United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
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In Reply Refer To:
2022-0040625

Memorandum

To: Regional Director, Region 2, Albuquerque, New Mexico

Through: Assistant Regional Director, Ecological Services, US Fish and Wildlife Service Region 2, Albuquerque, New Mexico

From: Field Supervisor DEBRA BILLS Digitally signed by DEBRA BILLS Date: 2022.05.20 11:07:46 -05'00'

Subject: Intra-Service Section 7 Conference Opinion for the proposed *Oil and Gas Habitat Conservation Plan for the Lesser Prairie-chicken; Colorado, Kansas, New Mexico, Oklahoma, and Texas*

This transmits the U.S. Fish and Wildlife Service's (USFWS) Intra-Service Section 7 Conference Opinion (CO or Opinion) on issuance of an Incidental Take Permit (ITP) under section 10 of the Endangered Species Act of 1973, as amended (ESA) (16 U.S.C. 1531 *et seq*.) for the proposed *Oil and Gas Habitat Conservation Plan for the Lesser Prairie-chicken; Colorado, Kansas, New Mexico, Oklahoma, and Texas* (HCP) for the Lesser prairie-chicken (*Tympanuchus pallidicinctus*; LEPC) between the applicant and the USFWS. This conference opinion analyzes the effects of the proposed action (the issuance of an ITP) which authorizes take of the LEPC from oil and gas development projects, should the species be listed during the life of the ITP. We have determined that this action "may affect" the LEPC which is currently proposed for listing with two distinct population segments under the ESA. The HCP only covers the LEPC; participants must avoid or receive separate take authorization, as necessary for other federally listed species that occur within their respective project area(s) in order to be eligible for enrollment in the HCP. Therefore, the LEPC is the only species addressed in this conference opinion.

This conference opinion is based on information provided in the HCP, the LEPC Species Status Assessment (SSA), the 12-month finding and proposed listing rule for the LEPC, data in the Arlington, Texas Ecological Services Field Office (ARLES) files, and discussions with biologists knowledgeable about the species. Literature cited in this conference opinion is not a complete bibliography of all literature available on the species of concern or on other subjects considered in this opinion. A complete administrative record of this conference is on file at ARLES.

1.0 CONFERENCE HISTORY

LPC Conservation LLC (Applicant) began talks with the USFWS in early 2016 about the development of a conservation agreement to cover the potential impacts of oil and gas development across the range of the LEPC. On November 10, 2021, the USFWS received the Applicant's HCP and application for issuance of a section 10(A)(1)(B) incidental take permit. On February 11, 2022, the USFWS published a Notice of Availability in the Federal Register which began a 30-day public comment period, which was subsequently extended by 7 days, where the USFWS accepted comments on the incidental take permit application, the HCP and draft Environmental Assessment.

CONFERENCE OPINION

2.0 DESCRIPTION OF PROPOSED ACTION

Regulations implementing the ESA (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 Federal action associated with this Opinion is the issuance of an ITP to the Applicant in response to an application and associated HCP submitted by the applicant to provide a mechanism for proponents in the oil and gas industry to voluntarily participate in LEPC conservation while meeting the statutory and regulatory requirements of the ESA should the LEPC or any distinct population segment become listed as threatened or endangered under the ESA.

Conservation banks and other approved USFWS mitigation mechanisms that meet the standards required by the HCP will provide the mitigation implemented through the HCP to be used by developers or other project proponents who need to compensate for the adverse impacts their projects have on LEPC. These mitigation mechanisms will conserve and protect LEPC by means of restoring, creating, and/or enhancing habitat on mitigation lands, which will then be managed and maintained in perpetuity for LEPC, resulting in permanent conservation for the species. Mitigation implemented under the HCP will support LEPC conservation efforts by ensuring mitigation lands are strategically located, have funding assurances to support management in perpetuity, and will provide a balanced approach to restoration and enhancement actions. Refer to the HCP for further details regarding potential mitigation options.

The HCP is designed to minimize and mitigate the potential impact to LEPC on non-federal property within the Permit Area from the development and operation of oil and gas projects enrolled in the HCP. The Applicant will work only with property owners who voluntarily agree to provide mitigation that meets the standards detailed within the HCP. All conservation actions will meet the minimum criteria outlined within the HCP.

To be issued take authorization under an ITP, the Applicant has provided an HCP which meets the issuance criteria found at 50 CFR 13 and 17 and must ensure all participants implement the requirements defined in any Certificate of Inclusion (CI) as consistent with the HCP and ITP. The lands addressed in the HCP include the Plan Area and the Permit Area. The HCP Plan Area includes the geographic area where the Covered Activities, including conservation activities described in the HCP can occur (USFWS and NMFS 2016). The Permit Area is a subset of the Plan Area and includes all areas where take of the Covered Species (LEPC) is reasonably certain to occur as a result of Covered Activities authorized under the ITP. The specific areas within the Permit Area where take will be authorized is unknown at this time and will depend on the location of projects enrolled under the HCP/ITP. For these reasons, the HCP Permit Area has been broadly defined to share the same outer boundary as Plan Area (Figure 1.1). This Opinion will also refer to this area as the Action Area for purposes of analysis.

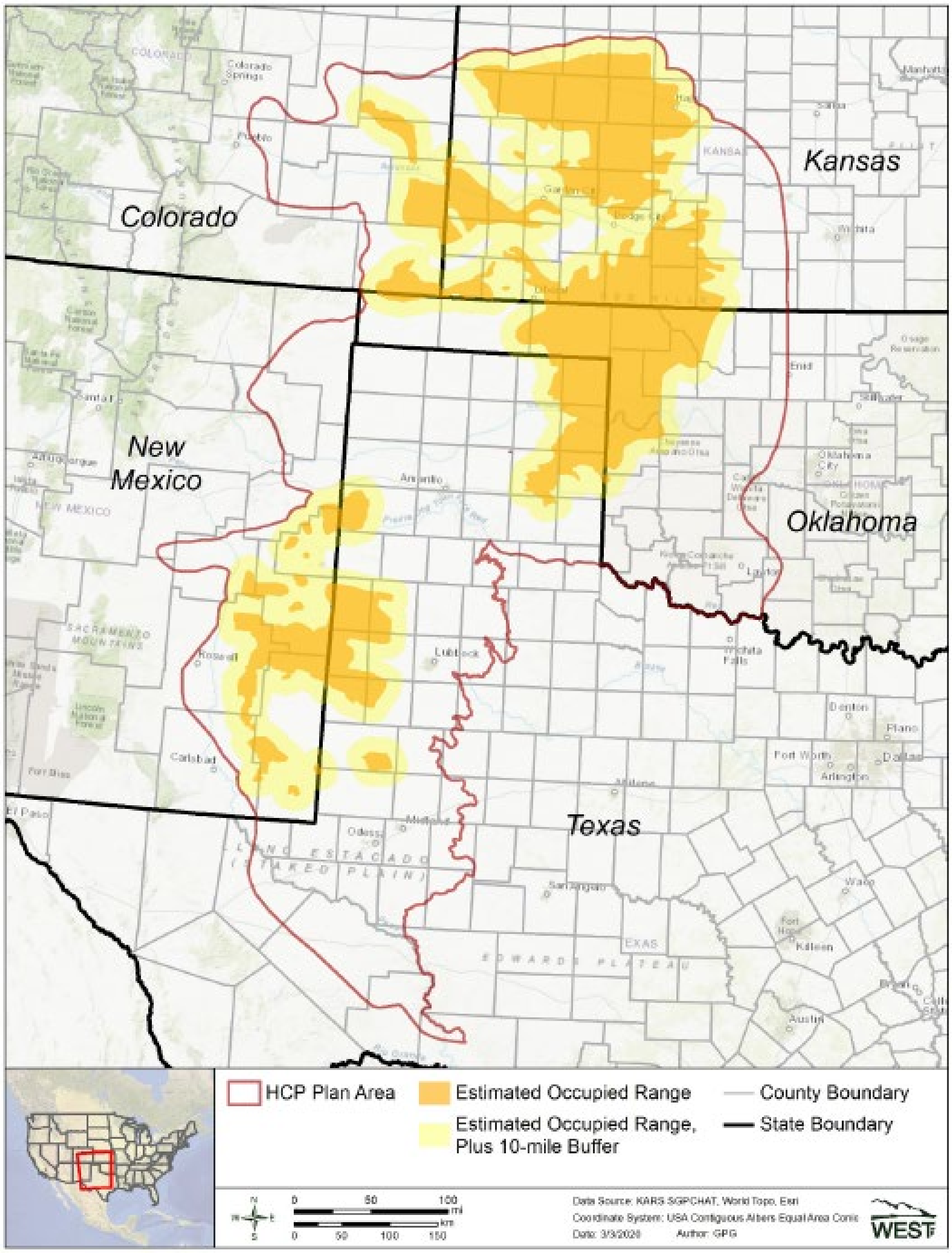


Figure 1.1. LEPC estimated occupied range and Plan area of the HCP

The Permit Area includes portions of the nation where oil and gas development has been ongoing since the early 1900s. As such, oil and gas wells, distribution and gathering lines, meter and regulator stations, compressor stations, and other appurtenant facilities are present in high numbers. This portion of the country has historically been a vital component of the nation’s oil and gas production. In recent years, advances in technology have resulted in increased production in shale gas and tight oil plays both within and near the Permit Area (e.g., Niobrara, Woodford, and Spraberry plays) as well as in plays across the US (e.g., Bakken, Eagle Ford, Utica, and Marcellus plays). The construction and operation of additional oil and gas projects, and the appurtenant facilities associated with these projects are expected to increase in the coming years. Because LEPC occur within the Permit Area, incidental take of this species resulting from habitat loss fragmentation and degradation from the construction and operation of oil and gas projects is likely to occur.

While the specific areas where take will be authorized within the Permit Area are not known at this time and will depend on the location of projects enrolled under the HCP, Covered Activities from development will not occur on lands used for mitigation under the HCP, or on certain other protected lands. The Permit Area will not include or overlap the following:

- lands designated under USFWS-approved mitigation banks, conservation plans, in-lieu fee programs, or permittee-responsible mitigation for any species
- lands enrolled in any CCAA servicing the dunes sagebrush lizard (*Sceloporus arenicolus*)
- lands owned by The Nature Conservancy
- lands owned and managed by a state wildlife agency
- USFWS-approved acquisition lands
- land that is listed on the National Register of Historic Places; and
- lands identified as US Geological Survey (USGS) Gap Analysis Program-protected conservation areas (Aycrigg et al. 2013)

3.0 DESCRIPTION OF THE APPLICANT'S PROPOSED COVERED ACTIVITIES

The Covered Activities for the HCP include all activities typically associated with oil and gas upstream and midstream buildout, including ancillary (e.g., access road) ground disturbing activities associated with these project types within the HCP Permit Area that could impact potentially suitable LEPC habitat. In addition, the Covered Activities include grassland improvement and management activities that could occur in potential LEPC habitat on mitigation parcels in order to manage the parcel for LEPC. Beyond initial construction of a project, further ground disturbing activities could occur during some types of repairs required during the operations and maintenance phase, project repowering, or project decommissioning; however, once initial ground-disturbing activities have occurred, additional changes to those same areas will have minimal impacts to LEPC. The Covered Activities are limited to an aggregate of up to 500,000 acres (ac) of affected potentially suitable LEPC habitat within the Permit Area. Given the nature of oil and gas development, it is possible the total project footprint of some enrolled projects could extend beyond the boundary of the Permit Area. For such projects, the HCP and the associated ITP will only be applicable to Covered Activities on lands located within the HCP Permit Area, and CI-holders under this HCP will need to ensure ESA compliance for any activities on lands occurring outside of the Permit Area through other means.

The following descriptions provide a general overview of the types of activities commonly associated with oil and gas development that can affect potentially suitable LEPC habitat as well as grassland improvement and management activities that, while expected to result in a long-term benefit for LEPC, may have temporary adverse effects upon initial implementation, and for which incidental take coverage will be available through the HCP. Ground disturbing activities can vary among oil and gas developments due to variability in the size of facilities and site-specific conditions. In addition, as technologies evolve the timeframes, processes, and specific methods could change.

Covered Activities typically associated with most oil and gas projects are categorized into "upstream" and "midstream," commonly used terms in the crude oil, natural gas, and petroleum products industries; however, overlap between these categories exists and different federal agencies may define these categories differently from the definitions used in the HCP. Where available, typical area dimensions for project infrastructure are provided and based on commonly reported specifications; however, these values are intended for reference only and will likely vary between projects.

3.1 Upstream Production

Upstream Production, as defined by the HCP, includes activities associated with the construction of infrastructure required to extract oil, natural gas, and other petroleum products, as well as the processes to extract those resources. Covered activities typically associated with upstream production include:

- Construction of well field infrastructure, including:
    - Well pads
    - Access roads
    - Electric distribution lines
    - Off-site impoundments
    - Drilling, completion, and production activities
    - Gas flaring
    - Communication towers
- Operation, maintenance, and decommissioning of upstream wells, roads, electric distribution lines

3.1.1 Construction of well field infrastructure

Areas determined to have recoverable crude oil or natural gas deposits are developed as well fields to initiate extraction of these resources. Well fields include facilities and infrastructure that support oil and gas production and may include one or multiple well pads.

Well pads: Well pads include all structures and equipment necessary for recovering crude oil or natural gas (production wells). A single well or multiple wells can be drilled on each pad. Well pads may also be necessary for obtaining water for oil and gas recovery (water wells) or disposal of fluids used in the oil and gas recovery following production (disposal wells). Primary facilities involved in well pad construction include the pad, drilling rig, pump or well head, and reserve pits for the containment of drilling muds and cuttings. The well pad also includes facilities such as storage tanks for extracted water and crude oil, fuel tanks, water tanks, mist pumps, mud pumps, flow lines, pipelines, and associated electrical equipment. The pad also houses structures such as the cellar (where the well's main borehole is drilled), drilling pipe storage areas (referred to as the rat and mouse holes), and various trenches and sumps (to collect liquids).

Typical well pad construction requires vegetation clearing, grading to level the site, construction of storm water and erosion control structures, laying shale, gravel, and/or rock over the well pad, and constructing reserve/cutting pits, trenches, sumps, a cellar, and the rat and mouse holes. Land clearing, grading, and construction are typically performed with a bulldozer or other heavy equipment and soil is typically excavated to a depth of approximately 6.0 inches (in; 15.2 centimeters [cm]) during routine well pad installation but may vary based on site-specific conditions. Topsoil removed from the construction area is typically stored for use during site restoration. Vegetation debris piles are stored along the edges of the construction site and are typically buried in the reserve pit, burned, or left in place after drilling operations are completed.

Additional shale, gravel, and/or rock may be delivered to the construction site via dump trucks to aid in leveling the site and raise the pad above grade. In most cases, two reserve pits, approximately 75.0 by 75.0 feet (ft; 22.9 by 22.9 meters [m]) each and a minimum of 8.0 ft (2.4 m) deep, are excavated using a bulldozer within the well pad site. Additional soil or fill may be hauled in for pit construction and/or clay may be hauled to the site to line the reserve pits. Once completed, additional gravel or rock is hauled in to cover the vehicular traffic areas and trailer areas associated with drilling operations. Once constructed, the majority of the pad site is a long-term installation (30−40 years for a productive well). Once a well is ready for production, reserve pits and slopes used for drilling purposes are restored with topsoil and revegetated. Standard erosion control measures are incorporated into each well pad site. The average production well pad is approximately 4.0 ac (1.6 ha), not including associated electrical distribution lines, offsite impoundments, and access roads. The average water well pad is approximately 1.0 ac (0.4 ha) and an average disposal well pad is approximately 6.0 ac (2.4 ha).

Access roads: Development of well fields relies on existing roadways or may require construction of new roads. Newly constructed roads are first cleared of vegetation with a bulldozer and leveled with a road grader. Shale/rock/gravel is used to stabilize the length of the road. It is estimated approximately 80% of newly constructed roads remain in permanent use, and 20% are used only temporarily (existing for less than five years) and are restored to natural conditions. Roads are designed to meet rigorous state standards to control erosion and sedimentation and specifications may vary between different oil and gas companies. Road length can vary significantly; however, the average road length per well pad is 300.0 ft (91.4 m). Rights-of-way (ROW) for access roads average 25.0 ft (7.6 m) in width for permanent roads and 15 ft (4.6 m) for temporary roads. Roads require periodic maintenance to correct washouts or other deterioration. Where necessary, culverts and ditches may be installed to facilitate drainage away from the road.

Electric distribution lines: Each well pad has its own electrical distribution line unless a generator provides power. Vegetation clearing and grading along the electric transmission ROW are typically necessary prior to installation. The length of electric distribution line necessary at each facility is determined by the location and distance to the nearest existing active line and is, on average, 300.0 ft in length. ROWs average 30.0 ft (9.1 m) in width. Distribution lines are typically suspended 30.0 ft above grade and are typically constructed above-ground, with 18.0-in (45.7-cm) diameter poles approximately every 75.0–80.0 ft (22.9–24.4 m). Electrical distribution lines and poles are needed throughout the life of the well. Less often, electrical distribution lines may be buried to meet the needs of the project design. If distribution lines are buried below-ground, trenching is accomplished with back-hoes, track-hoes, or similar other ditching equipment. Excavated soil is placed to one side of the trench in a spoil pile. After the trench is excavated, the electric line is then strung in the open trench and the excavated trench is backfilled with the previously removed soil.

Off-site impoundments: Construction of an impoundment outside of the existing well pad is sometimes necessary to maintain a water source for hydraulic fracturing operations. Hydraulic fracturing is a well stimulation process used to maximize the extraction of crude oil and natural gas by injecting fluids into the geologic formation. Excavating equipment is used to construct impoundments and fill from the pit is stockpiled along its edge. Impoundments are lined with an impermeable liner to prevent leaks, breakage, or discharge of impounded materials into ground or surface water. Water is then pumped into the impoundment. Less than 1% of well pads require off-site impoundments. The average size of such impoundments is 2.5 ac (1.0 ha) and the structure typically remains permanent after project completion.

Drilling, completion, and production activities: Following construction of access roads and well pads, drilling rigs and associated equipment are transported to the well pad and installed. Drilling rigs are typically 140.0−180.0 ft (42.7−54.9 m) in height. All drilling activities occur within the previously disturbed (cleared and graded) well pad. After drilling is completed, the rig is removed, and hydraulic fracturing equipment may be brought onto the well pad to facilitate production. All activities associated with drilling and well completion occurs on previously disturbed areas. Drilling rigs typically include multiple sources of light. After drilling and completion, typically 35% of the well pad is re-vegetated. The remaining 65% is typically maintained as a well pad for 30−40 years.

Gas flaring: Some operations may produce natural gas as a byproduct of other operations at rates that are not economically feasible to collect for sale. In some locations, no pipeline infrastructure is available to transport natural gas off-site. If no other use for the gas is found, such gas may be flared (burned in the air) for disposal over a three to six day period during drilling and production. This gas passes through a vent away from the well and is burned in the presence of a pilot flame. Additionally, smaller flares may be associated with tanks at production sites. These smaller flares may be burning constantly throughout the production process.

Communication towers: Communication towers may be required at some facilities, are usually constructed within the permanent footprint of the well pad, and typically range from 10.0– 200.0 ft (3.0–61.0 m) in height. Under the HCP, communication towers must be under 200.0 ft in height, shall not use any guy wires, and shall not use lighting, unless required by the Federal Aviation Administration (FAA). Communication towers that exceed 200.0 ft in height or require guy wires are not eligible for inclusion under this HCP and will require CI-holders to seek ESA compliance through other means. Towers exceeding 200.0 ft in height typically have Federal oversight through the FAA or Federal Communications Commission (FCC).

3.1.2 Operation, maintenance, and decommissioning of upstream wells, roads, and electric distribution lines.

Operation and maintenance activities may be routine (i.e., planned upgrades to equipment) or emergency (i.e., unplanned repairs). While well operation and maintenance activities typically occur within the existing well pad, erosion affecting adjoining property may require disturbance outside of the existing well pad to repair and install additional erosion control features. Wells for which commercial life is over, or unsuccessful wells, will be decommissioned and plugged according to state regulations that protect groundwater, surface water bodies, and soil. Decommissioning of wells typically involves removing the permanent structures and restoring the area of the well pad to its original condition.

Operation and maintenance of permanent access roads includes adding additional surface material (i.e., gravel, dirt) to the road and maintaining bar ditches. Roads will require periodic maintenance to correct washouts or deterioration. To minimize dust, water may be applied to roads. All additional disturbances would occur within previously disturbed areas.

If a road is no longer needed, surface material would be removed, and native vegetation is typically restored by seeding. Temporary roads may be restored with native vegetation following construction and would not require any operation and maintenance activities.

Operation and maintenance of electric distribution lines may include pole replacement and repairing above-ground lines. Most repairs require less than one acre (0.4 ha) of disturbance, typically about 50.0 square ft (4.6 square m). Electric distribution line ROWs are kept clear of trees and brush to provide for line maintenance. Vegetation is typically maintained with mowing equipment (e.g., tractor, brush hog) or herbicide application (by applicators on foot or all-terrain vehicles) every one to three years. Decommissioning of above ground electric distribution lines may involve removal of poles and distribution lines for above-ground lines. Buried electric lines would likely be left in place once disconnected from power sources.

3.2 Midstream development

Midstream development, as defined in this HCP, includes gathering, processing and treatment, transmission, and distribution of crude oil, natural gas, or other petroleum products. Midstream activities begin at the gathering lines that connect wells with the pipelines, processing facilities, compressor stations, and related infrastructure necessary to prepare natural gas and oil for market. Gathering lines terminate at a processing plant, from which a transmission line departs to serve various markets, where consumers are served by distribution lines. Another aspect of midstream activities is the processing and transport of natural gas liquids derived from condensate. These hydrocarbons require their own pipelines to reach market. Extracted gas goes through an initial separation process at the well pad in which water and condensate are separated from the gas. The condensate is stored in tanks and is then hauled by truck or transported via pipeline to processing facilities. The gas that leaves the well pad in gathering lines is raw gas and requires further processing to remove hydrogen sulfide, water, mercury, nitrogen, and natural gas liquids before it enters transmission pipelines to be piped to market. Covered activities associated typically associated most midstream development include:

- Construction of gathering, transmission, and distribution pipelines
- Construction of associated surface facilities including:
    - Access roads
    - Booster, compressor, and pump stations
    - Meter stations, mainline valves, pig (a device used to clean and/or inspect pipelines) launchers and receivers (locations where pigs are inserted into or removed from a pipeline), regulator facilities, and other required facilities
    - Natural gas processing and treatment facilities

  - Communication towers
  - Electric distribution lines
  - Electric substations
  - Operation and maintenance of pipeline and associated surface facilities
  - Decommissioning and reclamation of pipeline and associated surface facilities

3.2.1 Construction of gathering, transmission, and distribution pipelines

Pipelines located within the boundaries of well pads are included in upstream production, while gathering, transmission, and distribution pipelines are considered midstream development. Oil and gas pipeline construction involves land clearing activity where ROWs are cleared and graded. Pipeline construction ROWs are typically divided into four areas of activity: trenching, spoil piles (excavated materials consisting of topsoil or sub-soils that have been removed and temporarily stored during the construction activity), pipeline assembly, and vehicle traffic areas. Clearing and installation of the pipeline typically requires the use of heavy equipment. The types of equipment used during construction may include track-hoes, bulldozers, side booms, bending machines, ditching machines, boring machines, and, in some cases, hydraulic directional drilling rigs. Pipe hauling and welding trucks, as well as miscellaneous smaller vehicles, are also used on most projects.

Pipeline ROW widths are determined by the pipeline diameter and material, as well as terrain and site-specific conditions. Trench widths are determined by the pipeline diameters (e.g., typically the diameter of the pipe plus 6.0−12.0 in [15.2−30.5 cm] clearance between the pipe and the trench wall) and pipeline burial depths (e.g., deeper trenches usually dictate greater trench widths to address sidewall instability and worker safety). Pipeline construction ROWs also vary based on the type of pipeline. Gathering pipeline ROWs (the smaller interconnected pipeline networks that bring crude oil or natural gas from wells to treatment plants or processing facilities) average 50.0 ft (15.2 m) in width. Transmission pipeline (longer pipes with larger diameters that move oil and gas from processing facilities to market) typically have construction ROWs of 75.0−150.0 ft (22.9−45.7 m) depending on pipe sizes. Distribution pipelines (pipelines used to take products to the final consumer, including feeder lines) typically consist of small diameter, pipelines with construction ROWs of 10.0−50.0 ft.

Typical pipeline construction proceeds along the ROW in one continuous operation. Prior to initiating ground-disturbing activities, existing underground utilities (i.e., cables, conduits, and pipelines) must be located, identified, and flagged to prevent accidental damage during pipeline construction. Project areas are cleared of vegetation and large obstacles, such as trees, rocks, brush, and logs. Timber is only removed where necessary for construction purposes. Timber and other debris are burned or disposed of in accordance with applicable regulations.

Following clearing, the construction workspace is graded where necessary to allow safe passage of equipment. Temporary erosion and sediment controls are installed after initial disturbance of the soils, in accordance with local, state, and federal regulations. Also during grading, topsoil may be stripped from the area overlying the pipeline trench and spoil piled in the ROW. The topsoil is stockpiled separately from the subsoil. The segregated topsoil is typically restored to its original location immediately following installation of the pipe and backfill of the trench to reduce erosion and preserve native seed stock.

Trenching may be accomplished with back-hoes, track-hoes, or similar other ditching equipment. Excavated soil is placed to one side of the trench in a spoil pile. After a trench is excavated and pipeline assembled, the pipe is laid in the open trench using a side boom. The excavated trench is backfilled with the previously removed soil.

After backfilling the trench, work areas are graded and restored as closely as possible to preconstruction contours, and previously segregated topsoil is spread across the construction ROW. Surplus construction material and debris is removed, and, typically, vegetation is reestablished (usually through seeding). To minimize future settling, the trench may be compacted with tracked construction equipment or left crowned. Permanent erosion controls are installed within the ROW as needed during the restoration phase.

Horizontal directional drilling (HDD) may be used to install pipeline beneath roads, railroad crossings, water crossings, or in other sensitive areas. This method generally requires excavation of a pit on either side of the feature, the placement of boring equipment in the pit, and boring underneath the feature. This is a trenchless crossing method, and, while costly, it is becoming more common as a measure to avoid impacts to above ground features. In HDD, a small-diameter pilot hole is drilled under the aboveground feature, aided by a surface monitoring system that tracks the location of the drill bit. The hole is enlarged to more than 12 in (0.3 meters) wider than the pipeline to be installed. Finally, the pipeline is pulled through the HDD hole. Similar to trenching, once the pipeline is installed, the excavated pits are backfilled with the previously removed soil, surplus construction material and debris is removed, vegetation is typically reestablished.

For pipelines that must cross a stream or other body of water, an open-cut, dry-ditch method may be used in place of HDD. This method diverts a stream or body of water around a work area using cofferdams. In high-flow streams, one or more flume pipes are used, with stream flow propelling water through the flumes. In low-flow streams, stream flow is diverted around the work area using pumps and hoses. This provides a dry work zone to dig the trench, lay pipe, backfill, and stabilize the substrate. In small streams, a wet-ditch method may be used, whereby a trench is excavated without cofferdams and water diversion.

Contractor yards and pipe storage areas are generally located in existing commercial/industrial sites or other previously disturbed areas but may require land clearing in areas with native vegetation. In addition, extra workspace (i.e., areas needed for equipment storage and trenching) is sometimes required at stream, wetland, railroad, road, and other pipeline crossings due to extra safety and environmental precautions often taken in these areas.

3.2.2 Construction of associated surface infrastructure

Surface facilities associated with crude oil, natural gas, and petroleum product pipelines may include access roads, booster stations, pump stations, compressor stations, valve sites, meter stations, pig launchers and receivers, processing/treatment plants, communication towers, electric distribution lines and other utilities, electric substations, and others. The number, type, and size of facilities required for each pipeline varies depending on the size of the pipeline, product being transported, topography of the area, existing infrastructure in the area, and needs of the project proponents.

Access roads: Construction of access roads may be necessary to reach pipelines and/or associated facilities if existing roads are not available. Some of these access roads may be reclaimed following construction; however, others remain for operation and maintenance of the pipeline and associated facilities. Roads typically range in widths from 15−30 ft (4.57-9.14 meters), with an average length of 0.25 miles (mi; 0.40 kilometers [km]), depending on the location and necessary use. In addition, roads are expected to require periodic maintenance to correct washouts or other deterioration. Where necessary, culverts and ditches may be installed to facilitate drainage away from the road.

Booster, compressor, and pump stations: Booster, compressor and/or pump stations are generally required at intervals between 25 and 100 mi (between 40 and 161 km) along a pipeline to maintain or increase internal pressures and keep the flow of oil or gas moving through the pipeline at an appropriate rate. The location of these stations is typically determined by topography, the type of product being transported, and system hydraulic requirements. Compressor, booster, and pump stations are usually built within or adjacent to the pipeline ROW. Additional clearing and grading may be required at these facilities during construction. Office, control, utility, storage, and maintenance buildings and parking areas may be associated with these facilities. These associated facilities typically range in size from approximately 0.10 to over 5.00 ac (0.04 to over 2.02 ha). Compressor and pump station facilities generally incorporate gravel or other hardened surfaces, lighting, and perimeter fencing.

Meter stations, mainline valves, pig (a device used to clean and/or inspect pipelines) launchers and receivers (locations where pigs are inserted into or removed from a pipeline), regulator facilities, and other required facilities: Connections between large transmission pipelines and smaller pipelines require meter/regulator stations to control the metering and flow control. Mainline valves are installed along transmission pipelines to enable portions of the pipeline to be shut down or isolated, if necessary. Pig launcher/receiver facilities are usually installed at locations of other aboveground facilities such as compressor stations or meter stations, but these facilities may also be required at points of pipeline diameter change or to accommodate the maximum practical distance that can be recorded by a pig during internal inspections. Regulators, which control the pressure of sections of pipeline, are associated surface facilities for natural gas distribution pipelines. Gas flaring may be associated with tanks at surface facilities. Each meter station, mainline valve site, pig launcher/receiver, and regulator facility may be surrounded by security fencing. Other appurtenances include miscellaneous facilities such as filter/separators, miscellaneous valves, sumps, tanks, yard piping, pipeline markers, cathodic protection system (a method of protection for iron and steel against electrochemical corrosion) components, offices, storage buildings, and sheds. These are often associated with other surface facilities like compressor stations, but some, such as pipeline markers, may be located independently on pipeline ROWs.

Natural gas processing and treatment facilities: Additional processing or treatment facilities may be required to process natural gas before it can be transported. Relatively few natural gas processing facilities are necessary, as gathering systems may interconnect more than 100 wells to a processing facility. These facilities generally range in size from approximately 5.0−30.0 ac (2.0−12.1 ha). Processing facilities generally include hardened surfaces, lighting, and perimeter fencing.

Communication towers: Communication towers may be required at some of the associated surface facilities, are usually constructed within the permanent footprint of the facility, and typically range from 10–200 ft (3.05-60.96 meters) height. Under the HCP, communication towers must be under 200 ft (60.96 meters) in height, shall not use any guy wires, and not use lighting, unless required by the FAA. Communication towers that exceed 200 ft (60.96 meters) in height or require guy wires are not eligible for inclusion under this HCP and will require CI-holders to seek ESA compliance through other means. Towers exceeding 200 ft (60.96) in height typically have federal oversight through the FAA or FCC.

Electric distribution lines: Electric distribution lines and other utilities are often constructed to serve facilities that need a source of electricity, such as compressor and pump stations, valve sites, and processing plants. Vegetation clearing and potentially grading along the electric distribution ROW are typically necessary prior to installation. The length of electric distribution line necessary is determined by the location and distance to the nearest substation. Distribution lines are usually between 0.5 mi (0.8 km) and 5.0 mi (8.0 km) in length. If distribution lines are buried below-ground, trenching is accomplished with back-hoes, track- hoes, or similar other ditching equipment. Excavated soil is placed to one side of the trench in a spoil pile. After the trench is excavated, the electric line is then strung in the open trench. The excavated trench is backfilled with the previously removed soil. If above-ground, distribution lines are approximately 18.0–40.0 ft (5.5–12.2 m) high, depending on the voltage required. Poles are usually constructed every 75.0–80.0 ft. The typical permanent ROW is approximately 20.0-ft (6.1-m) wide. Electrical distribution lines and poles are needed throughout the life of the well pad and are considered permanent structures; however, ROWs associated with these lines may be maintained as native vegetation.

Electric substations: Electric substations may be associated with electric distribution lines. These substations generally require approximately 2.0−5.0 ac (0.8−2.0 ha) of disturbance. Electric substations are usually located off a county road, but occasionally require an access road built to the site. Electric substations are typically surrounded by fencing. When constructed in association with an associated facility, the substation may be constructed on the same facility site within an easement granted to the electric service provider.

Operation and maintenance of pipeline and associated surface facilities: Operation and maintenance activities may be routine (i.e., planned upgrades to equipment) or emergency (i.e., unplanned repairs). Pipelines may require maintenance for a number of reasons including corrosion, correction of manufacturing and component defects, weld failures, stress caused by flooding, land movement (landslide and erosion) that may occur particularly in steep and variable terrain (sometimes referred to as “slips”), and excavation damage. During the operation and maintenance phase of midstream development, visual inspections are performed in accordance with State Department of Transportation regulations and pipeline operator procedures. Personnel may carry out such inspections on foot, in all-terrain vehicles, or aerially. Pipeline integrity is checked throughout the pipeline’s lifespan, sometimes requiring soil disturbance. Digging to, exposing, and, in some instances, replacing pipeline, may be necessary based on inspection results.

Operators typically minimize the need for corrective maintenance by implementing quality control and rigorous inspection and testing. Pipelines are inspected regularly using devices called pigs that travel from launching sites to receiving stations installed along the pipeline. The gas or liquid pressure within the pipeline propels the pig along. “Smart pigs” inspect for leaks, while other types of pigs are specially designed to clean the pipeline.

The permanent ROWs of larger transmission pipeline, some gathering lines, and the electric distribution lines are kept permanently clear of trees and brush to allow future maintenance and inspections. Vegetation maintenance is typically done by large mowing equipment (e.g., tractor, brush hog) or herbicide application, by foot or all-terrain vehicles, once every one to three years.

Gas flaring may be used at associated surface facilities and pipelines. Smaller gas flares may be burning constantly throughout the life of the project, while others may be short-term (20−30 minute intervals) that are used as control of pressure for emergency releases.

Operation and maintenance of permanent access roads includes adding additional surface material (i.e., gravel, dirt) to the road and maintaining bar ditches. Disturbances are expected to occur within previously disturbed areas. Roads will require periodic maintenance to correct washouts or deterioration. To minimize dust, water may be applied to roads.

Operation and maintenance of electric distribution lines may include pole replacement for above-ground lines. Repair of buried lines may require soil disturbance to locate problems. These repairs typically rely on existing roads. Most repairs require less than one ac of disturbance, typically about 50 square ft (4.65 square meters).

Decommissioning and reclamation of pipeline and associated surface facilities: Decommissioning a pipeline and associated facilities occurs when the pipeline or facility is no longer functional or necessary. Such facilities are typically removed, and the area may be restored to native vegetation conditions. Decommissioned pipelines are either dismantled and removed or left in place. Leaving pipe in the ground protects nearby pipelines from excavation damage, maintains soil stability, and minimizes soil disturbance. Pipelines left in place are capped and grouted at locations of road/railroad crossings, which requires minor soil disturbance at the locations of the capping. Removing pipelines involves excavating to expose the pipeline, cutting and removing the pipe, and backfilling and reclaiming the area.

If an access road is no longer needed, surface material would be removed, and native vegetation is typically restored by seeding. Decommissioning of above ground electric distribution lines involves removal of poles and distribution lines. Buried electric lines would likely be left in place following disconnection from power sources.

3.3 Grassland improvement and management

Activities that can impact potentially suitable LEPC habitat could occur on mitigation parcels during improvement and management activities to enhance or maintain habitat for LEPC. These activities, while intended to ultimately result in a net benefit to LEPC in the long-term, may initially have temporary impacts, as described below. Activities associated with grassland improvement and management that could occur on HCP mitigation parcels and have temporary impacts to LEPC include:

- Fire management
- Erosion control
- Mechanical brush control

- Herbicide treatments
- Grazing management
- Range planting
- Forage harvest management
- Fence installation

These activities, while intended to ultimately result in a net benefit to LEPC in the long-term, may initially have temporary impacts, as described below.

Fire Management: Benefits of fire to grassland ecosystems are well-documented. Fire can reduce the density of unwanted woody vegetation and brush, slow the spread of woody vegetation, and increase grass and forb production, among other uses. As such, fire management activities could be implemented on some HCP mitigation parcels to improve habitat conditions for LEPC.

Erosion Control: Erosion control could be used on some HCP mitigation parcels to maintain or improve LEPC habitat conditions. Within grassland habitat, erosion control generally consists of planting native grasses and forbs to increase ground cover. On parcels with surface water resources, other erosion control measures to protect those features (e.g., dams, gabions, bank stabilization structures) could be necessary.

Mechanical Brush Control: Mechanical brush control is another method for removing woody vegetation from grasslands but can be more costly on a per-acre basis than fire management because of the required equipment and is typically reserved for use in relatively small areas. Various types of equipment can be used to mechanically remove brush or woody species by bulldozing, chaining, roller-chopping, or grubbing unwanted vegetation.

Herbicide Treatment: Herbicide treatments could be used on some HCP mitigation parcels to control mesquite (*Prosopis* spp.), other woody vegetation, or reduce shinnery oak (*Quercus havardii*) canopy cover in order to improve LEPC habitat conditions. Herbicide applications on mitigation parcels will be consistent with the USFWS LEPC Mitigation Guidelines (USFWS 2014b). Various types of equipment ranging from hand applicators to small broadcast spreaders could be used depending on the extent of vegetation to be controlled.

Grazing Management: Livestock grazing could be implemented on some HCP mitigation parcels as a means to manage the vegetation composition of the parcel and maintain healthy grasslands.

Range Planting: Range planting could be used on some HCP mitigation parcels to restore or enhance LEPC habitat. Various types of equipment can be used to plant native vegetation ranging from hand-held tools to heavy machinery.

Forage Harvest Management: Forage harvest management could be used on some HCP mitigation parcels to maintain LEPC habitat by removing forage at a particular time of year to promote vigorous plant regrowth, increase soil nutrient uptake, and control insects, weeds or diseased plants. Various types of equipment can be used to mechanically remove forage by bulldozing, chaining, roller-chopping, or grubbing targeted vegetation.

Fence Installation: New fencing could be installed on or around some HCP mitigation parcels to facilitate grazing management to improve LEPC habitat, or to secure parcels from unintended anthropogenic activities (i.e., trespassing).

3.4 Mitigation Activities

Implementation of the HCP will include measures to mitigate the impacts of the take of LEPC from the covered activities described above and are described in detail within this section of the opinion. As outlined within the HCP, the applicant indicates that most mitigation will be provided via traditional permanent mitigation which has been approved by the USFWS and thus the take of LEPC associated with management of these properties will already be covered through other mechanisms. The HCP does provide the applicant with the option of utilizing dynamic permanent mitigation, which is permanent mitigation provided through the implementation of a series of term contracts. Dynamic permanent mitigation does not have a mechanism outside of the ITP to cover incidental take associated with management activities, and thus is covered under the HCP. The applicant estimates that a maximum of 50,000 ac of dynamic permanent mitigation will occur. The mitigation measures are intended to provide conservation benefits to the Covered Species.

Dynamic mitigation includes lands contracted with a mitigation entity to be managed for LEPC for a specified amount of time (e.g., 15, 25, 50, or other number of years). Dynamic mitigation parcels are managed for LEPC conservation until the expiration of the mitigation contract, at which time the landowner will choose whether or not to renew the contract and continue managing the parcel for LEPC. If a landowner does not renew the contract for a dynamic mitigation parcel, the funds that would have been used to renew that contract are instead utilized to secure another dynamic mitigation parcel on the landscape in an area that will provide equivalent or greater conservation value to the LEPC compared to the original parcel. In this way, the total mitigation offset for dynamic mitigation is retained in perpetuity.

The HCP emphasizes conservation measures that address the LEPC's vulnerability to habitat impacts. Mitigation provided through the HCP focuses on the creation of strongholds as set forth in the technical white paper issued by the USFWS in July 2012, *USFWS Conservation Needs of the Lesser Prairie-chicken* (USFWS 2012a). All mitigation implemented to meet the obligation of the HCP will be approved by the USFWS. CI-holders will follow the conservation measures and required mitigation identified in the HCP to ensure that habitat impacts are offset in a way that maintains the likelihood of long-term population perseverance.

Furthermore, the HCP is structured to provide a 2:1 mitigation ratio with a minimum of 1 ac of restoration for every acre of potentially suitable LEPC habitat impacted by enrolled projects after the fifth year of the ITP term, or after the 50,000 ac (20,234 ha) of mitigation which is already approved by the USFWS (see Biological Objective 1c) have been sold, whichever occurs first. All mitigation must be in place prior to impacts and all restoration credits must meet USFWS performance standards before they can be used to offset impacts; therefore, this 5-year time lag will allow mitigation entities to begin restoring parcels early in the ITP term, that will become available for use later in the ITP term. By offsetting oil and gas impacts with restoration credits, there is a potential for strongholds to increase in size and result in no net decrease of available habitat. The remainder of the required mitigation would be targeted at enhancing existing habitat. All mitigation included under the HCP will be strategically located in areas to ensure mitigation parcels are adequate to offset impacts as described within the HCP.

3.6.1 Biological Goals and Objectives for the Conservation Measures

The purpose of the HCP is to minimize and fully offset the impact to LEPC from the development and operation of oil and gas projects. This would be primarily accomplished through contributions towards the establishment of strongholds in the form of habitat conservation banks and habitat restoration efforts throughout the LEPC range to reduce the threat of habitat loss and fragmentation. As described above, the establishment of strongholds is necessary to meet the goals and objectives of LEPC conservation throughout the species' range (USFWS 2012a). The goals of the stronghold concept are outlined in the USFWS' *Conservation Needs of the Lesser Prairie-chicken* (USFWS 2012a) and include:

1. Establishing strongholds to ameliorate effects from current and future fragmentation and to increase the chances for long-term survival.
2. Ensuring connectivity between strongholds in order to facilitate movement and allow for gene flow.
3. Committing to implementation of management strategies to avoid or reduce ongoing habitat fragmentation in conjunction with the establishment of strongholds and connectivity between strongholds.
4. Providing long-term certainty that mechanisms will be in place to achieve and sustain the necessary habitat for the creation, maintenance, and conservation of strongholds and connectivity in the long term.

The USFWS defines strongholds as parcels of relatively high-quality habitat with multiple leks, long-term protection, and a minimum size of 25,000 ac (10,117 ha), though larger parcels of up to 50,000 ac (20,234 ha) or more may be needed to account for the amount and distribution of non-LEPC habitat (e.g., irrigated croplands) and otherwise suitable habitat located within the buffer distances associated with anthropogenic features (e.g., areas surrounding vertical structures, which are avoided by LEPC; USFWS 2012a). In order to meet the long-term goal of ensuring connectivity between strongholds to allow seasonal movements and gene flow, management strategies should include:

1. Development of a strategic and collaborative system to target and prioritize appropriate areas for the establishment of strongholds that will maximize connectivity.
2. Incentives for new oil and gas developments to mitigate for impacts in areas outside of, but would provide connectivity with, existing strongholds.
3. Habitat improvement and restoration, which could include removal of vertical structures causing structural fragmentation and/or conversion of croplands to native grasslands in areas where doing so would reduce spatial fragmentation.

4. Monitoring of LEPC populations and habitat as a basis for adaptive management.

Biological Goal 1: Establish, protect, expand, and enhance strongholds and habitat corridors between strongholds to increase the chances for the long-term survival of the LEPC through compensatory mitigation provided to offset the loss of potential LEPC habitat as a result of oil and gas development covered under the HCP. The creation of strongholds is among the most important steps that can be taken to secure the conservation of LEPC (USFWS 2012a).

> **Biological Objective 1a:** Establish one or more permanent LEPC strongholds more than 25,000 ac (10,117 ha) in size in each of the four LEPC habitat regions (i.e., mixed-grass prairie, sand sagebrush prairie, sand shinnery oak, and shortgrass/Conservation Reserve Program (CRP) mosaic; Figure 4.2) over the ITP term, if practicable based on availability of suitable land, landowner willingness to participate in LEPC conservation, and cost to ensure mitigation standards will be met.
>
> **Biological Objective 1b:** Prioritize the protection of existing suitable LEPC habitat that has been approved for preservation by the USFWS (50,000 ac; 20,234 ha) by placing these acres, if available, into strongholds or connectivity corridors prior to other potentially available mitigation parcels.
>
> **Biological Objective 1c:** Secure 1 ac of restoration for every acre of potentially suitable LEPC habitat impacted after the fifth year of the ITP term or after the initial 50,000 ac (20,234 ha) of currently approved mitigation has been utilized, whichever comes first. As feasible, restored acres will be contiguous with or connected to established LEPC strongholds to expand the size of strongholds and connectivity corridors.

Biological Goal 2: Minimize impacts to LEPC populations by reducing habitat loss, habitat fragmentation, and LEPC avoidance of otherwise suitable habitat as a result of oil and gas development covered under the HCP.

> **Biological Objective 2a:** Implement mitigation ratios (Section 3.7.3.1) that increase the mitigation obligations for projects sited on higher value (i.e., higher Crucial Habitat Assessment Tool [CHAT] category) LEPC habitat to monetarily incentivize siting projects on lands of marginal LEPC habitat value and produce a net reduction in the average per project impact to suitable LEPC habitat as compared between initial and final project layouts over the ITP term.
>
> **Biological Objective 2b:** Restrict project-related activities involving human presence during the LEPC breeding season (March 1 – July 15) based on time of day and distance to leks recorded as active within the previous five years (Section 3.7.2.2) and require self-certification of implemented minimization measures for projects occurring with three miles (also mi) of leks recorded as active within the previous five years.

In summary, the Biological Goals and Objectives of the HCP seek to mitigate the loss or fragmentation of up to 500,000 ac of suitable LEPC habitat as a result of oil and gas development throughout the Permit Area. This will be accomplished through the creation, preservation, and expansion through restoration of stronghold LEPC habitat, to fully offset impacts from projects enrolled in the HCP, and implementation of mitigation ratios intended to minimize the siting of projects within suitable LEPC habitat. For impacts that are not or cannot be avoided, the HCP will channel mitigation dollars into the creation of permanent LEPC strongholds and expand those strongholds as defined in USFWS guidance (USFWS 2012a, 2014b).

3.5 Measures to avoid, or minimize and mitigate the impacts of the taking

3.5.1 Impact avoidance through project design and planning

Oil and gas projects can avoid impacts and the cost of mitigation by siting projects in areas where impacts to LEPC will not occur. Avoiding impacts can be accomplished by siting a project such that the Impact Boundary is entirely within areas that do not meet the conditions of potentially suitable LEPC habitat, as evaluated during each project's Impact Assessment as described in Section 3.5.3 of this opinion.

3.5.2 Measures to minimize the impacts of taking

3.5.2.1 Siting projects in low-impact areas

Potentially suitable LEPC habitat can be physically lost (i.e., land conversion) or functionally lost (i.e., degraded resources; infrastructure that leads to LEPC avoidance of an otherwise suitable area) and result in fragmentation of the remaining LEPC habitat on the landscape. Potentially suitable LEPC habitat is likely to be present within the Impact Boundary of many projects within the Permit Area. In those cases, the cost per unit of mitigation and mitigation ratios that increase for impacts to higher priority LEPC habitat (Section 3.5.3) compels developers to consider siting projects in areas where impacts from project footprints (physical habitat loss) and associated Impact Boundaries (functional habitat loss) are minimized and/or occur within less suitable habitat. Mitigation ratios and credits are valued to create an incentive for minimizing impacts. Smaller project impacts would require fewer mitigation credits to offset those impacts. Minimization measures that project proponents can implement to reduce the amount of required mitigation offset include:

- Locating new project infrastructure and its impact buffers (Table 3 of the HCP) outside of suitable habitat, or within spaces which already have existing impacts, as evaluated during each project-specific Impact Assessment, to the extent possible.
- Co-locating new infrastructure, such access roads and power lines, within the impact buffers of existing features on the landscape or within the impact buffers of other new features (Table 3 of the HCP).
- Burying linear facilities, such as power lines and transmission lines, where practicable given geographic, geotechnical, and engineering constraints.

3.5.2.2 Conservation measures during the lesser prairie-chicken breeding season

While habitat loss, fragmentation, and degradation are considered the primary threat to LEPC, increased noise disturbance could adversely impact the integrity of habitat that currently exists for the species (USFWS 2012b). As such, during the LEPC breeding season (March 1 – July 15), noise and blasting, traffic volume and speed, and access points will be minimized to reduce LEPC disturbance. In addition, off-road travel will be avoided, where feasible, within 3 mi (5 km) of leks that have been recorded as active within the previous five years. These measures will reduce impacts to breeding, nesting, and brooding LEPC (Winder et al. 2014) that may occur in the vicinity of a project.

During construction, operations, and routine maintenance activities where humans are present, non-emergency activities during the breeding season will be avoided between the hours of 3:00 am and 9:00 am in areas within 3 mi (5 km) of known leks recorded as active within the previous five years.

3.5.3 Measures to mitigate the impact of taking

Impacts that cannot be completely avoided and remain after minimization measures have been implemented will be mitigated to fully offset the impacts of the take. Because it is impracticable to express take or conservation benefits in terms of individuals, both the impacts of activities and the mitigation of those impacts are measured using a surrogate: acres of potentially suitable LEPC habitat. Use of acres of habitat impacted as a surrogate for exact numerical amounts of anticipated take of LEPC individual is consistent with current ESA regulation (80 FR 26832 [May 11, 2015]).

The project proponents will follow the process outlined within Section 4.4 of the HCP (Project-specific Impact Assessment and Predicted Take) to determine the total number of acres of impacts to suitable LEPC habitat. Once the total acres of impact is quantified, the HCP employs a tiered mitigation system to assign the appropriate mitigation ratio based upon the priority of LEPC habitat impacted. Specifically, the tiered mitigation system assigns higher mitigation ratios to areas of higher priority LEPC habitat and lower mitigation ratios to areas of lower priority LEPC habitat. The priority of LEPC habitat is defined using the Southern Great Plains CHAT and averages a 2:1 mitigation ratio. The determination of impacts to suitable LEPC habitat and calculation of required mitigation to offset impacts will be provided by the CI applicant to the HCP Administrator, and subsequently to the USFWS for approval prior to project enrollment and construction. For participants of the HCP, mitigation to fully offset impacts will be required to be in place and meeting performance standards prior to impacts occurring. Additionally, the HCP requires that impacts from specific projects be offset with mitigation occurring in areas of equivalent or higher priority habitat, as defined by the Southern Great Plains CHAT. The mitigation system designed within the HCP, on average, for every 1 ac of impact will require a minimum of 1 ac of restoration and 1 ac of habitat enhancement; a minimum of one of those previously mentioned acres will be put under traditional permanent conservation that meets the standards as outlined within the HCP and provides the option to have the remainder of the mitigation to be provided by using dynamic mitigation as discussed within the HCP. The HCP allows the use of dynamic permanent mitigation for up to 50% of the required mitigation acres. For further details regarding the mitigation design please see the HCP.

3.6 Monitoring and reporting

Once projects have been approved and issued a CI, implementation of the HCP requires both compliance and effectiveness monitoring. Compliance monitoring will be undertaken to ensure accordance with the terms of the CIs, HCP and ITP, including the impacts resulting from the Covered Activities. Effectiveness monitoring will include an assessment of the effectiveness of the minimization and mitigation measures, by evaluating progress towards meeting the biological goals and objectives described in the HCP. Specific project enrollment review, compliance and effectiveness monitoring, and reporting requirements are described in the HCP.

The HCP Administrator will monitor and report compliance annually both on a per-project basis and aggregated across all enrolled projects. Specifically, the following will be tallied within the Plan Area both annually and cumulatively over the ITP term and provided in the annual compliance monitoring report:

- The location and number of acres of potentially suitable LEPC habitat impacted by oil and gas projects enrolled under CIs
- The total number of acres inclusive of all project footprints and impact radii of surrounding project structures for enrolled projects
- The number of acres of mitigation habitat (a) preserved, and (b) restored, to offset impacts to potentially suitable LEPC habitat
- If applicable, the numerical disparity between on-the-ground impacts to suitable LEPC habitat from enrolled projects and implemented mitigation to fully offset those impacts
- The total impact acreage to demonstrate compliance with the 500,000-ac cap on impacts to potentially suitable habitat
- The rate of enrolled project impacts, to predict if the 500,000-ac impact cap is likely to be reached before the end of the ITP term
- The location and area (in acres) of mitigation stronghold habitat provided under the HCP
- Impact minimization measures implemented during project construction and operations
- All non-compliance issues and resolutions

In addition, the compliance monitoring report will include a forecast of if and when the 500,000-ac impact threshold is expected to be met during the ITP term and appended CI-holder reports submitted to the HCP Administrator during the Reporting Period.

As projects are enrolled under the HCP through a CI conduct Covered Activities, impacts to suitable LEPC habitat will be measured against purchased mitigation to evaluate CI-holder compliance with the CI and overall compliance with the ITP. The HCP Administrator will maintain a ledger of project impacts and mitigation offsets, and the amount of dynamic mitigation (i.e., where take of LEPC through grassland improvement and management activities covered under the HCP could occur) that has been implemented. A copy of the current ledger or electronic access will be provided to the USFWS with the annual report and made available to the USFWS upon request at any time during the ITP term. The primary purpose of the ledger is to provide documentation of the habitat impacts and mitigation that has occurred, as reviewed and approved by the USFWS, confirm sufficient mitigation is in place to offset the impacts of the take of LEPC as measured by impacts to suitable habitat, and track the estimated take associated with the HCP.

3.6.1 Habitat Conservation Plan Effectiveness Monitoring

The HCP Administrator shall be responsible for monitoring and reporting the progress made towards achieving the HCP's Biological Goals and Objectives. The HCP Administrator will submit an annual effectiveness monitoring report to the USFWS using the same reporting timeline and general reporting methods as the annual compliance monitoring report (Section 3.6.3). It will be the obligation of CI-holders to provide documentation to the HCP Administrator for all project-specific minimization measures resulting from project siting (Section 3.5.2.1). Specifically, each CI-holder will provide the HCP Administrator with a written description and applicable maps to illustrate any project specific layout modifications implemented during the project planning phase (which could have occurred prior to submission of the CI application) to reduce the overall impacts to suitable LEPC habitat, if such minimization measures were implemented by a CI-holder. The HCP Administrator will compile data provided by each CI-holder on a Minimization Measures Report (HCP Appendix D), to be submitted with annual effectiveness monitoring report, and calculate the total reduction in impacts to suitable LEPC habitat for the Reporting Period and cumulatively over the ITP term. CI-holder provided maps and descriptions of minimization efforts will be appended to the Minimization Measures Report.

In addition, the effectiveness monitoring report will include a summary of the types (static and dynamic) and category (preservation and restoration) of mitigation implemented for the Reporting Period and cumulatively over the ITP term. This summary will allow progress toward the HCP's Biological Goals and Objectives (Section 3.6.1) to be tracked annually over the ITP term.

3.6.2 Mitigation Monitoring and Reporting

Mitigation monitoring will be the responsibility of the provider of the mitigation (i.e., through a bank, in-lieu fee program, or permittee-responsible mitigation) for projects enrolled under the HCP.

The requirements for mitigation monitoring as stipulated under the USFWS LEPC Mitigation Guidelines (USFWS 2014b) and the HCP includes interim and long-term management and monitoring, as well as reporting. The management agreement between mitigation providers and landowners for each Bank Parcel or other mitigation property will provide the HCP Administrator with the rights and interests necessary for implementing the interim and long-term management obligations under the HCP. The requirements associated with these obligations are described in detail in the HCP.

3.6.3 Compliance and Mitigation Monitoring Audit

No later than the third year after the HCP is implemented and the ITP is issued, a third-party audit of the compliance and mitigation monitoring will be conducted. Thereafter, audits will continue annually for each year in which new projects are enrolled under the HCP for the remainder of the ITP term. The HCP Administrator will provide the audit report to the USFWS for review. If an audit reveals a discrepancy between the total cumulative impacts and the amount of mitigation implemented to fully offset impacts, within 30 days the HCP Administrator will review project-specific documentation to identify the source of the discrepancy and present the USFWS with a written explanation for the discrepancy and proposed corrective action to be taken. Depending on the source of the discrepancy, dispute resolution between the HCP Administrator and the offending CI-holder or the Applicant and the USFWS could be initiated (HCP Section 9.6). Discrepancies resulting from clerical errors will be corrected and written documentation of the correction will be provided to the USFWS by the HCP Administrator to be placed in the HCP file.

4.0 STATUS OF THE SPECIES

The LEPC is the only Covered Species addressed in the HCP and this 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 USFWS' Species Status Assessment (SSA) (USFWS 2021) for the LEPC.

4.1 Species description

Hagen and Giesen (2005) describe the LEPC as a medium-sized grouse with a total body length of 15−16 in (38−41 cm). 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; 0.75 kilograms [kg]), while that of females' averages 1.57 lbs (0.71 kg; 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.

4.2 Species Status and Occurrence

The LEPC has been considered for Federal listing under the ESA since 1997 (62 FR 36482

[July 8, 1997]), and was briefly listed as threatened in 2014 (79 FR 19973 [April 10, 2014], USFWS 2014a) until the ruling was overturned in court (US 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 petition, on June 1, 2021, the USFWS proposed to list two distinct population segments (DPS) 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 4.1). 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 opinion because they are the same across ecoregions. During the later sections of this opinion when discussing the cumulative effects, conclusions, and incidental take statement we will include an analysis for each DPS.

The LEPC currently inhabits sand sagebrush (*Artemisia filifolia*), sand shinnery oak, and mixed grass vegetation communities within the southern Great Plains in portions of Colorado, Kansas, New Mexico, Oklahoma, and Texas (USFWS 2021). The species' historical range was approximately 115,000,000 ac, not all of which was occupied or had the ability to support LEPCs (Figure 4.2). Within the LEPCs current estimated occupied range there are a total of 21,000,00 ac, of which we estimate a maximum of 4,000,000 ac or 18% are potentially habitat

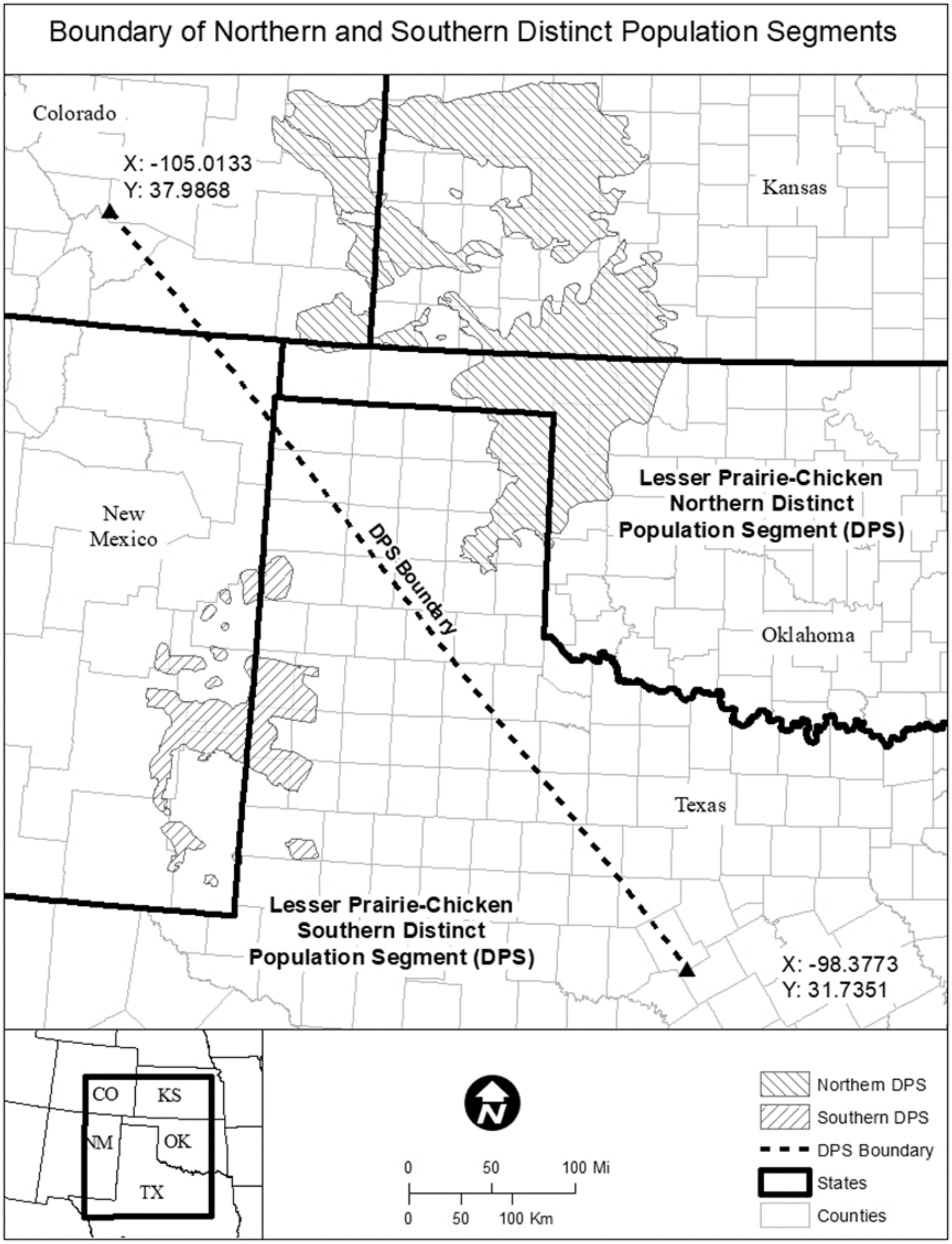
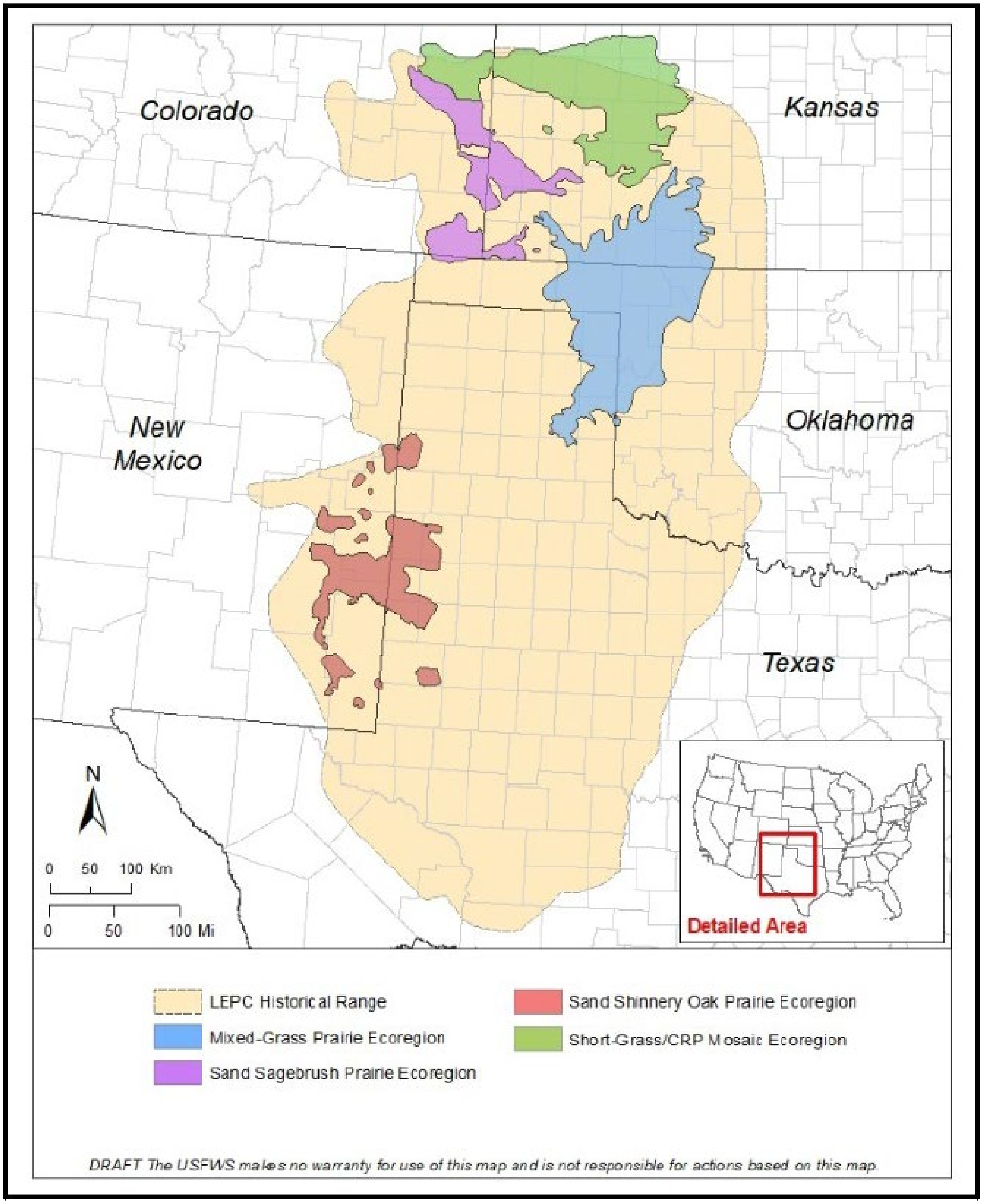


Figure 4.1. LEPC proposed Distinct Population Segments



DRAFT The USFWS makes no warranty for use of this map and is not responsible for actions based on this map.

Figure 4.2. Estimated historical range and the four ecoregions spanning the LEPC's current range (USFWS 2021).

(USFWS 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 (USFWS 2021). The USFWS (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. Habitat loss and fragmentation, as well as other threats to the LEPC, are described in Section 4.5.

4.3 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). Clutches size is commonly 10–12 eggs, but reduced 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 as a result of predation or abandonment, females can attempt to nest again, with chicks hatching mid-June through early July (Merchant 1982, see 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 – July 15, with some latitudinal variation (Van Pelt et al. 2013).

Nest success and survival of chicks 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).

LEPC 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. Each of these habitat types have different vegetation compositions, which are described in Section 4.4.

4.4 Habitat Characteristics

LEPC are a landscape level species that use various habitats types to satisfy particular life requirements. LEPC use of habitats follow's Johnson (1980) order of habitat selection where the first order of 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 4.3). 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 ac 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 ac (486–10,118 ha) of continuous native rangelands could be capable of sustaining a viable population. More specifically in Kansas, 19,407 ac 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, USFWS 2010) to provide summer shade, winter protection, and supplemental food (USFWS 2010). The absence of trees and other relatively tall woody vegetation is characteristic of these grassland ecosystems, with the exception of areas along watercourses (USFWS 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.).

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 in close proximity to one another. Van Pelt et al. (2013) provides summaries of habitat components required by LEPC, as described below in more detail.

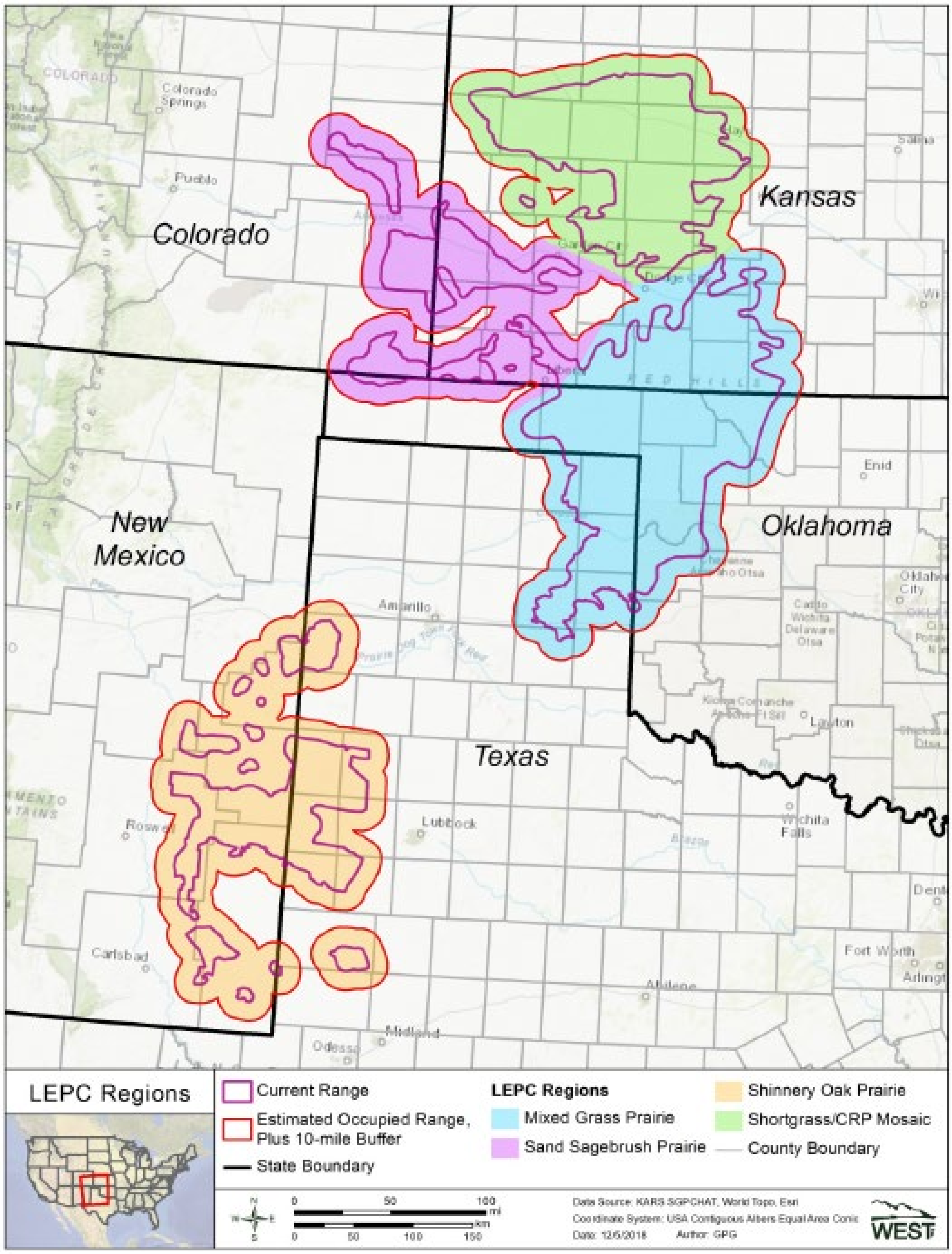


Figure 4.3. Regions delineated for the LEPC and currently estimated occupied range (Van Pelt et al. 2013).

4.4.1 Leks

Lek sites are characterized by relatively sparse vegetation generally less than 4 in (10 cm) 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.

LEPC exhibit site fidelity to lek sites, with the majority of use occurring within 3.1 mi (5 km) 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 5–10 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 mi (5 km) of 62 lek sites found a positive correlation between lek attendance and the proportion of grassland in the surrounding landscape (Gehrt et al. 2020).

4.4.2 Nesting Habitat

LEPC 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. 2017).

A number of researchers have found most female LEPC nest within 2.0 mi (3.2 km) 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 mi (5 km) of leks (Winder et al. 2015). Hagen et al. (2013) suggest vegetation management for nesting should be focused around 1 mi (1.6 km) 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).

4.4.3 Brood Habitat

Young broods have relatively limited mobility; therefore, quality brood habitat must occur in close proximity 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 ft (305 m) 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 easy on the ground. Active sand dunes, dunes that physically change size, shape or location due to the effects of 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.

4.4.4 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.

4.5 Current Habitat and Recent Population Trends by Ecoregion

4.5.1 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 the geospatial analysis described in Section 3.2 of the SSA report, 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 4.1). We estimated approximately 1,023,894 ac (414,355 ha), or 16% of the ecoregion, in potential usable unimpacted areas with 60% or greater potential usable unimpacted land cover within one mile (1.6 km) (Table 4.2).

Table 4.1. 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 4.2. 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 4.1). 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	

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 warm season native 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 in (35–80 cm) in height (Rodgers and Hoffman 2005). This is largely due to the fact that the CRP is an idle lands program and has 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.

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 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) expresses concerns about the implications of genetic introgression (i.e., dilution) of LEPC genes, and the fact that potential effects are poorly understood (2016). Subsequent publication by Oyler-McCance et al. (2016) summarize the evidence of hybridization of greater prairie-chicken and LEPC, including 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 the majority of 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 and aerial survey results from 2016 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. 2021) of the four ecoregions. Average estimates from 2016 to 2021 are 19,870 birds (90% confidence intervals (CI): 6,521, 36,329), making up about 67% of the range-wide LEPC total. Recent years have suggested modest increases. Approximate distribution of lek locations as reported by WAFWA observed occupied at least once by LEPC between 2015 and 2019 are included in Appendix E, Figure E.7 of the LEPC SSA (USFWS 2021).

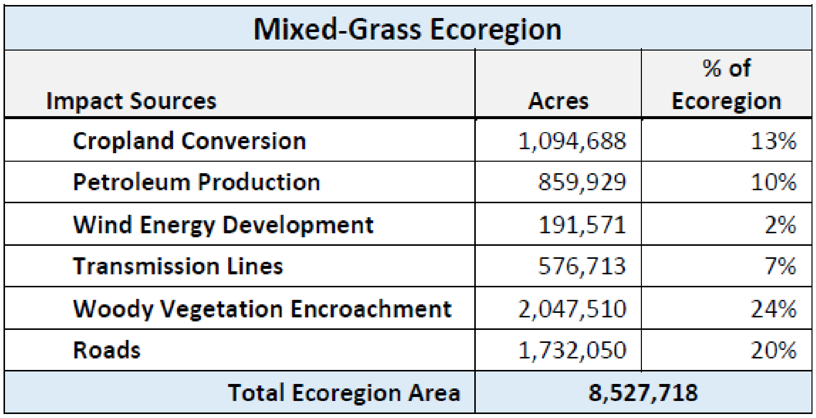
4.5.2 Mixed-Grass Prairie Ecoregion

Much of the Mixed-Grass Prairie Ecoregion was severely fragmented originally by home-steading, which subdivided tracts of land into small parcels of 160–320 ac (65–130 ha) 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. Conservation Reserve

Program 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 (NRCS 2016). Oklahoma Forestry Services estimated the average rate of expansion of eastern red-cedar in 2002 to be 762 ac (308 ha) per day (Wolfe et al. 2016).

Using the geospatial analysis described in Section 3.2 of the SSA (USFWS 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 4.3). We estimated there are approximately 994,483 ac (402,453 ha) or 12% of the ecoregion occur in potential usable unimpacted areas with 60% or greater potential usable unimpacted land cover within one mile (1.6 km) (Table 4.1).

Table 4.3. 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 4.1). 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**	

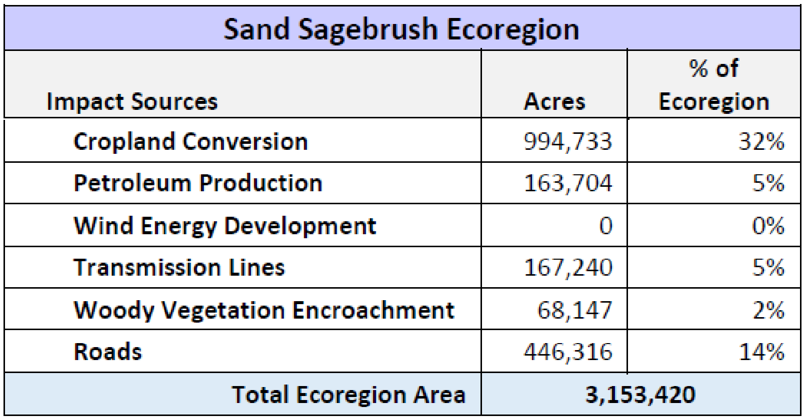
The Mixed-Grass Ecoregion historically contained the highest LEPC densities (Wolfe et al. 2016). Hagen et al. (2017) estimated historical trends in LEPC abundance from 1965–2016 in the Mixed-Grass Ecoregion using population reconstruction methods. The mean population estimate was around 30,000 males 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 to its lowest levels, <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 2021 indicate this ecoregion has the second highest population size (Nasman et al. 2021) of the four ecoregions. Average estimates from 2016 to 2021 are 5,202 birds (90% CI: 1,662, 10,441), representing about 18% 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, USFWS 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 (USFWS 2021).

4.5.3 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 SSA (USFWS 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 4.4). We estimated there are approximately 1,028,523 ac (416,228 ha) or 33% of the ecoregion that occur in potential usable unimpacted areas with 60% or greater potential usable unimpacted land cover within 1 mile (1.6 km) (Table 4.1). 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.

Table 4.4. 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 4.1). 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	

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 due to 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 decline (Haukos et al. 2016).

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 >90,000 males from 1970 to 1975 and declined to its lowest level of fewer than 1,000 males in recent years.

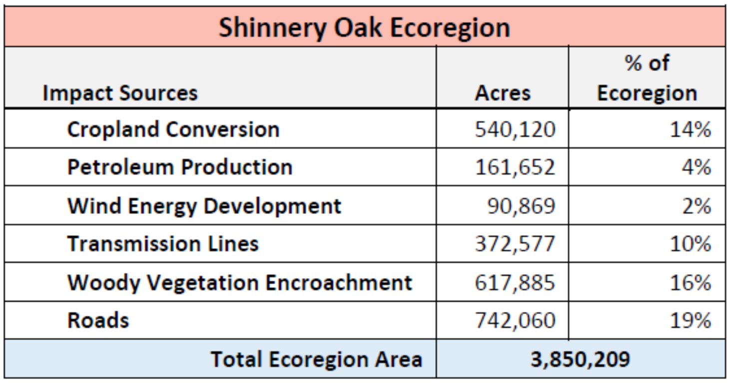
Aerial surveys have been conducted to estimate LEPC population abundance since 2012 and results in the Sand Sagebrush Prairie Ecoregion from 2012 through 2021 indicate that this ecoregion has the lowest population size (Nasman et al. 2021) of the four ecoregions. Average estimates from 2016 to 2021 are 1,182 birds (90% CI: 55, 4,547) representing about 4% of the range-wide 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 actually larger than indicated by the aerial survey results (Rossi and Fricke, Pers. Comm. from USFWS 2021). Approximate distribution of lek locations as reported by WAFWA 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 (USFWS 2021).

4.5.4 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 State Game Commission and federally owned BLM lands in New Mexico, the majority of Shinnery Oak Prairie on the Southern High Plains is privately owned (Grisham et al. 2016). Nearly all of 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 encroachment within this ecoregion has played a significant role in available space for the LEPC. Prior to the late 1990s, approximately 100,000 ac (40,000 ha) of sand shinnery oak in New Mexico and approximately 1,000,000 ac (405,000 ha) 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 SSA (USFWS 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 4.5). We estimated there are approximately 1,023,572 ac (414,225 ha) or 27% of the ecoregion occur in potential usable unimpacted areas with 60% or greater potential usable unimpacted land cover within 1 mile (1.6 km) (Table 4.1).

Table 4.5. 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 4.1). 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 ~1,000 males in 1997. The mean population estimate peaked again to ~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 2021 indicate that this ecoregion has the third highest population size (Nasman et al. 2021) of the four ecoregions. Average estimates from 2016 to 2021 are 3,249 birds (90% CI: 630; 9,300), representing about 11% of the range-wide total. Recent estimates have varied between fewer than 1,000 birds in 2015 to nearly 5,000 birds in 2018 and 2020 and back down to 1,571 birds in 2021. Approximate distribution of lek locations as reported by WAFWA 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 (USFWS 2021).

4.6 Threats

The range of the LEPC has been substantially reduced as a result of 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 in excess of 20,000 ac 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 USFWS 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 (USFWS 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 (USFWS 2021).

4.6.1 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 (>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 93,000 square km (23 million ac; 9.3 million ha) 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.

4.6.1.1 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. (2016) 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).

4.6.1.2 Petroleum and Natural Gas Production

Petroleum and natural gas production has 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, entire; Hunt and Best 2004, pp. 99–104; Plumb et al. 2019, pp. 224–227; Sullins et al. 2019, Peterson et al. 2020).

4.6.1.3 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 (MW) 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 2020). 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 ft/second (6.5 m/second), at 262 ft (80 m) high) (Department of Energy [USDOE] National Renewable Energy Laboratory 2010).

The average size of installed wind turbines continues to increase (USDOE 2015, p. 63; AWEA 2020, p. 87–88). 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, p. 16), 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 mi (2 km) 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 mi (1.8 km) 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 mi (1.4 km) 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 mi (3.2 km) and 12 mi (20 km), respectively. Manier et al. (2014) also reported proposed values for potential conservation buffer distances based on multiple sources ranging from 3 to 5 mi (5 to 8 km). Lastly, the Range-wide Conservation Plan (RWP) identified a 2,188-ft (667-m) 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 vast 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 ft (30 to 38 m) 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. (2009) 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. 2009). 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 mi (0.15 km) of major roads, or transmission lines within a 1.2 mile (2 km) radius (Sullins et al. 2019).

4.6.1.4 Woody Vegetation Encroachment

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 (*Juniperus virginiana*) 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 ac (5 trees per ha), and no nests were placed in areas with a tree density greater than 0.8 trees per acre (2 trees per ha), at a scale of 89 ac (36 ha) (Lautenbach 2017). Similarly, within the Shinnery Oak Ecoregion, Boggie et al. (2017) documents 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.

4.6.1.5 Roads and Electrical Distribution Lines

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 mi (0 to 3 km) 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 >1,148 ft (>350 m) for secondary roads. Sullins et al. (2019) finds evidence to suggest decreased probability of use for areas with greater than 5 mi (8 km) of county roads within a 1.2-mi (2-km) radius and greater than 0.1 mi (0.15 km) 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. 2009, 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 mi (0 to 3 km) 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 >1,800 ft (>550 m) 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.

4.6.2 Other Factors

4.6.2.1 Livestock Grazing

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 are also 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.

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.

4.6.2.2 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 ac (40,000 ha) of sand shinnery oak in New Mexico and approximately 1,000,000 ac (405,000 ha) 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.

4.6.2.3 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.

4.6.2.4 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.

4.6.2.5 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. 2005). 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. (2005) 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.

4.6.2.6 Predation

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. (2005) and Wolfe et al. (2007) reported that raptor predation increased with lek attendance. Patten et al. (2005) 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 to be 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 discussed prior, 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. 2014). The data necessary to calculate the total effect of predation on the LEPC do not exist.

4.6.2.7 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.

4.6.2.8 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. 2017). 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. 2017). 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.

4.6.2.9 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, we currently have no information that indicates insecticides are influencing LEPC populations.

4.6.2.10 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.

5.0 ENVIRONMENTAL BASELINE

Regulations implementing the ESA (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.

5.1 Status of the Species within the Action Area

The lands addressed in the HCP include the Plan Area and the Permit Area. The HCP Plan Area includes the geographic area where both the Covered Activities, including conservation activities described in the HCP can occur (USFWS and NMFS 2016). The Permit Area is a subset of the Plan Area and includes all areas where take of the Covered Species (LEPC) is reasonably certain to occur as a result of Covered Activities and is authorized under the ITP. The specific areas within the Permit Area where take will be authorized is unknown at this time, and will depend on the location of projects enrolled under the HCP/ITP. For these reasons, the HCP Permit Area has been broadly defined to share the same outer boundary as Plan Area (Figure 1.1). The action requiring conference in this opinion is the issuance of an ITP within the Plan Area; therefore, in this opinion, the terms Plan Area, Permit Area, and Action Area are interchangeable.

Within the Action Area are several Federal programs that currently provide conservation benefits to the species and directly address threats to the LEPC. Certain programs provide technical and financial assistance to landowners for habitat management for LEPC. Range-wide efforts include the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service's (NRCS) LEPC Conservation Initiative and Environmental Quality Incentives Program, and the USDA Farm Service Administration's Conservation Reserve Program. In addition, there are numerous conservation efforts being led at state and regional programs such as the USFWS Partners for Fish and Wildlife Program in all five LEPC states, the U.S. Forest Service (USFS) Cimarron and Comanche National Grasslands management, the U.S. Bureau of Land Management (BLM) Lesser Prairie-Chicken Habitat Preservation Area of Critical Environmental Concern. These existing Federal conservation programs provide a net conservation benefit to the LEPC across its range. In addition to the current benefits being provided by these programs, the USFWS' SSA (USFWS 2021) projected the benefits of several of these efforts to the LEPC over the next 25 years at different levels of intensity, including efforts to enhance existing LEPC habitat (Table 5.1) across the four ecoregions occupied by the LEPC. Additionally, there are multiple LEPC state led and private conservation efforts ongoing across the range of the of the LEPC, including, but not limited to, the Range-Wide Lesser Prairie-Chicken Conservation Plan and associated oil and gas CCAA, the Texas agricultural CCAA, the Oklahoma agriculture CCAA, the CCA/CCAA covering oil and gas as well agricultural activities in New Mexico, conservation actions by the State Wildlife Agencies, and by the Nature Conservancy. For a complete description of the current and projected future benefits of these programs please refer to the USFWS LEPC SSA (USFWS 2021).

Table 5.1. Projected acreage of LEPC habitat enhancement from selected Federal sources over the next 25 years above and beyond the existing level of effort (USFWS 2021).

Enhancement Efforts	Total Level of Future Effort (Acres) at Year 25		
	Low	Continuation	High
Short-Grass/CRP Ecoregion			
NRCS LPCI Grazing Plan	0	0	4,000
USFWS PFW Contract	14,000	14,000	20,000
Mixed-Grass Ecoregion			
NRCS LPCI Grazing Plan	0	0	58,000
USFWS PFW Contract	50,000	50,000	70,000
Sand Sagebrush Ecoregion			
NRCS LPCI Grazing Plan	0	0	13,000
USFWS PFW Contract	0	6,000	18,000
Shinnery Oak Ecoregion			
NRCS LPCI Grazing Plan	0	0	39,000
USFWS PFW Contract	5,000	15,000	50,000
BLM Prescribed Fire	0	25,000	100,000

Additionally, in December 2021, the Service approved an HCP covering impacts from renewable energy development on the LEPC. The renewables HCP covered the same area as this oil and gas HCP and utilized the same methodology to quantify and offset impacts to the species. The renewables HCP included 300,000 acres of take coverage for the Northern DPS of the LEPC and 200,000 acres for the Southern DPS of the LEPC. The renewables HCP was designed to fully offset impacts from covered activities and thus it is not expected to substantially impact the baseline.

Because the HCP Permit Area (Action Area) includes the entire range of the LEPC, refer to Status of the Species section (Section 4) of this opinion to address the Status of the Species in the Action Area.

6.0 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).

6.1 Effects Resulting from Covered Activities

The Covered Activities for the HCP include all activities associated with oil and gas buildout, including ancillary (e.g., access road) ground disturbing activities associated with these project types within the HCP Permit Area that could impact potentially suitable LEPC habitat. In addition, the Covered Activities include grassland improvement and management activities that could occur in potential LEPC habitat on mitigation parcels in order to manage the parcel for LEPC. Adverse effects to LEPC resulting from these covered activities are described below, or referenced to prior sections of this Opinion.

6.1.1 Upstream development of oil and gas projects

Site preparation, construction, and operation and maintenance of these covered activities and their associated ancillary ground disturbing activities can result in disturbance of individuals and further habitat loss and fragmentation for LEPC. Refer to Section 4.6 (Threats) for more detailed descriptions of the effects from each of these actions on the LEPC.

6.1.2 Midstream development associated with oil and gas projects

Site preparation, construction, and operation and maintenance of these covered activities and their associated ancillary ground disturbing activities can result in disturbance of individuals and further habitat loss and fragmentation for LEPC. Refer to Section 4.6 (Threats) for more detailed descriptions of the effects from each of these actions on the LEPC.

6.1.3 Mitigation activities involving grassland improvement and management

Activities that can impact potentially suitable LEPC habitat could occur on mitigation parcels during improvement and management activities to enhance or maintain habitat for LEPC. These activities, while intended to ultimately result in a net benefit to LEPC in the long-term, may initially have temporary impacts, as described below.

Fire Management: Areas burned during fire management activities could temporarily become inaccessible or unsuitable for LEPC until the targeted grass and forb species regrow, or could injure, kill, or destroy LEPC nests if present in the immediate vicinity of fire management activities. Ultimately, fire management activities are expected to benefit LEPC in the long-term by improving overall habitat quality, however short-term impacts could occur initially.

Erosion Control: While erosion control measures would be implemented to maintain or improve LEPC habitat, vehicles and equipment used during site preparation and seeding (or structure installation for the protection of water resources) could injure, kill, or destroy LEPC nests if present in the immediate vicinity of erosion control activities. In addition, increased noise and human presence could displace LEPC (if present on site) temporarily from the area.

Mechanical Brush Control: Noise and increased human presence associated with these activities could temporarily displace LEPC in the general vicinity of activities from otherwise suitable habitat. In addition, the machinery used could injure, kill, or destroy LEPC nests (if present) in the immediate area where mechanical brush control is implemented.

Herbicide Treatment: Noise and increased human presence associated with these activities could temporarily displace LEPC in the general vicinity of activities from otherwise suitable habitat. In addition, if methods other than hand application is implemented, the machinery used could injure, kill, or destroy LEPC nests (if present) in the immediate area where an herbicide treatment is being applied.

Grazing Management: Livestock grazing could be implemented on some HCP mitigation parcels as a means to manage the vegetation composition of the parcel and maintain healthy grasslands. Livestock allowed to graze on mitigation parcels are unlikely to disturb adult LEPC but could damage or destroy LEPC nests (if present) by trampling them. LEPC nests could also be trampled when livestock are herded and moved between grazing areas. In addition, increased human presence associated with the management of livestock (e.g., stock tank and feeder maintenance, herding livestock between pastures, and monitoring) could temporarily displace LEPC in the general vicinity of activities from otherwise suitable habitat.

Range Planting: Range planting could be used on some HCP mitigation parcels to restore or enhance LEPC habitat. Various types of equipment can be used to plant native vegetation ranging from hand-held tools to heavy machinery. The machinery used could injure, kill, or destroy LEPC nests (if present) in the immediate area where planting is implemented. Noise and increased human presence associated with these activities could also temporarily displace LEPC in the general vicinity of activities from otherwise suitable habitat.

Forage Harvest Management: Noise and increased human presence associated with these activities could temporarily displace LEPC in the general vicinity of activities from otherwise suitable habitat. In addition, the machinery used could injure, kill, or destroy LEPC nests (if present) in the immediate area where forage harvest management is implemented.

Fence Installation: LEPC collisions with fences have not been observed directly but are suspected based on mortality studies conducted along fence lines (Robinson et al. 2016, see Section 4.6.2.5).

6.2 Summary of Effect to the Species

Implementation of the Covered Activities is expected to result in take of LEPC through habitat destruction and displacement from habitats that otherwise would have been used, loss or a reduction in habitat quality, destruction of nests, and mortality to individuals. Displacement into lower quality habitat could result in direct impacts to fitness parameters (e.g., nest, brood, and individual mortality). Of these impacts, loss of suitable habitat and subsequent displacement of individuals is the principal reason for population declines (USFWS 2021). Impacts to LEPC would occur throughout the species' annual cycle: wintering, spring breeding/lekking season, nesting, early brood rearing (summer), and late brood rearing (summer-fall). Impacts could occur later in time, leading to take through decreased survivorship or fecundity due to compromised access to suitable foraging, nesting, sheltering, and wintering habitat, or from the introduction of barriers to movement and therefore reduced/altered access to essential habitat components of the LEPC annual cycle. Take can occur if impacts meet the definition of harm (i.e., significant habitat alteration or reduction occurs to the degree that essential behavioral patterns are significantly impaired, resulting in death or injury of an individual). For LEPC, such habitat alterations may compromise the species' ability to complete the breeding/nesting cycle, meet bioenergetic demands, or expose individuals to other environmental stressors, such as predation and increased disturbance that lead to death or injury.

As described in Section 4.6, oil and gas activities can lead to increased habitat fragmentation and loss of suitable habitat, the effects of which are expected to extend beyond the boundaries of project footprints causing LEPC displacement or avoidance of otherwise suitable habitats (USFWS, 2021). Take may occur where LEPC avoid or have limited access to otherwise suitable habitat due to the presence of oil and gas infrastructure or where potentially suitable LEPC habitat is removed or degraded. However, as described in Section 3.5.2.2, the HCP also provides minimization measures to address impacts to individuals. These measures include seasonal and location-specific practices that reduce the likelihood that individual LEPC could be injured or killed while occupying breeding, nesting, or brooding sites.

While the population-level implication of direct impacts leading to take of individuals is less well established than the loss of suitable habitat as described above, take of individual LEPC could also potentially occur through collision with anthropogenic structures when flying or running. Impacts to individual LEPC could also potentially result from crushing by vehicles or other motorized equipment during construction, operations or mitigation maintenance activities.

Construction, as well as some conservation activities implemented on mitigation parcels to improve or maintain LEPC habitat, could result in LEPC mortality if it caused the destruction of a nest or hatchling/pre-fledgling birds. Potential construction- or mitigation-related mortality of adult or juvenile LEPC is considered unlikely due to mobility of individuals; however suspected collisions by adult LEPC with livestock fencing have been documented, though mortality risk is expected to be insignificant (Robinson et al. 2016). Impact minimization measures further reducing the risk of construction-related disturbance to brooding hens and chicks are described in Section 3.5.2.2 and mitigation-specific conservation plans will reduce risks to LEPC on mitigation parcels. Collision with vehicles or other motorized equipment by LEPC could potentially occur during any life stage. However, the generally minimal and infrequent traffic on roads directly related to projects and on mitigation parcels is not likely to present a substantial risk to LEPC.

In addition, as described in Section 3.5.2.2 of this Opinion, the HCP provides seasonal and location-specific practices to reduce the likelihood that individual LEPC could be directly injured, killed, or disrupted while occupying breeding, nesting, or brooding sites. Impact avoidance and minimization measures to reduce the risk of vehicle collision during construction are described in Section 3.5.2.2 and mitigation-specific conservation plans will reduce risk on mitigation parcels. A project-specific Conservation Plan for Mitigation Parcels will be developed for all mitigation parcels that are not obtained through a USFWS-approved bank or in lieu fee program, to ensure all conservation management activities are appropriately executed and timed to minimize risks to any LEPC currently occupying a mitigation parcel and provide the intended long-term benefits (HCP Section 9.2).

Though take resulting from maintenance of performance standards on mitigation parcels may occur, take of LEPC associated with grassland improvement and management activities on mitigation secured through a USFWS-approved bank or in-lieu fee program will be covered under a Section 10(a)(1)(A) permit associated with the existing banking or in-lieu fee program agreement between the mitigation provider and the USFWS. Take associated with grassland improvement and management activities for mitigation under the HCP will be covered under the ITP pending approval by USFWS and USFWS-acceptance of a mitigation project-specific Conservation Plan for Mitigation Parcels (HCP Section 9.2). The application for the ITP anticipates incidental take on up to 500,000 acres over 30 years and it is expected to be fully offset through a combination of restoration and preservation that will result in a net benefit to the species. Compliance and effectiveness monitoring, and reporting requirements will provide details annually.

As discussed previously within this opinion, the HCP uses habitat as a proxy for take. The effects of the action described above are expected to occur on portions of 500,000 ac, with 200,000 ac expected to occur within the Southern DPS of the LEPC and 300,000 ac to occur within the Northern DPS of the LEPC for the covered activities. All impacts are expected to be mitigated. A minimum of 50% of the mitigation must be provided via traditional permanent mitigation which is static on the landscape and includes a conservation easement. The HCP allows the remainder of the conservation to be provided via dynamic permanent mitigation. The HCP will provide ecologically effective mitigation offsets for impacts and will also provide quantifiable progress toward securing additional strongholds for the LEPC. The amount of take resulting from individual projects will be measured using the process outlined in Section 4.4 of the HCP.

7.0 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 Opinion (50 CFR 402.02).

The Action Area consists primarily of private and State lands interspersed with public land. Federally unregulated activities on state and private lands may adversely affect the LEPC through a variety of avenues. Many of these threats may exacerbate the normal effects of periodic drought on LEPC populations. Conversely, certain land management programs currently provide conservation benefits to the species and directly address threats to the LEPC. Major cumulative effects on LEPC populations are discussed below:

Energy Production/Transmission:

- <u>Wind Energy Development</u> – As discussed in Section 4.6.1.3 of this Opinion, the development of wind energy has the potential to impact the LEPC resulting in habitat loss and fragmentation. For a complete discussion on the of wind energy development refer to Section 4.6.1.3. Within the LEPC SSA, the USFWS (2021) projects potential habitat loss for the LEPC from wind energy development under three separate scenarios. Those projections indicate that within the Northern DPS between 122,400 - 261,500 ac and in the Southern DPS between 41,700 - 66,500 ac of LEPC habitat may be adversely impacted over the next 25 years (USFWS 2021).

- <u>Petroleum and Natural Gas Production</u> – Section 4.6.1.2 of this Opinion describes the potential loss and fragmentation of LEPC habitat resulting from petroleum and natural gas production. Within the LEPC SSA, the USFWS (2021) projects potential habitat loss for the LEPC from wind energy development under three separate scenarios. Those projections indicate that within the Northern DPS between 112,730 - 356,593 ac and in the Southern DPS between 136,539 - 243,749 ac of LEPC habitat may be adversely impacted over the next 25 years (USFWS 2021).
- <u>Solar Energy Development</u> – The development of solar energy facilities within the Plan Area also has the potential to impact the LEPC resulting in habitat loss and fragmentation. Impacts to the LEPC may be similar to those resulting from other actions which remove or fragment LEPC habitat. Although the USFWS expects new solar projects to be developed within the Plan Area, we do not have a means to project the extent of these impacts due to lack of data (USFWS 2021).
- <u>Energy Transmission Line Development</u> **-** As discussed in Section 4.6.1.3 of this Opinion, the development of new energy transmission line projects has the potential to impact the LEPC resulting in habitat loss and fragmentation. While the USFWS has been able to analyze the current impacts of transmission lines on the LEPC, due to the lack of information available to project the location (and thus effects to LEPC habitat), we could not quantify the future potential effect of habitat loss and fragmentation on the LEPC which could be caused by transmission line development. However, we do acknowledge potential habitat loss and fragmentation from transmission lines is likely to continue depending upon their location (USFWS 2021).

Land management practices:

- <u>Conversion of grassland to cropland</u> - Because much of the arable lands (lands capable of being used for row crops) have already been converted to cultivated agriculture, we do not expect future rates of conversion of grassland to cultivated agriculture to reach the level of conversion witnessed historically; however, conversion has continued to occur. Rates of future conversion of grasslands to cultivated agriculture in the Action Area will be affected by multiple variables including site-specific biotic and abiotic conditions as well as socioeconomic influences such as governmental agriculture programs, commodity prices, and the economic benefits of alternative land use practices. Within the LEPC SSA, the USFWS (2021) projects potential habitat loss for the LEPC from the conversion of grassland to cropland under three separate scenarios. Those projections indicate that within the Northern DPS between 136,469 – 378,766 ac and in the Southern DPS between 21,985 – 93,946 ac of LEPC habitat may be adversely impacted over the next 25 years (USFWS 2021).

- Livestock grazing - Grazing is expected to continue to be a primary land use on the remaining areas of grassland within the range of the LEPC in the future, and grazing has the ability to drastically influence habitat suitability for the LEPC. The USFWS' SSA for the LEPC (USFWS 2021) indicates that grazing can be an invaluable tool when managed to produce habitat conditions for the LEPC, although overutilization can have significant negative effects. Grazing management varies both spatially and temporally across the landscape. Additionally, grazing management could become more difficult in the face of a changing climate with more frequent and intense droughts. We acknowledge livestock grazing will influence LEPC populations in the future.
- Fire - As the effects of fire suppression continue to manifest throughout the Great Plains, the future impacts of wildfires on the LEPC are difficult to predict. If recent patterns continue with wildfires occurring at increasingly larger scales with less frequency and higher intensities than historical fire occurrence, there is an increasing potential of greater negative impacts on LEPC. Additionally, as climate change projections are indicating the possibility of longer and more severe droughts across the range of the LEPC, this could alter the vegetation response to fire both temporally and spatially. We are not able to quantify these impacts across the Action Area, but we acknowledge that fire (both prescribed fires and wildfire), or its absence, will continue to be an ecological driver across the range of the LEPC in the future with potentially positive and negative effects across both short-term and long-term timelines.
- Woody vegetation encroachment - Numerous studies have documented the continued increase in woody vegetation into grassland ecosystems. Due to the past encroachment trends and continued suppression of fire across the range of the LEPC, we expect this encroachment of woody vegetation into grasslands to continue, which will result in further loss of LEPC habitat. The degree of future habitat impacts will depend on land management practices and the level of conservation efforts for woody vegetation removal. Within the LEPC SSA, the USFWS (2021) projects potential habitat loss for the LEPC from the woody vegetation encroachment under three separate scenarios. Those projections indicate that within the Northern DPS between 360,512 – 875,823 ac and in the Southern DPS between 11,548 – 170,653 ac of LEPC habitat may be adversely impacted over the next 25 years (USFWS 2021).
- Shrub control and eradication - The removal of native shrubs such as sand shinnery oak is an ongoing concern to LEPC habitat availability throughout large portions of the EOR, particularly in New Mexico, Oklahoma, and Texas. Suitable LEPC habitat historically included shrubs, and the permanently removal of shrubs may result in habitat that fails to meet the basic needs of the species, such as foraging, nesting, predator avoidance, and thermoregulation. In this portion of the range, nesting habitat primarily consists of low-growing shrubs and native grasses. In a few instances, herbicide use may aid in the restoration of LEPC habitat by allowing native grasses to increase where dense monocultures of sand shinnery oak exist. While relatively wide scale shrub eradication has occurred in the past, we do not have geospatial data to evaluate the extent to which shrub eradication may continue to contribute to habitat loss and fragmentation for the LEPC. While some Federal agencies such as BLM limit this practice in LEPC habitat, the practice still occurs through some Federal programs and on private lands. We do not have data available to project the potential scale of habitat loss likely to occur in the future due

to shrub eradication.

- Collision mortality from fences - Mortality due to fence collision could have an impact on the LEPC but appears to be a function of fence density. Areas with lower fence densities (for example, New Mexico) likely have less of an impact than areas with higher fence densities (for example, Oklahoma). We do not expect fencing to have a major influence on LEPC populations in the future except for localized effects in areas with high densities of fences.

Non-federal road construction: We acknowledge that some additional habitat loss and fragmentation will occur in the future due to construction of new roads, but we do not have data available to inform projections on how much and where any potential new development would occur.

Hunting, and other recreational, educational, and scientific use: The LEPC is currently not permitted for hunting in any state, and thus we do not expect hunting to affect the LEPC in the future. Additionally, while other recreational, educational, and scientific uses have the potential to have some localized impacts, there is no evidence to suggest that these impacts will have a detectable effect on the LEPC population in the future.

Land management programs to benefit the LEPC: Within the Action Area are a number of state, and private programs that currently provide conservation benefits to the species and directly address threats to the LEPC. Certain programs provide technical and financial assistance to landowners for habitat management for LEPC. Several programs address industry siting, best management practices, and avoidance minimization and voluntary mitigation. Range-wide efforts include the Western Association of Fish and Wildlife Agencies' (WAFWA) LEPC Range-wide Conservation Plan. In addition, there are numerous conservation efforts being led by state and regional programs such as: Kansas Department of Wildlife Parks and Tourism's Habitat First; the Shortgrass Prairie Initiative in Colorado by The Nature Conservancy and Colorado Department of Transportation; Colorado Parks and Wildlife LEPC Habitat Improvement Program; Oklahoma Department of Wildlife Conservation LEPC Candidate Conservation Agreement with Assurances (CCAA); Oklahoma Department of Wildlife Conservation Wildlife Management Areas; Texas Parks and Wildlife Department LEPC CCAA; The Nature Conservancy properties in New Mexico; the New Mexico Candidate Conservation Agreement and CCAA; and Prairie Chicken Areas owned by New Mexico Department of Game and Fish. Collectively, these existing conservation programs provide a net conservation benefit to the LEPC across its range. The USFWS' SSA (USFWS 2021) projected several of these efforts into the future at different levels of intensity, including efforts to enhance existing LEPC habitat (Table 7.1) across the four ecoregions occupied by the LEPC (refer to Figure 4.1).

Table 7.1. Projected acreage of LEPC habitat enhancement from selected non-Federal sources over the next 25 years above and beyond the existing level of effort (USFWS 2021).

Enhancement Efforts	Total Level of Future Effort (Acres) at Year 25		
	Low	Continuation	High
Short-Grass/CRP Ecoregion			

KDWPT Enhancement Contract	0	6,740	17,500
Mixed-Grass Ecoregion			
WAFWA Management Plan	0	0	118,245
KDWPT Enhancement Contract	0	120	3,100
ODWC Management	1,400	3,300	6,400
ODWC Additional CCAA Enrollment	0	50,000	100,000
TPWD Additional CCAA Enrollment	0	0	55,000
Sand Sagebrush Ecoregion			
KDWPT Enhancement Contract	0	720	4,400
CPW Enhancement Contract	0	12,200	37,900
Shinnery Oak Ecoregion			
WAFWA Management Plan	0	0	8,129
NM CCAA Prescribed Fire	50,000	100,000	150,000
TPWD Additional CCAA Enrollment	0	25,000	60,000

CONCLUSION

After reviewing the current status of the LEPC in the Northern DPS, the environmental baseline, the effects of the proposed action and cumulative effects for this area, it is our conference opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Northern DPS of the LEPC. We anticipate that the implementation of the proposed action will not appreciably diminish the likelihood of both the survival and recovery of the Northern DPS of the LEPC. We base this conclusion on the following:

- Within the SSA for the LEPC, we estimated a maximum of approximately 3,000,000 ac of the LEPC habitat with the Northern DPS of the LEPC. While the requested 300,000 ac of take for this DPS would make up approximately 10% of the total acres of LEPC habitat, the HPC requires mitigation that when implemented will fully offset the impacts. The design of the mitigation framework established within the HCP accounts for both temporal and spatial impacts to the LEPC.
- It is required that all mitigation will be in place and meeting performance standards prior to impacts occurring to ensure there is no temporal loss for the species.
- The HCP implements a strategy that was developed in close coordination with the USFWS to ensure all effects that rise to the level of take are accounted for using the best available scientific information.
- Once take is quantified, using habitat as a proxy, that take must be mitigated for using the tiered mitigation system established within the HCP based upon the relative value of the habitat as defined by the Southern Great Plains CHAT. Impacts to higher priority areas will require higher mitigation ratios as compared to impacts in lower priority areas. Overall, the mitigation ratios average 2 ac of mitigation for every 1 ac of impact. Additionally, all impacts must be offset using mitigation occurring in priority areas of equivalent or higher value areas as defined by the Southern Great Plains CHAT.

- After year 5, or the first 50,000 ac of mitigation are sold, for every 1 acre of impact, the HCP requires an additional minimum of 1 ac of restoration to result in no net loss of habitat. The remainder of the required mitigation can be targeted at additional restoration efforts or habitat enhancement.
- If all 300,000 ac of take for the Northern DPS are utilized for development this would result in mitigation requirements, on average, of approximately 300,000 ac of restoration actions and 300,000 ac of additional mitigation which could be targeted towards either restoration or enhancement of existing habitat. All of the 600,000 total ac of mitigation would be required to be permanent. To ensure no net loss of habitat, on average, 1 ac of restoration for every 1 ac lost to development is required. An additional acre of either restoration or enhancement is required to account for the inherent uncertainties associated with the success of mitigation.
- The HCP requires that all required mitigation be permanent. A minimum of 50% of the mitigation must be provided via traditional permanent mitigation which is static on the landscape and includes a conservation easement. The HCP allows the remainder of the conservation to be provided via dynamic permanent mitigation.
- Static mitigation, including restoration and preservation of LEPC habitat, will meet all requirements set forth in the LEPC Mitigation Guidelines (USFWS 2014b). Dynamic mitigation, including restoration and preservation of LEPC habitat, will meet all requirements defined by the LEPC Mitigation Guidelines (USFWS 2014b) except for those relating to permanent conservation easement and components thereof.
- By utilizing the USFWS' LEPC Mitigation Guidelines (USFWS 2014b) while focusing on the creation of strongholds for the LEPC, the HCP will provide ecologically effective mitigation offsets for impacts and will also provide quantifiable progress toward securing additional strongholds for the LEPC.
- The HCP's measures to avoid, minimize and mitigate the impacts of taking are designed so that the mitigation ratios increase for impacts to higher quality LEPC habitat which compels developers to consider siting projects in areas where impacts from project footprints (physical habitat loss) and associated impact boundaries (function habitat loss) are minimized and/or occur within less suitable habitat. Mitigation ratios and credits are valued to create an incentive for minimizing impacts.
- The HCP incorporates adaptive management principles and processes including monitoring data to provide information about the need for, and type of, adjustments that should be made to the minimization and mitigation measures conformant with the assurances of the HCP. If it is found the mitigation (e.g., credits) does not lead to decreased fragmentation and disturbance of potentially suitable LEPC habitat, such that the majority (65%) of land cover within enrolled project footprints are intact grassland/shrubland cover, then adaptive management will be triggered to further disincentive habitat fragmentation by adjusting mitigation ratios.

After reviewing the current status of the LEPC in the Southern DPS, the environmental baseline, the effects of the proposed action and cumulative effects for this area, it is our conference opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Southern DPS of the LEPC. We anticipate that the implementation of the proposed action will not appreciably diminish the likelihood of both the survival and recovery of the Southern DPS of the LEPC. We base this conclusion on the following:

- Within the SSA for the LEPC we estimated that a maximum of approximately 1,000,000 ac of the LEPC habitat occurs within the Southern DPS of the LEPC. While the requested 200,000 ac of take for this DPS would make up approximately 20% of the total acres of LEPC habitat, the HCP requires mitigation that when implemented will fully offset the impacts. The design of the mitigation framework established within the HCP accounts for both temporal and spatial impacts to the LEPC.
- It is required that all mitigation be in place and meeting performance standards prior to impacts occurring to ensure there is no temporal loss for the species.
- The HCP implements a strategy that was developed in close coordination with the USFWS to ensure all effects that rise to the level of take are accounted for using the best available scientific information.
- Once take is quantified, using habitat as a proxy, that take must be mitigated for using the tiered mitigation system established within the HCP based upon the relative value of the habitat as defined by the Southern Great Plains CHAT. Impacts to higher priority areas will require higher mitigation ratios as compared to impacts in lower priority areas. Overall, the mitigation ratios average 2 ac of mitigation for every 1 ac of impact. Additionally, all impacts must be offset using mitigation occurring in priority areas of equivalent or higher value areas as defined by the Southern Great Plains CHAT.
- After year 5, or the first 50,000 ac of mitigation are sold, for every 1 ac of impact the HCP requires a minimum of 1 acre of restoration to result in no net loss of habitat. The remainder of the required mitigation can be targeted at additional restoration efforts or habitat enhancement.
- If all 200,000 ac of take for the Southern DPS are utilized for development this would result in mitigation requirements, on average, of approximately 200,000 ac of restoration actions and 200,000 ac of additional mitigation which could be targeted towards either restoration or enhancement of existing habitat. All of the 400,000 total ac of mitigation would be required to be permanent. To ensure no net loss of habitat, on average 1 ac of restoration is required for every 1 ac lost development. An additional acre of either restoration or enhancement is required to account for the inherent uncertainties associated with the success of mitigation.
- The HCP requires that all required mitigation be permanent. A minimum of 50% of the mitigation must be provided via traditional permanent mitigation which is static on the landscape and includes a conservation easement. The HCP allows the remainder of the conservation to be provided via dynamic permanent mitigation.
- Static mitigation, including restoration and preservation of LEPC habitat, will meet all requirements set forth in the LEPC Mitigation Guidelines (USFWS 2014b). Dynamic mitigation, including restoration and preservation of LEPC habitat, will meet all requirements defined by the LEPC Mitigation Guidelines (USFWS 2014b) except for those relating to permanent conservation easement and components thereof.
- By utilizing the USFWS' LEPC Mitigation Guidelines (USFWS 2014b) while focusing on the creation of strongholds for the LEPC, the HCP will provide ecologically effective

mitigation offsets for impacts and will also provide quantifiable progress toward securing additional strongholds for the LEPC.

- The HCP's measures to avoid, minimize and mitigate the impacts of taking are designed so that the mitigation ratios increase for impacts to higher quality LEPC habitat which compels developers to consider siting projects in areas where impacts from project footprints (physical habitat loss) and associated impact boundaries (function habitat loss) are minimized and/or occur within less suitable habitat. Mitigation ratios and credits are valued to create an incentive for minimizing impacts.
- The HCP incorporates adaptive management principles and processes including monitoring data to provide information about the need for, and type of, adjustments that should be made to the minimization and mitigation measures conformant with the assurances of the HCP. If it is found the mitigation (e.g., credits) does not lead to decreased fragmentation and disturbance of potentially suitable LEPC habitat, such that the majority (65%) of land cover within enrolled project footprints are intact grassland/shrubland cover, then adaptive management will be triggered to further disincentive habitat fragmentation by adjusting the mitigation ratios.

The conclusions of this conference opinion are based on full implementation of the project as described in the Description of the Proposed Action section (Section 2.0) of this document, including any conservation measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA 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 ESA 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 ESA do not apply unless the species is listed. However, the USFWS 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.

If the LEPC or any Distinct Population Segment is listed under the ESA, the measures described below are non-discretionary, and must be undertaken by the USFWS for the exemption in section 7(o)(2) to apply. The USFWS has a continuing duty to regulate the activity covered by this incidental take statement. If the USFWS (1) fails to assume and implement the terms and conditions or (2) fails to require the Applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the USFWS must report the progress of the action and its impact on the species as specified in the incidental take statement. [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

The estimated potential take of LEPC that could result from Covered Activities will be measured using acres of suitable LEPC habitat (as defined in Section 4.4 of the HCP) affected by individual projects participating in the HCP as a surrogate for direct take of LEPC individuals. A surrogate is required for the following reasons: 1) it is difficult to determine LEPC numbers at a site and predict how many individuals would be taken by development of oil and gas projects within the Permit Area or implementation of grassland improvement and management activities; 2) the location and amount of suitable LEPC habitat can be readily quantified using geographic information systems (GIS) data; and 3) habitat loss and fragmentation is the primary threat affecting LEPC populations (79 FR 19973 [April 10, 2014]). Thus, because it is impracticable to express take or conservation benefits in terms of individuals, both the impacts of activities and the mitigation of those impacts are measured in acres of habitat.

There is a causal link between construction of anthropogenic features described in the covered activities and effects that may rise to the level of take of LEPC as these development activities result in habitat modification or degradation that significantly impairs the essential behavioral patterns of the LEPC. For instance, the infrastructure associated with the development of oil and gas, including roads and powerlines, has been documented to result in avoidance of otherwise suitable habitat by grouse (USFWS 2021). Use of a surrogate for expressing take is consistent with current USFWS guidance that acknowledges that when the numerical amount of anticipated incidental take of individuals is difficult to determine, the acres of habitat affected may then be substituted for as a surrogate for take prediction, as provided in Section 8.2.2 of the HCP Handbook (USFWS and NMFS 2016).

While the HCP provides a rough estimate of all oil and gas buildout within the Permit Area that may impact LEPC, it is infeasible to precisely determine the acreage of impacts that could occur from project development in the Permit Area over the ITP term. In addition, it is infeasible to determine the total amount of mitigation that will be provided from sources other than a USFWS-approved bank or in-lieu fee program. However, the requested authorized amount of take associated with the HCP is capped at 500,000 ac of potentially suitable LEPC habitat, with 300,000 ac for the Northern DPS of the LEPC and 200,000 ac of for the Southern DPS of the LEPC. Take associated with projects enrolled under the HCP will be calculated as impacts to potentially suitable LEPC habitat as defined through the project-specific Impact Assessment procedures described in Section 4.4 of the HCP, regardless of the specific type of project being constructed. Take associated with grassland improvement and management activities on mitigation parcels covered under the HCP will be calculated as the total acres of mitigation secured by means other than a USFWS-approved bank or in-lieu fee program. All LEPC take resulting from implementation of the HCP will be authorized through the associated 10(a)(1)(B) ITP should the species become listed during the life of the ITP.

EFFECT OF 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. We have also determined that the level of anticipated take is not likely to result in jeopardy to the Southern DPS of the LEPC. Although we anticipate incidental take to occur, the implementation of the conservation measures and mitigation requirements proposed should ultimately result in minimization and offsetting of adverse effects.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

All conservation measures within the HCP including mechanisms to determine appropriate mitigation, mitigation effectiveness and compliance monitoring, structuring of mitigation cost to incentivize avoidance of high-quality LEPC habitats, and avoidance and minimization measures are incorporated herein by reference as reasonable and prudent measures and terms and conditions to address the incidental take of the LEPC. No additional reasonable and prudent measures were identified during the conference.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA 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. We do not have any additional conservation recommendations at this time.

Reinitiation Notice

This concludes the conference for the proposed issuance of an ITP under section 10 of the ESA for the proposed Oil and Gas HCP for the LEPC in Colorado, Kansas, New Mexico, Oklahoma, and Texas. The USFWS may confirm the conference opinion as a biological opinion if the proposed species is listed. If there have been no significant changes in the action as planned or in the information used during the conference, the USFWS will confirm the conference opinion as the biological opinion for the project and no further intra-service section 7 consultation will be necessary with regard to the LEPC.

After listing as threatened or endangered and any subsequent adoption of this conference opinion, the USFWS shall re-initiate consultation if: 1) the amount or extent of incidental take for either DPS 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 if there are changes that warrant additional consultation. Modifications of the opinion and incidental take statement may be appropriate to reflect that take.

We appreciate your collaboration in this effort. If further assistance or information is required, please contact Clay Nichols at clay_nichols@fws.gov or Omar Bocanegra at omar_bocanegra@fws.gov.

cc: Field Supervisor, Ecological Services, Tulsa, Oklahoma; Albuquerque, NM; Manhattan, KS; Lakewood, CO

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