 LEPC is roughly 0.6% of the currently estimated LEPC population in the Northern DPS. Although we anticipate some incidental take to occur, the implementation of the conservation measures proposed should ultimately result in avoidance and minimization of most adverse effects.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the impacts of incidental take of the LEPC:

1) The proposed amended CCAA identifies the conservation measures that will be implemented to benefit the LEPC. All conservation measures described in the amended CCAA, are hereby incorporated by reference as reasonable and prudent measures within the incidental take statement.
2) The Service has a continuing duty to regulate the activity covered by this incidental take statement through implementation of the amended CCAA.

Terms and Conditions

The following terms and conditions, which implement the reasonable and prudent measures described above, must be undertaken for the exemptions from the prohibitions of section 9 of the Act to apply. These terms and conditions are non-discretionary.

1) The amended CCAA will be fully implemented
2) The minimization practices associated with each conservation measure as described in this conference opinion and the CCAA are hereby incorporated by reference as terms and conditions within this incidental take statement.
3) The Service will work with the ODWC and/or private landowners to fully implement the conservation measures and associated minimization practices of the CCAA.
4) The Service will fulfill their role and responsibilities as described in the CCAA.

Reporting Requirements

The ODWC will be responsible for annual monitoring through its WMP process and ODWC will be responsible for annual reporting requirements for the CCAA. These annual monitoring and reporting activities by ODWC will fulfill the compliance and biological monitoring requirements of the amended CCAA. Information in annual reports will include, but not be limited to: (1) a summary and brief description of landowners enrolled under the CCAA during the reporting year, including copies of completed CIs; (2) a digital polygon of each enrolled property that is compatible with common mapping programs (*e.g*. ArcMap); (3) a summary and brief description of conservation measures (habitat management activities) and habitat conditions in the CCAA area, including all enrolled lands (acres); (4) an evaluation of effectiveness of conservation measures (habitat management activities) implemented on enrolled lands during the reporting year at meeting the intended high conservation benefit of the CCAA; (5) if herbicides are used to manage shinnery oak, an evaluation of the use of herbicides on shinnery oak to ensure application rates defoliate but do not kill shinnery oak; (6) population surveys conducted on enrolled private lands during the reporting year; (7) amount of incidental take described by number of acres of suitable habitat converted to unsuitable, and all dead or injured LEPCs, including lost nests with eggs or broods/year, reported or documented; and; (8) funds used for habitat conservation (implementation of conservation measures) on enrolled private lands.

Reports will be due on April 30 of each year to the Administrators of the CCAA, and to any participating landowners.

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or otherwise impaired listed species, initial notification must be made to the Service's Law Enforcement Office, 9014 East 21st St., Tulsa, Oklahoma 74129 at Tel. (405)-371-1699 email: anthony_vowell@fws.gov and the Oklahoma Ecological Services Field Office at (918) 581-7458 within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office identified above with a copy to the Oklahoma Ecological Services Field Office at 9014 E. 21st Street, Tulsa, Oklahoma 74129. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The following recommendations are provided for consideration:

The ODWC and Service are encouraged to work with other Federal agencies, especially the USDA's NRCS and FSA, to: (a) monitor the effects of existing private land management assistance programs on the LEPC, (b) modify existing programs or develop new programs to help restore habitat on private lands for the species, and (c) implement interagency public information programs to help educate the public about the effects of land management practices on the LEPC.

For the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATON NOTICE

This concludes the conference for the application to amend the ODWC's Permit and the associated CCAA for LEPCs in Oklahoma. This conference opinion may be confirmed as a biological opinion issued through formal consultation, if the LEPC is listed in future. If the Service determines there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion for the project and no further section 7 consultation will be necessary.

After listing as threatened or endangered and any subsequent adoption of this conference opinion, the ODWC shall re-initiate consultation if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may affect the species in a manner or to an extent not considered in the conference opinion; 3) the agency action is subsequently modified in a manner that causes an effect to the species that was not considered in this opinion or written concurrences; or 4) a new species is listed or critical habitat designated that may be affected by the action.

The incidental take statement provided in this conference opinion does not become effective until the species is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the project will be reviewed to determine whether any take of the proposed species has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of the proposed species may occur between the listing of the species and the adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation. Although not required, we recommend that the ODWC implement the reasonable and prudent measures and terms and conditions herein prior to our final listing decision. If the species is subsequently listed, implementation of reasonable prudent measures and terms and conditions in any conference opinion adopted as a biological opinion, is mandatory.

This concludes formal consultation on the application to amend ODWC's Permit and the associated CCAA for LEPCs in Oklahoma. As provided in 50 CFR §402.16, reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law)

Please refer to the consultation number, [02EKOK00-2022-0037462] in future correspondence concerning this project. Should you require further assistance or if you have any questions please contact Patricia Echo-Hawk at patricia_echo-hawk@fws.gov or 918-482-4505.

Approved:

KENNETH COLLINS

Digitally signed by KENNETH COLLINS
Date: 2022.05.03 09:20:54 -05'00'

May 3, 2022

Ken Collins, Field Supervisor,
Oklahoma Ecological Services Field Office

Date

Concur:

Division Chief, Division of Environmental Review
Region 2

Date

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APPENDIX A

This Appendix contains the rationales for no effect and not likely to adversely affect determinations for listed species and non-jeopardy determinations for candidate species.

Monarch Butterfly (*Danaus plexippus*)

The Federal Register listing the monarch butterfly as warranted but precluded was published on December 17, 2020 (85 FR 81813).

The monarch is a species of butterfly in the order Lepidoptera that occurs in throughout the Americas as well as the south Pacific (Malcolm and Zalucki 1993). In North America, monarch are found in 2 populations: east and west of the Rocky Mountains. In Texas, the population is the eastern Rocky Mountain population. Adult monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. The black border has a double row of white spots, present on the upper side and lower side of forewings and hindwings (Bouseman and Sternburg 2001). Adult monarchs are sexually dimorphic, with males having narrower wing venation and scent patches (CEC 2008). The bright coloring of a monarch is aposematic, as it serves as a warning to predators that eating them can be toxic. Habitat requirements for breeding and migration include open, grassland-type areas with sufficient amount of milkweeds and nectar bearing plants for migration (Service 2020c). The impacts driving the warranted but precluded determination include loss and degradation of habitat, conversion of grasslands to agriculture, climate change, and loss of over-wintering habitat (Service 2020c). The eastern North American populations overwinters in Mexico.

<u>Conclusion</u>

We determined that the proposed action will not cause jeopardy of the monarch due to the project actually addressing some of the threats impacting the monarch. The CCAA covers conservation practices aimed at improving and restoring grasslands, increase habitat connectivity, and potentially decrease croplands through restoration efforts.

Arkansas River Shiner (*Notropis girardi*)

The Arkansas River Basin population of the Arkansas River Shiner (ARS) was listed as a threatened species on November 23, 1998 (63 FR 64772) based on reductions of the species' range and numbers due to habitat destruction and modification, channelization, construction of impoundments, stream dewatering, diversion of surface water, groundwater pumping, and water quality degradation (Service 1998). An introduced non-native population of ARS occurs in the Pecos River in New Mexico, which is not protected under the Endangered Species Act.

Critical habitat was designated in October 2005 (70 FR 59808) and consists of about 532 miles of linear distance of the Cimarron and Canadian Rivers in Kansas and Oklahoma, including 300 feet of adjacent riparian areas measured laterally from each bank. Riparian areas were included to help protect water quality and support an abundant terrestrial, semi-aquatic, and aquatic invertebrate food base. Critical habitat within the action area consists of portions of the Cimarron River in Harper, Woods, and Woodward counties, and a portion of the South Canadian River in Custer County.

The Arkansas River shiner inhabits wide, shallow, sandy bottomed rivers and larger streams of the

Arkansas River basin (Gilbert 1980). The Arkansas River shiner historically was widespread and abundant throughout the western portion of the Arkansas River basin in Kansas, New Mexico, Oklahoma, and Texas. This species has subsequently disappeared from over 80% of its historical range and is now almost entirely restricted to about 508 miles of the Canadian River in Oklahoma, Texas, and New Mexico.

The species is considered a habitat generalist, with no obvious selection for any particular habitat (i.e., main channel, side channel, backwaters, and pools (Wilde *et al.* 2000). The Arkansas River shiner is believed to be a generalized forager, with its diet consisting of grass seeds, detritus (decaying organic material), sand, sediment, and aquatic and terrestrial invertebrates (Jimenez 1999, Bonner *et al.* 1997, Polivka and Matthews 1997).

Conclusion

We conclude that the proposed action is not likely to adversely affect the Arkansas River shiner. The proposed action would consist of the protection, restoration, and enhancement of terrestrial habitat for the benefit of the LEPC. The Arkansas River shiner is an aquatic species. The proposed CCAA does not include any practices that would remove ground water or decrease theamount of surface water used by this species. Herbicide treatment and prescribed burns may, at times, occur within riparian zones along rivers occupied by this species. However, because the CCAA will target terrestrial habitat for the LEPC, we anticipate that only a very small percentage of the acreage that would be enrolled in the CCAA would consist of riverine habitat used by this species. Post fire erosion control devices will be used where run-off carrying sediment, debris, and ash potentially could adversely impact aquatic habitat used by this species.

We also anticipate that most prescribed burns would be implemented during late winter and early spring. Late winter or early spring burns will ensure rapid recovery of the vegetation to minimize potential increases in run-off carrying sediment, debris, and ash downstream into aquatic habitats. Flows in the rivers also would be expected to be at or above average during this time. Moderate to high flows would increase the dilution effect and help minimize any impacts of runoff on water quality. Herbicide use is anticipated to occur very sparingly and only when habitat goals cannot be achieved by other means. All herbicide use would be conducted by a licensed applicator in compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (7 USC 136 *et seq*), all label instructions and requirements, and in accordance with regional pesticide recommendations for Region 2 of the Service (Service 2007), as appropriate. When herbicide use is deemed appropriate, spot treatment of target plants rather than broadcast application would typically occur. Prescribed burns and herbicide use, therefore, are not expected to occur at scale which would appreciably diminish water quality in areas where the shiner is known to occur. Therefore, we anticipate that the overall effects of the CCAA on the Arkansas River shiner and its habitat would be insignificant and discountable. We anticipate effects will not reach the level of take.

We conclude that the proposed action is not likely to adversely modify designated critical habitat. The proposed action would consist of the protection, restoration, and enhancement of terrestrial habitat for the benefit of the LEPC. We anticipate that only a very small percentage of the acreage that would be enrolled in the CCAA would consist of portions of designated critical habitat (portions of either the Canadian or Cimarron Rivers or riparian areas along these rivers). Post fire erosion control devices will be used where run-off carrying sediment, debris, and ash potentially could adversely impact designated critical habitat. We also anticipate that most prescribed burns would be implemented during late winter and early spring. Late winter or earlyspring burns will ensure rapid recovery of the vegetation to minimize potential increases in run- off carrying sediment, debris, and ash downstream into aquatic habitats. Flows in the rivers also would be expected to be at or above average during this time. Moderate to high flows would increase the dilution effect and help minimize any impacts of runoff on water quality. Herbicide use is anticipated to occur very sparingly and only when habitat goals cannot be achieved by other means. All herbicide use would be conducted by a licensed applicator in compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (7 USC 136 *et seq*), all label instruction and requirements, and in accordance with regional pesticide recommendations for Legacy Region 2 of the Service (Service 2007), as appropriate. When herbicide use is deemed appropriate, spot treatment of target plants rather than broadcast application would typically occur. Prescribed burns and herbicide use, therefore, are not expected to occur at a scale which would appreciably diminish habitat quality or adversely impact critical habitat.

Piping Plover (*Charadrius melodus*)

The piping plover was federally listed as endangered in the Great Lakes watershed and as threatened throughout the remainder of its range on December 11, 1985 (50 FR 50726). Critical habitat has been designated for the Great Lakes breeding population (66 FR 22938), the northern Great Plains breeding population (67 FR 57637), and for wintering piping plovers (66 FR 36038,73 FR 62816, and 74 FR 23476). There is no designated critical habitat for piping plovers in Oklahoma. Primary threats include the loss and degradation of summer and winter habitat, human disturbance of nesting and foraging birds, unfavorable water management, the modification of riverine habitat through channelization and the construction of dams, and predation (Service 2009).

The breeding range of the piping plover includes the Atlantic Coast, the Northern Great Plains of the United States and Canada, and around the Great Lakes (Andrews and Righter 1992, Service 2009). Breeding habitat consists of sparsely vegetated, sandy shores of lakes, ponds, and rivers and coastal beaches. The plover winters along the southern Atlantic and Gulf coasts, and in the Bahamas and West Indies (Service 2009). Non-breeding habitats include ocean beaches and sand, mud, and algal flats. Piping plovers use sandy rivers, reservoir beaches and mudflats during migration (Haig 1992, Haig and Plisnner 1993, Service 2009). The threatened northern Great Plains population migrates through the action area in Oklahoma each spring and fall.

<u>Conclusion</u>

The piping plover is a shorebird that utilizes aquatic and shoreline habitats. They migrate through Oklahoma each spring and fall and largely are considered a transient species in the state. Piping plovers that occur in the action area are anticipated to be migrating individuals. The proposed CCAA does not include any practices that would adversely impact habitat used by this species. Therefore, the piping plover is not expected to be affected by the proposed action.

Whooping Crane (*Grus americana)*

The final rule listing the whooping crane as endangered was published on March 11, 1967 (35 FR 8495). Critical habitat has been designated (43 FR 20938) and includes the following areas: 1) Monte Vista National Wildlife Refuge (NWR), Colorado; 2) Alamosa NWR, Colorado; 3) Grays Lake NWR and vicinity, Idaho; 4) Cheyenne Bottoms State Waterfowl Management Area, Kansas; 5) Quivira NWR, Kansas; 6) Platte River Bottoms between Lexington and Dehman, Nebraska; 7) Bosque de Apache NWR, New Mexico; 8) Salt Plains NWR, Oklahoma; and 9) Aransas National NWR and vicinity, Texas.

The whooping crane is a tall, mostly white migratory bird with red facial skin. This species occurs in freshwater marshes, wet prairies, shallow lakes, lagoons, salt flats, and grain fields during the summer and during their spring and fall migration period. Whooping cranes typically occur in coastal marshes, salt flats, and along barrier islands during the winter. The whooping crane was once widespread over North America. However, it has declined drastically primarily due to: 1) the loss of nesting and wintering habitat to agriculture, 2) human disturbance of nesting areas, and 3) uncontrolled hunting. Other causes for their decline include disease, natural events, such as storms, and collision with power lines. Currently, the only self-sustaining population consists of less than 200 individuals. This population breeds in one small area in Canada and winters primarily along the Texas coast. These cranes migrate each spring and fall between their breeding and summer grounds primarily through the great plains area of the central United States (North Dakota, South Dakota, Montana, Nebraska, Kansas, Oklahoma, and Texas). They are diurnal migrants and stop daily to feed and rest. Salt Plains NWR, designated critical habitat, occurs within the action area and is an important stopover area for migrating whooping cranes (Canadian Wildlife Service and Service 2005).

Conclusion

We conclude that the proposed action is not likely to adversely affect the whooping crane or designated critical habitat for the following reasons; the proposed action consists of the protection, restoration, and enhancement of terrestrial habitat for the benefit of the LEPC. The CCAA does not consist of practices that would result in the loss of wetland or aquatic habitat that may be used by this species. Although whooping cranes may use crop lands during migration, restoring crop land habitat to native rangeland as proposed is not anticipated to appreciably diminish habitat availability for the whooping crane at a scale where take would occur. Over 3 million acres of the action area is in cropland. Therefore, the effects of the implementation of the other covered activities are anticipated to be relatively small compared to the availability of this and other foraging resources within the action area. The proposed action would occur only on private lands and is not anticipated to have any impact on designated critical habitat at the Salt Plains NWR.

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