Kansas Ornithological Society

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6 July 2009

Mike Hayden, Secretary
Kansas Department of Wildlife and Parks
1020 Sth Kansas, RM 200
Topeka, KS 66612-1327

Edwin J. Miller
T & E Program Coordinator
Kansas Department of Wildlife and Parks
5089 CR 2925
Independence, KS 67301

Dear Secretary Hayden and Mr. Miller:

Every five years Kansas Department of Wildlife and Parks (KDWP) is responsible for reviewing the listing of rare species of fauna as Endangered, Threatened, or Species-in-Need-of-Conservation as required by Kansas statute (K.S.A. 32-960). A Threatened and Endangered Species Task Committee (Committee) oversees the process and makes listing recommendations to the Secretary of KDWP. The recommended changes must then be approved by the KDWP Commission. In 2008, the Committee solicited input from other entities regarding listing, delisting, uplisting, or downlisting of Kansas wildlife as part of the review process. The Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*), hereafter LPC, was not petitioned for listing. The US Fish and Wildlife Service (USFWS) completed a review of the LPC in November 2008 to reassess its candidate status. The USFWS review was completed after solicitation and review of petitions received by KDWP. Moreover, recent published data underscores the vulnerability of the species rangewide.

As such, new data on potential threats to existing populations of LPCs in Kansas necessitates the enclosed emergency petition, pursuant to the authority under K.S.A. 32-960, for the Secretary of KDWP to consider the LPC as a "threatened" species in Kansas. Therefore, the Kansas Ornithological Society as lead petitioner, and Kansas Birds Records Committee, Wichita Audubon Society, Jayhawk Audubon Society, Northern Flint Hills Audubon Society, Burroughs Audubon Society, Topeka Audubon Society, and Smoky Hills Audubon Society, collectively as co-petitioners, request your review and action on the attached emergency petition that we believe warrants emergency State listing of the LPC as "threatened" in Kansas.

On behalf of the petitioners, the point of contact's for all technical aspects related to this petition include:

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while general correspondence can be directed to the lead petitioner, the Kansas Ornithological Society.

We look forward to any inquiries you have in regards to this action and are willing to answer any questions regarding the listing of the LPC. Thank you for your consideration on this matter.

Respectfully Submitted;

Nancy J. Leo, President
Kansas Ornithological Society

Co-Petitioners:

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EMERGENCY PETITION SPECIES REVIEW
6 July 2009
Petition for Species Review to List the Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*)

Kansas Department of Wildlife and Parks (KDWP) is responsible for listing rare species of fauna in KS as Endangered, Threatened, or Species-in-Need-of-Conservation (SINC). Every five years the list is reviewed as required by statute (K.S.A. 32-960). A Threatened and Endangered Species Task Committee (Committee) oversees the process and makes listing recommendations to the Secretary of KDWP. The recommended changes must then be approved by the KDWP Commission.

The Committee solicited input from other sources regarding listing, delisting, uplisting, or downlisting of KS wildlife in 2008 as part of the review process. The Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*), hereafter LPC, was not petitioned for listing. The US Fish and Wildlife Service (USFWS) completed a review of the LPC in November of 2008 to reassess its candidate status. The USFWS review was completed after solicitation and review of petitions received by KDWP, moreover, a paper just published underscores the vulnerability of the species rangewide. As such, new data on potential threats to existing populations in KS necessitates a petition that warrants emergency State listing of the LPC in KS.

PETITION FOR EMERGENCY SPECIES REVIEW 6 July 2009

Species Common Name: ___Lesser Prairie-Chicken_____

Species Scientific Name: ___*Tympanuchus pallidicinctus*_____

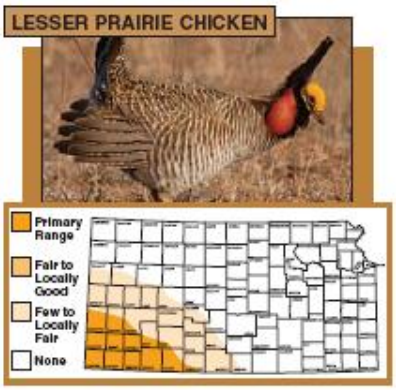
Recommended change in petition species status (please circle or check):
List as: ___ Endangered _X__ Threatened ___ Species-in-need-of-conservation (SINC)
And/or remove from: ___Endangered ___ Threatened ___SINC

1) Describe the species' current distribution and abundance:
In Kansas: The current range in the western portion of the State is approximately 29,130 sq km, within all or part of 35 counties since 1999. Houts et al. (in press) using GIS and the KS GAP vegetation map determined that there is between 2,221,133 ha (5,488,539 ac) and 2,903,364 ha (7,174,369 ac) of suitable LPC habitat remaining. Recently, LPC distribution in Kansas has moved northward. At the same time the Greater Prairie-Chicken (hereafter GPC, *Tympanuchus cupido*) range has expanded northwestward in Kansas. As a result of these changes a hybrid zone now exists between the two species in approximately eleven northwestern counties and individuals of both species have been reported at the same lek in Pawnee County. A hybridization rate of about 2.5% was estimated on at least one survey route (Bain and Farley 2002, USFWS 2008).

Based on survey routes and the National Gap Analysis, the estimated population for LPCs in 2006 was between 19,700 and 31,100 individuals (Rodgers 2007a, USFWS 2008). KDWP survey route data from 2005 and 2006 were not statistically significant from each other (n = 15 routes, 14.2 and 16.3 LPC/sq km respectively, Rodgers 2006, 2007b). However, in 2007 there was a statistically significant reduction by 38%, down to 10.1 LPC/sq km. Factors for the sudden decline in 2007 were attributed to drought during the breeding season and heavy snow cover in the winter (Rodgers 2007b). Kansas is key to the species' survival, as it contains the

most extensive remaining range and the largest population found in the five states where it occurs (KS, TX, NM, OK, CO) (KDWP 2006).

Figure from KDWP Hunting Regulations 2008 (KDWP 2008).



Current global distribution: The LPC is a highly threatened, endemic species with a very restricted distribution, limited to mixed sand-sagebrush or shinnery oak grasslands of eastern NM, northwestern TX, northwestern OK, southeastern CO, and western KS. Within this limited range, most of its habitat exists on private lands (95%) and only 4% is managed for LPC on public land (Bureau of Land Management in NM, and US Forest Service in OK, NM, CO, KS). The reduction in habitat and subsequent population decline resulted in a petition to list the LPC under the Endangered Species Act (ESA, 1973, 16 USC 1531 et seq., as amended) in 1995. The USFWS concluded that listing was warranted, but precluded, and therefore gave it candidate species status in 1998, with a listing priority of eight. In 2008, the USFWS reassessed the status of the LPC, and concluded that listing was again warranted but precluded, and it was given a higher priority listing of category two (USFWS 2008). Chris O'Meilia, USFWS biologist, stated in an interview with the Salina Journal (Schrag 2009) concerning the listing as a category two; "It is the last step in the candidate process before we initiate listing… We will start the listing process in the very near future if things don't change."

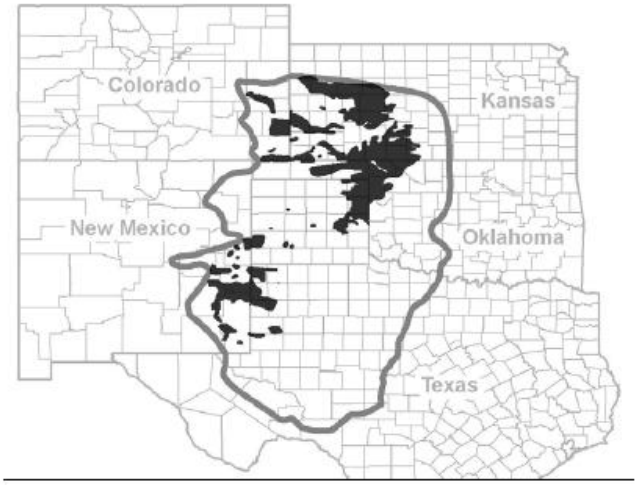
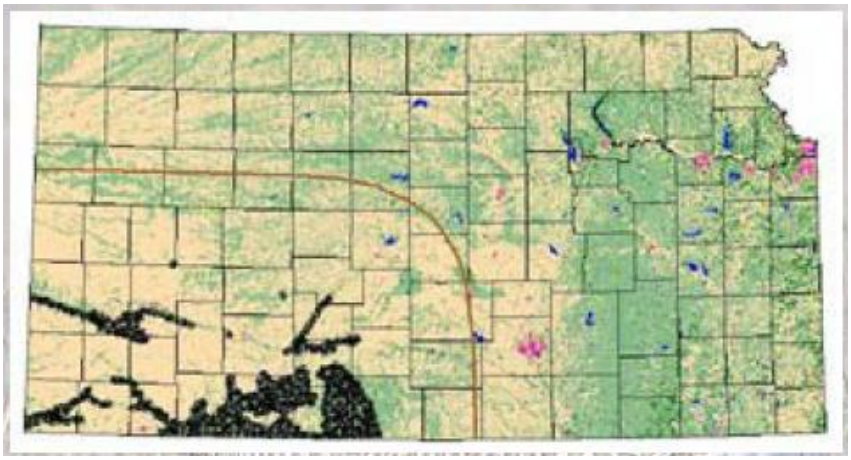


Figure 1. Estimated historic (perimeter circle) and current (black polygons) occupied LPC range in CO, KS, NM, OK and TX. Current (2007) range map layer courtesy of TPWD.

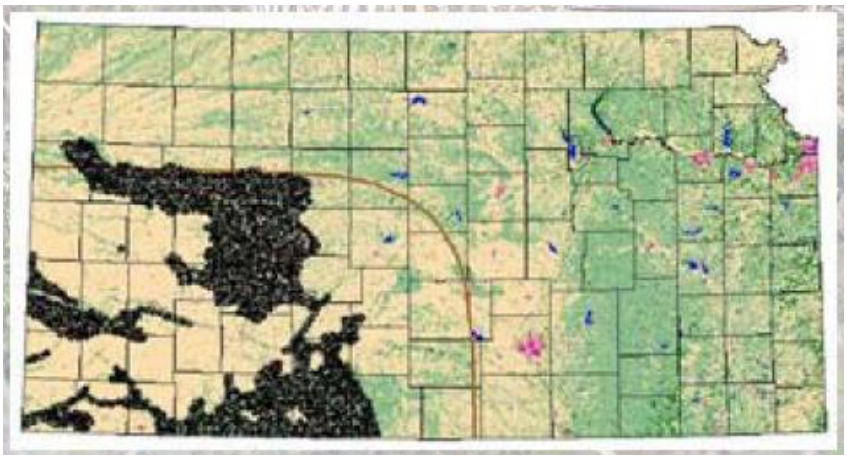
Above figure from USFWS (2008).

Cite references or studies supporting distribution information: Jensen et al. 2000, Bain and Farley 2002, KDWP 2006, 2008, Rodgers 2006, 2007a, 2007b, USFWS 2008 (Attached), Pruett et al. 2009, Schrag 2009, Houts et al. in press.

2) How and to what magnitude has the species' distribution changed during the past 35 years? In Kansas: Its historic range in Kansas was approximately 76,757 sq km, primarily sand-sagebrush habitat that was severely reduced with European settlement. Kansas once contained the second largest area of habitat second only to TX (236,398 sq km). By the mid-1900s it was largely restricted to the remnant habitat in southwestern KS, with the greatest abundance concentrated south of the Arkansas River. By 1997 it was restricted to 19 counties, primarily in the southwest, south of the Arkansas River. Since 1999 it reoccupied 16 counties north of the river and now occurs within 35 western KS counties. Reasons for the increase are generally attributed to the Conservation Reserve Program (CRP). Even with the recent reoccupation of part of the KS historical range, there has been a 62% decrease in the species' historical KS distribution. Underscoring the magnitude of the decline and the importance of KS to the species' survival is that fact that KS now ranks first in current occupied range with 29,130 sq km. Texas is second with 12,126 sq km out of an original 236,398 sq km.



Lesser Prairie-Chicken Pre-CRP Range



Lesser Prairie-Chicken Post-CRP Range

Figures showing Pre-CRP and Post-CRP ranges in Kansas from Horton (2008).

Globally: Historically the species' occupied between 260,000 to 456,087 sq km. The current range and distribution is only 64,414 sq km, a 75-86% reduction. The LPC has the smallest population and most restricted range of all grouse species in North America.

Cite references: Thompson and Ely 1989, Hagen and Giesen 2005, Jensen et al. 2000, Horton 2008, USFWS 2008, Houts et al. in press.

3) Describe the species' population (not distribution) trends during the past 35 years.
In Kansas: Numbers have been declining since the 1970s and this trend has continued even though large-scale conversion of prairie to intensive agriculture (center pivot irrigation) has ceased since the mid 1980s.

On the Cimarron National Grasslands (CNG), southwestern KS, recent population surveys (1988-2007) indicated a decline in the LPC population when compared to the first 15 yrs of study (1964-1978). From 1995-1999 more intensive lek surveys indicated a stable population of between 173-283 individuals (Smith and Smith 1999). This survey was completed again in 2005 resulting in an estimated 249 individuals. However, since 2005, the population has declined, with an estimated 124 individuals in 2006 and only 86 in 2007, a 65% decline (USFS pers. comm.; in USFWS 2008).

In Finney County, lek survey indices in the 1960s reported 4.7 birds per sq km, by the 1980s this dropped to 3.1 birds per sq km, and down to 1.6 birds per sq km by the 1990s, even though suitable habitat was available (Robel et al. 2004).

As indicated above (see #1) the estimated KS population for LPCs in 2006 was between 19,700 and 31,100 individuals. Numbers recorded on surveys in 2005 and 2006 were not statistically different, however, in 2007 there was a 38% decline. Kansas now has the largest remaining population of LPC in the world, thus KS is key to the species' continual survival.

The highest total reported on the CNG Christmas Bird Count (CBC) was 58 in December 1989. Since 1990 LPCs averaged 6.7 individuals (total 121, range 0-22) and was reported on 78% of the CNG CBCs. During this same period the maximum reported during a single KS CBC period was 39 in 1999.

Globally: Little is known of the actual population size prior to 1900, though it was considered as "common" throughout its range. There are some estimates that indicated as many as two million occurred in TX. In 1904, 15,000-20,000 were observed in grain fields in Seward County, KS. Rangewide populations declined through the mid-1900s and by early 1970s it was estimated at 60,000. By 1980 the population was estimated between 44,000 to 53,000 individuals. Current rangewide estimates are between 35,214 and 64,669 individuals.

Adjacent states also show a decline in the population in recent years. In CO, by 1997 the population was estimated to be between 800 and 1,000 LPC, with <1,500 individuals in 2000. In 2004, CO initiated a new survey protocol with an emphasis on surveying a broader range of habitat, including CRP grassland. As a result, more leks were found, but short-term trends still show a decline in the population. Furthermore, like the CNG data in KS, the Comanche

Grasslands of CO show a dramatic decrease in LPC from an estimated 348 birds in 1988 to 64 in 2005. The latest estimate for OK in 2000 was <3,000 individuals, with declines since the early 1990s (see figure below).

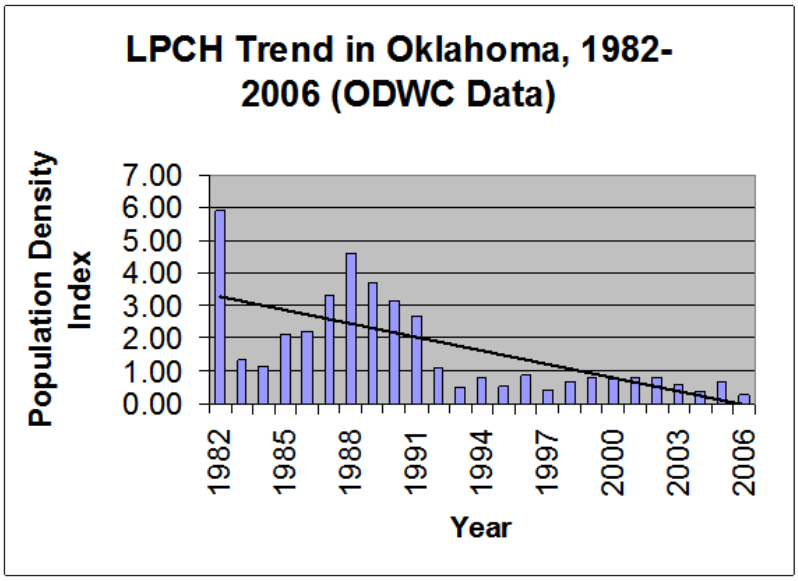


Figure from Sutton Avian Research Center and Oklahoma Department of Wildlife and Conservation (Sutton Avian Research Center 2009).

Colorado is the only state within the species' range to list the LPC, where it is considered as threatened.

Cite references: Bent 1932, Cable et al. 1996, Jensen et al. 2000, Robel et al. 2004, Hagen and Giesen 2005, KOS CBC data 1990-2007, USFWS 2008, Sutton Avian Research Center 2009.

4) What proportion of the species' global population is currently found within Kansas?
If you take current rangewide population estimates of between 35,214 and 64,669 individuals and an estimate of between 19,700 and 31,100 individuals in KS, than approximately 48-56% of the global population exists within KS.

Cite information upon which you base this determination: Rodgers 2007a, USFWS 2008.

5) What is the species' current residency status in Kansas (vagrant, migrant, year-round, etc.)? The LPC is a permanent resident (year-round).

6) Descibe the species' current breeding status within Kansas including changes or trends during the past 35 years.
LPCs are polygynous and use "traditional" lekking territories, usually associated with elevated grasslands that are more open, often with bare or sparsely vegetated ground. Males begin displaying at leks in February-March and remain through early June (peak April-early May). Displays usually take place at dawn and dusk. After mating, females seek nest sites, often within 1-3 km of the lek (Giesen 1994). Nesting usually takes place April-June. Average clutch size is

10-14 eggs; they can be double-brooded (if first attempt fails), and incubation lasts 23-28 days. Broods may remain with female for 6-10 wks.

Lesser Prairie-Chickens breed throughout their current range, and are presumed to have bred throughout their historic range. As a result of expansion and reoccupation of former range and expansion of the GPC range, they now hybridize (see 1 above). Breeding success varies annually as a result of weather factors, both during the breeding and non-breeding seasons.

A six year study initiated in 1997 determined that low nest success and poor chick survival was the most important contributing factor to the decline of LPCs since the 1980s. Reproductive success appears to be low in appropriate habitat near anthropogenic features (Hagen 2003, Pittman 2003, Robel et al. 2004).

Cite references: Bent 1932, Coats 1955, Ports 1979, Thompson and Ely 1989, Cable et al. 1996, Giesen 1994, Hagen 2003, Pittman 2003, Robel et al. 2004, USFWS 2008, Oklahoma Coorperative Extension Service.

7) Describe the species' habitat requirements: LPCs require large unfragmented tracts of native grassland (1,945-16,000 ha) for successful breeding. This unfragmented habitat also needs to be void of anthropogenic features (e.g. roads, buildings, oil and gas wells, transmission lines, and center pivot irrigation fields), especially those with vertical structure. A minimum of 4,096 sq km may be required as a management area. However, the exact extent of habitat required by LPC has not been ascertained. Greatest densities of LPCs in Kansas occur in the remaining sand-sagebrush grasslands of southwest Kansas, but extensive populations also occur in the mixed-prairies of the Red Hills. In the southern portions of its range it prefers shinnery-oak grasslands. CRP grassland is also used which may have facilitated the species' expansion northward in KS.

Cite references: Hagen 2003, Pittman 2003, Robel et al. 2004, KDWP 2006, USFWS 2008.

8) Discuss the species' degree of specialization with regard to habitat, food, or other life history factors. The LPC is a mixed-short grass prairie specialist of the southern high plains that appears to require a contiguous area of 32-101 sq km and a landscape of at least 63% native rangeland for sustaining populations. Individuals have large home ranges, perhaps from 211 to 1,945 ha (females larger than males), but individuals associated with a single lek may encompass 50 sq km. During drought years, common in southwestern KS, home ranges increase in size. Cultivated cropland in KS has caused considerable fragmentation of the remaining grasslands. While CRP land has allowed the LPC to expand its range within KS, the potential for discontinuing the CRP program always exists. Schrag (2009) indicated that two-thirds of the CRP contracts in KS are scheduled to expire by 2012. Therefore, the remaining habitat within KS is essentially "Critical Habitat" and all efforts to preserve such, on both private and government owned lands, should be a high priority.

Diet consists of insects, seeds, leaves, buds, and cultivated grains. Young birds tend to feed on more animal material (invertebrates) and adults consume more vegetative material, especially in

fall and winter. While grains have become increasingly important, a stable LPC population requires a landscape with no more than 20-37% cropland (Crawford and Bolen 1976).

Other Life History Factors: Due to their lekking mating system, display grounds are elevated grassland sites that are mostly sparsely vegetated, while nesting and brood rearing habitats typically require taller, more dense vegetated cover. Annual mortality rates are high (65%) and life-span is relatively short (about 5 yrs). The overall low reproductive and survival rates may be offset by increasing available habitat and the prevention of fragmentation. Hunting, while believed to not be a major threat at the population level, could have an impact at the local level and lead to local extirpation. LPCs avoid suitable sand sagebrush habitat near anthropogenic features.

References: Crawford and Bolen 1976, Hagen 2003, Pittman 2003, Hagen and Giesen 2005, USFWS 2008, Schrag 2009, Oklahoma Cooperative Extension Service.

9) Discuss the species' sensitivity to environmental contaminants, if any, including known actual potential problems:
"To date, no studies have been conducted examining potential effects of agricultural insecticide use on LPC populations. However, significant impacts from pesticides to other prairie grouse have been documented. Of approximately 200 sage grouse known to be feeding in a block of alfalfa sprayed with dimethoate, 63 were soon found dead, and many others exhibited intoxication and other negative symptoms (Blus et. al. 1989, p. 1139). Because LPC are known to selectively feed in alfalfa fields throughout their range, the Service believes there may be cause for concern that similar impacts may be occurring." (USFWS 2008)

"…Consequently, herbicide application to native rangelands for the purposes of permanently decreasing or eliminating the shrub component to increase forage production for livestock reduces habitat quality for LPC throughout the species' range. Herbicide application (primarily 2,4-D and tebuthiuron) to reduce or eliminate shrubs from native rangelands is a common ranching practice throughout LPC range. Through foliar and pellet application, respectively, these herbicides are designed to kill or suppress by repeatedly defoliating dicotyledon plants such as forbs, shrubs and trees, while causing no significant damage to monocotyledon plants such as grasses… Several studies have shown that shrub removal, primarily by herbicide application, is one mechanism that may be contributing to observed declines of LPC (Fuhlendorf et al. 2002, pp. 624-626, Bell 2005, Haukos and Smith 1989, p. 625)." (USFWS 2008)

To compound this problem, spraying in the southern portion of the LPCs range, within the shinnery-oak habitat is continuing, even on NRCS land. Additionally, grasslands managed with herbicides in other portions of the species range have shown LPCs abandon such areas.

10) To what degree is this species currently vulnerable to consumptive and/or commercial use in Kansas and what relationship does that use have on its total population?
Historically, the LPC was subject to market hunting but harvest has been regulated since the early 1900s. While the LPC is a "game species" within most of its range (excluding CO), legal harvest only occurs in KS and TX. However, in TX, LPCs are only harvested on properties with approved wildlife management plans that specifically address the LPC. Furthermore, the harvest

is limited to no more than 5% of the annual estimated population. Oklahoma has not allowed prairie-chicken hunting since 1996 (Doug Schoeling, ODWC, pers. comm.).

The current KS bag limit is set for one bird daily south of I-70 and two birds north of I-70 (all west of State HWY 281). Approximately 200 LPCs were harvested in 2006 (1,900 hunter-days) and the LPC harvest is "probably" insignificant at the population level (USFWS 2008). The annual harvest in both KS and TX combined is estimated to be fewer than 1,000 individuals annually. Some authors believe hunting is not an additive mortality, though in the past during low population cycles it may have accelerated declines.

With their current small and isolated populations in fragmented landscapes, and their clumped distribution within their natural landscape, they could be vulnerable to local extirpations through hunting. However, there is a lack of empirical data to support whether current harvest rates are problematic. Definitive experiments on different harvest rates associated with various fragmented patch sizes have not been completed, thus it is difficult to determine if harvest contributes to local population declines. One thing for certain, if the species' becomes federally listed hunting will not be allowed in any state.

Cite references: KDWP 2008, USFWS 2008.

11) To what degree is this species' Kansas habitat currently or potentially threatened by alteration or destruction?

Continued conversion of native grasslands or CRP grassland to cropland would adversely affect LPC populations. The reestablishment of part of their former range within KS appears to be a direct result of CRP grassland use. There were ca. 363,000 ha of CRP in KS based on cooperative mapping completed in 2007 (USFWS 2008). Based on estimated amounts of occupied CRP ranges, CRP fields in KS comprise 12.5% of the occupied LPC range, second only to TX (13.8%) (USFWS 2008). Two-thirds of the CRP contracts in KS are scheduled to expire by 2012 (Schrag 2009). The loss of CRP land would likely cause those lands to revert back to cropland and reduce the expansion of the LPCs range in recent years.

Due to habitats preferred by the LPC in KS, mixed-short grass rangeland in a region of low rainfall, the habitat is easily overgrazed and represents a management challenge. When overgrazing occurs the soils have less water-holding capacity resulting in less succulent vegetation, and consequently a reduction in insects required for developing young chicks. The lack of residual vegetation also decreases nesting cover and success.

The use of fencing for cattle ranching, while fragmenting the landscape, may also be contributing to declines in LPCs. Studies in OK, NM, and TX indicate that mortality due to collisions with fences may be significant (Wolfe et al. 2007, USFWS 2008). The single greatest cause of mortality in OK is fencing, which accounts for more than 40% of the deaths (Wolfe et al. 2007, Sutton Avian Research Center 2009).

Spatial fragmentation of an already fragmented landscape would have severe consequences for LPC populations. Increased fragmentation can lead to increased mortality rates or simply not

provide the natural history requirements for a sustainable population. The loss of CRP land would further increase an already fragmented landscape.

Structural fragmentation (introduced vertical structure) is known to cause LPCs to avoid or abandoned otherwise suitable habitat. Recent radio-telemetry studies conducted by Kansas State University researchers highlighted another threat to LPC, with the species avoiding human-made structures (Hagen 2003, Pittman 2003, Robel et al. 2004, Pittman et al. 2005, see attachment 3 and 4 for wind resource and transmission line development in KS). They ascertained that most LPC hens avoided nesting or rearing their broods within a quarter-mile of power lines and within a third-mile of improved roads. Buildings, including a coal-fired power plant and gas booster stations, were avoided from anywhere between two-thirds of a mile to one mile. This information, coupled with similar avoidance behavior noted in other species, suggests there is cause for concern over negative impacts on prairie chickens of other types of structures as well, including communications towers, wind farms, and suburban homes. Fragmentation of the open grassland horizons preferred by prairie chickens appears to represent the latest human-made threat to these species (KDWP 2006).

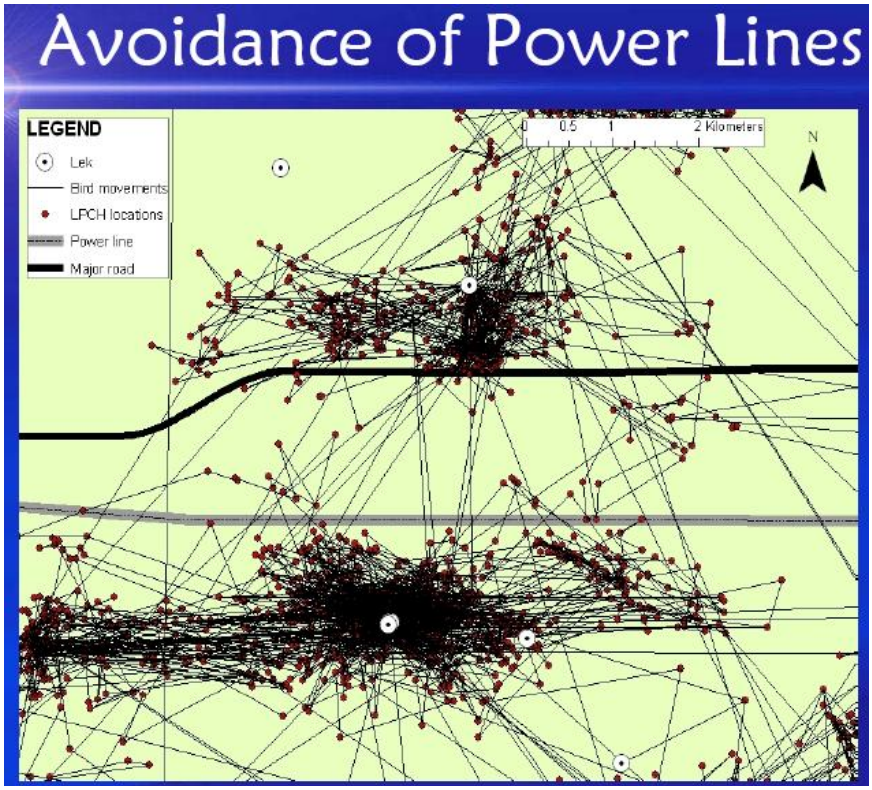


Figure from Patten (2008) showing LPC avoidance of transmission lines in OK panhandle.

Towers, power lines (transmission and distribution), oil and gas wells, compressor stations, fences, wind turbines, and buildings are examples of vertical structure that threatened LPC survival. Underscoring this we quote from the USFWS (2008); "…, southwestern KS currently supports the largest population and distribution of LPC of all states…In 2006, the Governor of

KS initiated the Governor's 2015 Renewable Energy Challenge, an objective of which is to have 1,000 megawatts (MW) of renewable energy capacity in KS by 2015 (Cita et al. 2008, p.1). A cost/benefit study (Cita et al. 2008, appendix B) found that wind was the most cost effective and likely renewable energy resource for KS. Modestly assuming an average of 2 MW per turbine—most commercial scale turbines are between 1.5 and 2.5 MW—some 500 turbines would be erected in KS if this goal is to be met. While not all of those turbines would directly overlap occupied range, the best wind potential in KS occurs in the western portions of the state (U.S. Department of Energy 2008). Inappropriate siting of wind energy facilities and associated facilities, including electrical transmission lines, appears to be a serious threat to LPC in western KS within the near future (R. Rodgers, KDWP, pers. comm. 2007)."

Again, we quote from the USFWS (2008); "…wind energy development is occurring within occupied portions of LPC habitat. Where such development has occurred, these areas are no longer suitable for LPC even though many of the typical habitat components used by LPC remain. Proposed transmission line improvements will serve to facilitate further development of additional wind energy resources. Future wind energy developments, based on the known locations of areas with excellent to good wind energy development potential, likely will have substantial overlap with known LPC populations. Additional areas that are currently unoccupied but lie within the historic range and provide suitable habitat for the LPC also could be developed. These areas of unfragmented habitat are crucial to ongoing efforts to conserve the LPC. Fragmentation of these areas would further modify or curtail the range of the LPC and hamper efforts to conserve the species. Therefore, the Service considers the ongoing and large-scale potential for commercial wind power development, particularly in western KS, northwestern OK and the TX panhandle, to be a high-level threat to the survival of the species in the near future. Siting of wind farms and transmission lines in a manner that avoids fragmentation of LPC habitat is important and some wind power developers appear sensitive to concerns about siting such facilities."

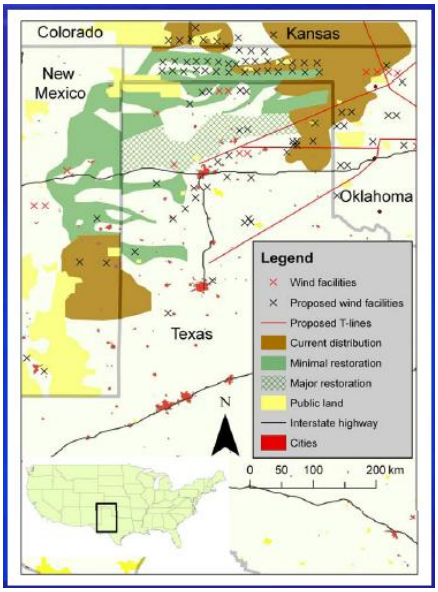
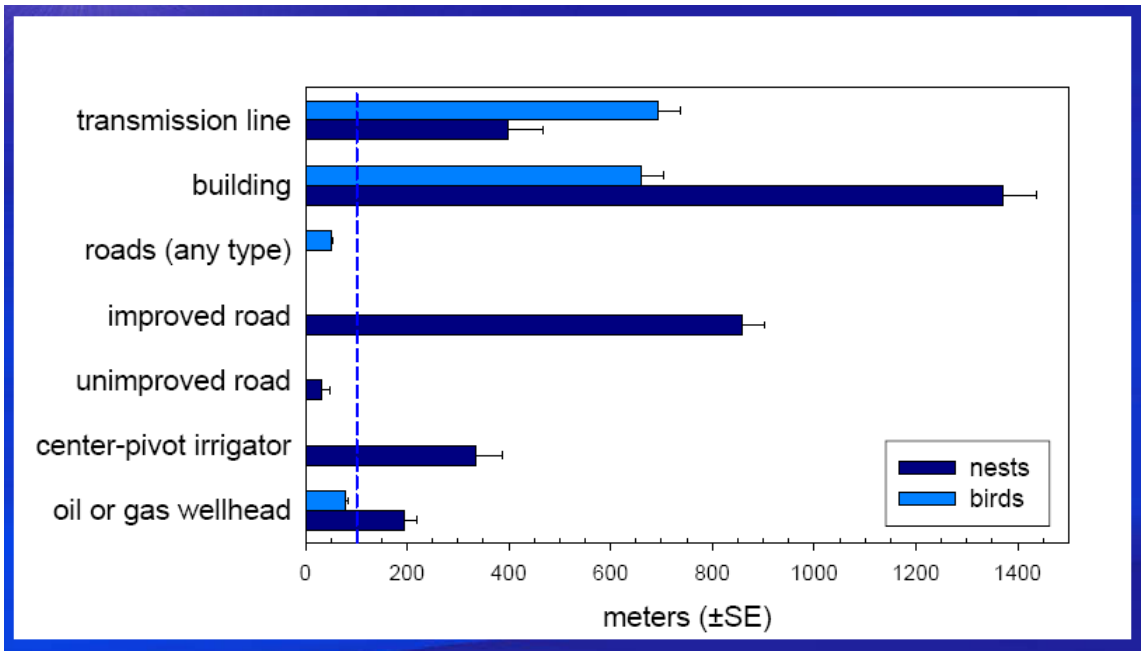


Figure from Patten (2008) and Pruett et al. (2009) showing potential wind resource area development in the southern portion of LPC range.

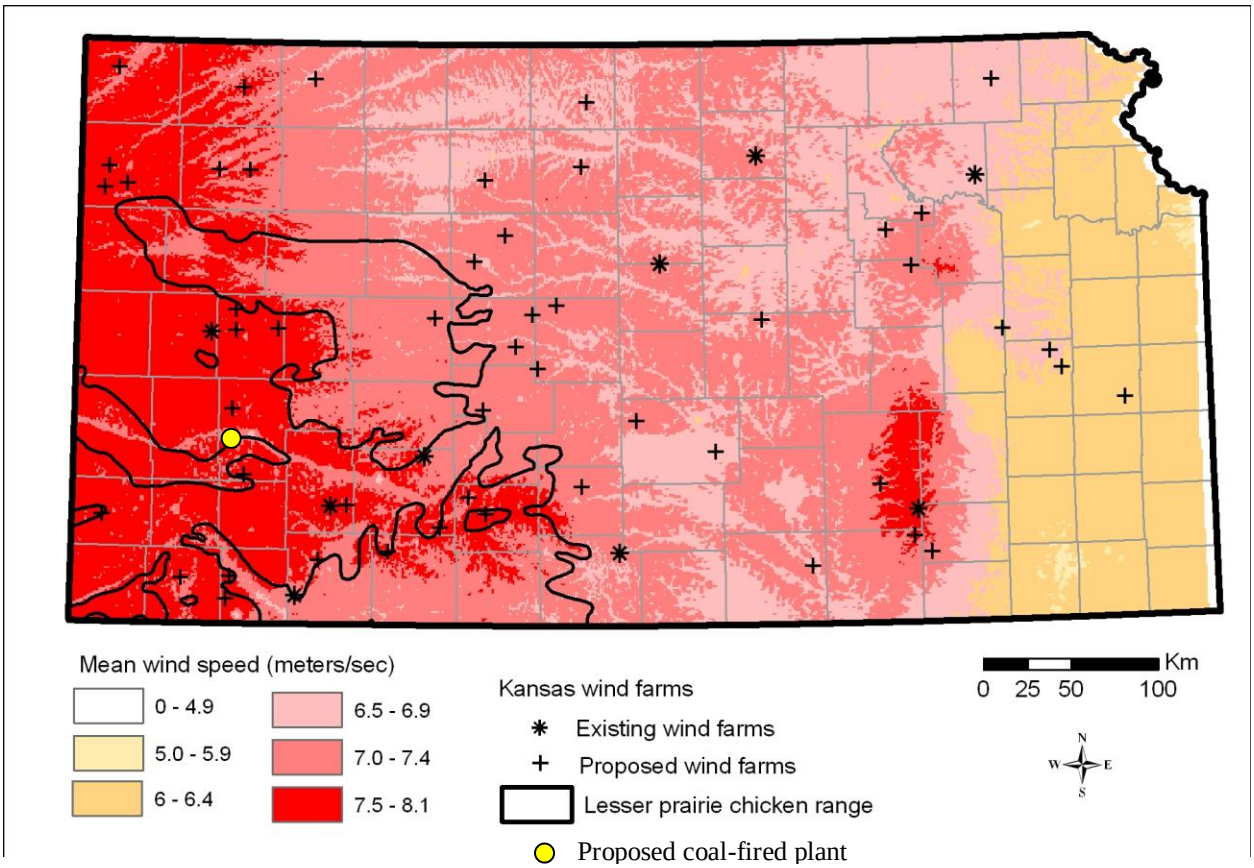
Oil and gas development in western KS is a concern considering the recent prices of oil, the push for natural gas development, and movement away from foreign oil dependence. Thus, there is

increased pressure and incentive to develop these fossil fuels. Such development, like wind energy development, provides potential for loss of habitat via fragmentation, both spatial and structural.

On 4 May 2008, Governor Parkinson agreed to a new energy plan that allows the development of an 895 MW coal-fired power plant in western Kansas, near Holcomb, after several years of rejection by the former governor (Office of the Governor 2009a, Klepper 2009). As part of the compromise to build the coal-fired power plant, Governor Parkinson and Sunflower Power Electric Corporation, Sunflower agreed to invest in more wind energy (Klepper 2009). Not only will the plant occupy potential prairie-chicken habitat, but it will also mean additional transmission line development within the LPCs range since only 200 MW will be for western KS, the remaining energy will be sent to CO (Klepper 2009).



Above Figure from Patten (2008) showing avoidance by individual LPCs and nests.



Above figure courtesy of Kansas Wind Resource Planner and Michael Houts, KDWP.

Finally, another potential human-related impact on the species is climate change. Peterson (2003) modeled climate change scenarios on montane and Great Plains bird species, including LPC, and predicted that Great Plains species would be more heavily influenced by climate change. The predictions under the assumption of no dispersal indicated there would be a dramatic area reduction (mode 35% of distributional area lost) and significant spatial movements (0-400 km shift of range centroid) of appropriate habitat.

12) Discuss the potential for recovery of this species through conservation measures. Be specific as to what measures you feel should be implemented to aid recovery.

According to the KS Wildlife Plan, KDWP lists several strategies to address the declining LPC population, loss of habitat, and fragmentation of existing habitat as follows:

• Develop broad scale education approach and outreach programs about the value of the LPC and promote LPC viewing on private properties.
• Publish and distribute publications on LPC management (similar to Oklahoma).
• Promote the LPC as an indicator species.
• Research and address wind farm impacts on LPC.
• Continue LPC monitoring.
• Bury or route power lines around nesting, brood rearing and lek habitats.

• Acquire, as advisable and possible, conservation easements on critical habitat with protocols for non-impact.

The USFWS (2008) listed the following "RECOMMENDED CONSERVATION MEASURES:

1. Reduce or eliminate upland construction of fence lines and utility lines within occupied habitat and for five miles surrounding all occupied habitat, especially near leks. If fence lines cannot be removed, it is recommended that the top and third wires of lines near active LPC leks be conspicuously marked to minimize collision mortality.

2. Limit or eliminate the federally-funded application of tebuthiuron herbicide in remaining shinnery oak habitats and 2, 4-D herbicide in sand sagebrush habitats.
3. Encourage range wide adherence to the Service's Voluntary Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines, released in July 2003, (http://www.fws.gov/habitatconservation/wind.pdf).

4. Work cooperatively with energy-related industry to avoid, minimize and compensate for impacts to LPC populations and habitats.

5. Work with partners to target re-enrollments and new contracts under CRP and related agricultural conservation programs to benefit LPC.

6. Minimize further fragmentation of remaining Federal lands within current and historic LPC range by abandoning the use of ineffective timing, noise and distance stipulations near active or historic leks. Instead, future energy leasing, exploration and development, or other fragmenting human land uses within essential LPC habitats should be limited.

7. Establish secure and well-funded financial incentive mechanisms for private landowners to provide ungrazed or very lightly grazed native rangeland habitats that are suitable for LPC use, and are not subject to herbicidal shrub control practices."

While we support the aforementioned recommendations from KDWP and USFWS, we believe it is critical to move forward and take the following additional steps:

1) List the LPC as threatened in KS;
2) pursue development of Candidate Conservation Agreements, including those with assurances;
3) reevaluate the use of fencing on State and federal lands, and develop educational material to deter private landowners from using fencing, or seek funding to help mark fences to reduce mortality;
4) support legislation to continue support for CRP lands, and to purchase existing prime LPC habitat, including CRP land;
5) encourage the use of a 5 mi (8.1 km) buffer zone around LPC leks for the development of anthropogenic features;
6) encourage the electrical utility companies (wind, coal, etc.) to develop conservation easements and to invest in the LPC conservation efforts;

7) encourage landowner conservation easements with non-governmental organizations to help protect existing habitat;
8) reevaluate the LPC hunting season to either eliminate or modify similar so that regulations are tied toward approved management plans (similar to what TX); and
9) ascertain the hybridization rate between LPCs and GPCs in their range of overlap.

There is a lack of regulatory measures to protect the LPC on private land, a generality for all species that exist in KS. Even with federally listed species, there is minimal statutory authority to address threatened and endangered species on private lands, but we should not use such facts to preclude State listing. Within KS, the listing of the LPC by KDWP should provide protection of any unwanted use of pesticides or herbicides within the LPCs range of occupied habitat and potential habitat, or at the very least allow for environmental review before such uses by local, State, or federal agencies. Efforts should be initiated by KDWP to encourage alternatives to the use of pesticides or herbicides within the LPCs range, especially on grasslands.

Listing efforts in KS would provide opportunities to potentially prevent the species from becoming federally listed. State listing should provide the impetus for KDWP and USFWS to pursue Candidate Conservation Agreements (CCA) and Candidate Conservation Agreements with Assurances (CCAA) with private landowners, non-governmental organizations, and the State to hopefully prevent future federal listing, or at least protect conservation measures and landowners in case the species becomes listed (ex. CCAA). New Mexico developed a CCA/CCAA that was signed in December 2008 (attached). Texas is working on such agreements.

With the potential threat to LPC populations associated with (ex. barbed-wire) fences (Wolfe et al. 2007), efforts should be made to reevaluate the use of fencing on State and federal lands. Studies in TX and OK have demonstrated that removal of fencing has reduced collisions. Thus, efforts to address removal of fences on private lands throughout the LPCs range in KS should be considered through the use of education, outreach, and publications on LPC management. Marking fences (ex. vinyl siding strips) also may help reduce collisions (Sutton Avian Research Center 2009).

Since CRP land has been beneficial to the LPC in KS, if CRP land is eligible for removal from the program then efforts should be made to encourage private landowners to maintain CRP vegetation. The future addition of new CRP lands also needs to be monitored. Not all CRP plantings are appropriate for LPCs, thus an emphasis should be made in seeding with the appropriate vegetation on new CRP acreage. Substantial effort should focus to encourage the continued funding of the CRP program. The State should also consider the possible acquisition of land for LPC management. Both grasslands (including CRP) and agricultural land should be considered since the latter could be converted back to grasslands.

While the country is in need of energy, especially more environmentally friendly sources, and western KS is a prime wind resource area, it also contains the single most significant LPC population and habitat in the world. Thus, listing of the LPC by KDWP would provide regulatory authority to protect this natural resource, while providing opportunities for further energy development. Based on existing data and recommendations from the USFWS we

recommend that no wind or oil development, or transmission line development occur within 5 mi (8.1 km) of all known LPC leks on native grasslands. If CRP lands that contain leks are significant enough to have a sustainable population, than the same 5 mi (8.1 km) buffer zone should be established around them. Development should be encouraged along cropland areas within the LPC range, but such development should maintain a 5 mi (8.1 km) buffer zone from known LPC leks, and appropriate grassland habitats.

Conservation easements may be an especially powerful mitigation tool when working with the wind and oil industry. In Oklahoma, OG&E announced on 1 April 2009, that they were investing $3.75 million with ODWC to help provide habitat for LPCs to help offset impacts as a result of wind farm development.

Landowner encouragement to establish conservation easements or to work with non-governmental organizations such as The Nature Conservancy should be emphasized. As an example, Horizon Wind Energy developed the Meridian Way Wind Farm in Cloud County and agreed to invest in a 20,000 ac off-site habitat restoration program in association with Ranchland Trust (Schrag 2009).

States that permit hunting of prairie-chickens do not do so directly to promote stable populations and conservation, rather they simply permit hunting for the sake of tradition and recreation (Tselepidakis 2007). Due to the extent of fragmentation of the LPC population and the overall reduction in population size, both globally and in KS, KDWP should immediately suspend LPC hunting and establish State population goals and conservation measures to reach these goals. This would prevent local extirpations as a result of overharvest. Furthermore, before reestablishment of a hunting season the LPC range-wide population status needs to be reassessed. At the very least, efforts should be made to only allow hunting in areas where approved management plans are in place, similar to what has occurred in TX.

LPC and GPC hybridization is a potential concern due to the small isolated populations of LPC. The extent of hybridization needs to be monitored to ascertain the overall impact on genetic diversity within the species.

We concur with the USFWS (2008) and this quote underscores the need for funding and cooperative efforts; “Finally, much attention has been directed to the decline of prairie grouse nationwide, as evidenced through special sessions, symposia, and solicited publications throughout professional conservation arenas. In particular, the spring 2004 edition of The Wildlife Society Bulletin contains a host of publications relevant to recent LPC management, including formal guidelines for management of the species and its habitats (Hagen et. al. 2004, pp. 69-82). The North American Grouse Partnership, in cooperation with the National Fish and Wildlife Foundation and multiple State wildlife agencies and private foundations, has embarked on the preparation of the prairie grouse portions of an overarching North American Grouse Management Strategy (Strategy). The LPC portion of this Strategy is being developed under the leadership of the Lesser Prairie-chicken Interstate Working Group in cooperation with the Playa Lakes Joint Venture, and is independently identified as the Lesser Prairie-chicken Conservation Initiative. This Strategy would provide clear recovery actions and define the levels of funding necessary to achieve management goals for all species of grouse in North America. The final

draft of the prairie grouse portions of this strategy, encompassing 65 million acres of grassland habitat in the U. S. and Canada, was officially released and unanimously endorsed by the Association of Fish and Wildlife Agencies in late March, 2008.

The Service views the increased emphasis and exposure for prairie grouse as positive for the conservation and recovery of the LPC. However, many of these important conservation efforts will fail to materialize if adequate funding and institutional participation is lacking."

13) Summarize your reasons for requesting a review of this species:
Under K.S.A. 32-958 section (f) a "threatened species" means any species of wildlife which appears likely, within the foreseeable future, to become an endangered species and under section (g) "wildlife" means any member of the animal kingdom, including, without limitation, any…bird… Furthermore, under K.S.A 32-960 the Secretary shall determine whether any species of wildlife indigenous to the state is a threatened species…in this state because of any of the following factors:

(1) The present or threatened destructions, modification or curtailment of its habitat or range;
(2) the overutilization of such species for commercial, sporting, scientific, educational or other purposes;
(3) disease or predation;
(4) the inadequacy of existing regulatory mechanisms; or
(5) the presence of other natural or man-made factors affecting its continued existence within this state.

New data from the USFWS (2008), Patten (2008), and Pruett et al. (2009) with the subsequent re-designation by the USFWS of the LPC as a "Candidate 2" species (imminent danger of becoming threatened or endangered) is the main impetus behind this emergency petition to have the LPC listed as "threatened" in KS.

Kansas has the largest remaining population in the world with the largest remaining habitat. Recent population trends indicate a decline in the population though it has increased its range, primarily a result of utilization of CRP grasslands. The potential for the non-renewal of existing CRP lands is a real threat to further habitat loss.

The emphasis for a change in energy dependency, both State-wide and nationally, means that the existing LPC range within KS is prime for additional energy development. In fact, on 22 May 2009, Governor Parkinson signed legislation, the Renewable Energy Standards Act, which codifies the goal for KS utilities to generate 20% of their power by renewable energy by 2020 (Office of the Governor 2009b). Therefore, the key population of the LPCs survival is under direct threat as a result of vertical habitat displacement that would occur with the development of wind farms, new transmission lines, coal-fired power plant production, and oil and gas wells. The listing of the LPC in KS would be the second regulatory mechanism within its range to help sustain LPC population's range-wide (CO listed LPC in 1973). The only other regulatory mechanisms are actions pertaining to hunting regulations, such as those used by OK to not allow hunting until population goals are met.

Clearly, based upon the data presented herein and under the authority set forth by K.S.A. 32-960, the LPCs:

(1) existing habitat and range is threatened with continued destruction, modification and curtailment;
(2) there is an inadequacy of existing regulatory mechanisms for this species; and
(3) the presence of additional anthropogenic features will affect its continued existence of this species' within this state.

14) Describe your expertise/experience with the species you are petitioning.
Formed in 1949, the Kansas Ornithological Society (KOS) is the only statewide organization in Kansas devoted specifically to the study, conservation, and enjoyment of birds. Collectively, we know more than anyone else about the distribution, abundance, habits, and identification of the more than 460 species of birds in our state.

Feel free to attach any information you may have pertaining to the status or biology of this species that will help in its review.
Attachments:

1) Species Assessment and Listing Priority Assignment Form: Lesser Prairie-Chicken (USFWS 2008).
2) Candidate Conservation Agreement for the Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) and Sand Dune Lizard (*Sceloporus arenicolus*) In New Mexico (USFWS et al. 2008)
3) Figure: Using GIS for Wind Resource Planning in Kansas. Kansas Wildlife and Parks, Kansas Biological Survey, and Kansas Applied Remote Sensing Program.
4) Figures: Southwest Power Pool Transmission Expansion (Caspary 2008).
5) Figure: Designing Energy Solutions Without Borders (Barton 2008).

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Return to: Edwin J. Miller, T & E Program Coordinator
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ATTACHMENT 1

Species Assessment and Listing Priority Assignment Form: Lesser Prairie-Chicken

USFWS. 2008. Species Assessment and Listing Priority Assignment Form: Lesser Prairie-Chicken. Available online: http://ecos.fws.gov/docs/candforms_pdf/r2/B0AZ_V01.pdf. Accessed 31 January 2009.

U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Tympanuchus pallidicinctus*

COMMON NAME: lesser prairie-chicken

LEAD REGION: 2

INFORMATION CURRENT AS OF: October, 2008

STATUS/ACTION

___ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status
___ New candidate
_X_ Continuing candidate
___ Non-petitioned
_X_ Petitioned - Date petition received: October 5, 1995
_ 90-day positive - FR date: July 8, 1997
_ 12-month warranted but precluded - FR date: June 9, 1998
_ Did the petition request a reclassification of a listed species? NO

FOR PETITIONED CANDIDATE SPECIES:
a. Is listing warranted (if yes, see summary of threats below)? YES
b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? YES
c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. During the past 12 months, almost our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, emergency listings, and essential litigation-related, administrative, and program management functions. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken, see the discussion of "Progress on Revising the Lists" in the current CNOR, which can be viewed on our Internet website (http://endangered.fws.gov/).

_X_ Listing priority change
Former LP: _8_
New LP: _2_

Date when the species first became a Candidate (as currently defined): June 9, 1998

___ Candidate removal: Former LPN: ___

___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
____U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
___ F – Range is no longer a U.S. territory.
___ I – Insufficient information exists on biological vulnerability and threats to support listing.
___ M – Taxon mistakenly included in past notice of review.
___ N – Taxon does not meet the Act's definition of "species."
___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Birds; Phasianidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Colorado (CO), Kansas (KS), New Mexico (NM), Oklahoma (OK), Texas (TX) / USA

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: CO, KS, NM, OK, TX / USA

LAND OWNERSHIP: Currently, 95 percent (61,193 square kilometers (sq km); 23,626 square miles (sq mi)) of occupied range is privately owned; 4 percent (3,221 sq km; 1,244 sq mi) is managed by the Bureau of Land Management (BLM) in NM, and the U. S. Forest Service (USFS) in CO, KS, OK and NM; 1 percent is State trust land in NM

LEAD REGION CONTACT: Pat Mehlhop, (505) 248-6663

LEAD FIELD OFFICE CONTACT: Ecological Services, Tulsa, OK, Kenneth Collins; (918) 382-4510; Ken_Collins@fws.gov

BIOLOGICAL INFORMATION

Species Description

The lesser prairie-chicken (*Tympanuchus pallidicinctus*) (LPC) is a species of prairie grouse endemic to the southern high plains of the United States, commonly recognized for its feathered feet, stout build, ground-dwelling habit and mating behavior. Plumage of the lesser prairie-chicken is characterized by a cryptic pattern of alternating brown and buff-colored barring, and is similar in appearance and mating behavior to greater prairie-chicken (*T. cupido pinnatus*), although somewhat lighter in color. LPC body length ranges from 38-41 centimeter (cm; 15-16 inches) (Johnsgard 1973, p. 275). Males have long tufts of feathers (pinnae) on the sides of the neck that are erected during courtship displays. Males also display brilliant yellow supraorbital eyecombs and reddish esophageal air sacs during courtship displays (Copelin 1963, p. 12, Johnsgard 1983, p. 318).

LPC are polygynous and exhibit a lek mating system. The lek is a place where males gather to conduct a competitive mating display. Male LPC gather to display on leks at dusk and dawn

beginning in late February through early May (Copelin 1963, p. 26, Hoffman 1963, p. 730, Crawford and Bolen 1976, p 97). Dominant older males occupy the center of the lek, while younger males occupy the periphery and compete for central access (Ehrlich et al. 1988, p. 259). Females arrive at the lek in early spring; peak hen attendance at leks is during mid-April (Copelin 1963, p. 26, Haukos 1988, p. 49). The sequence of vocalizations and posturing of males, often described as "booming, gobbling, yodeling bubbling, or duetting," has been described by Johnsgard (1983, p. 336) and Haukos (1988, pp. 44-45).

After mating, the hen selects a nest site, usually 1-3 km (0.6-2 mi) from the lek (Giesen 1994a, p. 97), and lays an average clutch of 10-14 eggs (Bent 1932, p. 282). Second nests may occur when the first attempt is unsuccessful. Incubation lasts 23-26 days and young leave the nest within hours of hatching (Coats 1955, p. 5). Broods may remain with females for 6-8 weeks.

Home range varies both by sex and by season. Males tend to have smaller home ranges than do females, with the males generally remaining closer to the leks than do the females (Giesen 1998, p. 11). In CO, Giesen (1998, p. 11) observed that spring and summer home ranges for males were 211 hectares (ha; 512 acres) and for females were 596 ha (1,473 acres (ac)). In TX, Taylor and Guthery (1980a, p. 522) found that winter monthly home ranges for males could be as large as 1,945 ha (4,806 ac) and that subadults tended to have larger home ranges than did adults. Based on observations from NM and OK, LPC home ranges increase during periods of drought (Giesen 1998, p. 11). Davis (2005, p. 3) states that the combined home range of all LPC at a single lek is about 49 sq km (19 sq mi—12,100 ac).

Diet of the LPC consists primarily of insects, seeds, leaves, buds, and cultivated grains (Giesen 1998, p. 4). Juveniles tend to forage primarily on insects such as grasshoppers and beetles while adults tend to consume a higher percentage of vegetative material (Giesen 1998, p. 4). This is particularly true in the fall and winter when insects are less abundant. LPC have a relatively short life span and high annual mortality. Campbell (1972, p. 694) estimated a 65 percent annual mortality rate and a 5-year maximum life span, although an individual nearly 7 years old has been recently documented in the wild (Wolfe et al., Unpubl. Manuscript, p. 2) Giesen (1998, p. 2-9) provides a comprehensive summary of LPC breeding behavior, habitat, and phenology.

Taxonomy

The LPC is in the Order Galliformes, Family Phasianidae, subfamily Tetraoninae, and is recognized as a species separate from the greater prairie-chicken (American Ornithologist's Union 1957, p. 137; Jones 1964, p. 65-73). The LPC was first described as a subspecies of the greater prairie-chicken (Ridgway 1873, p. 199), but was named a full species in 1885 (Ridgway 1885). A more thorough discussion of LPC taxonomy is found in Giesen (1998, p. 2, 3).

Habitat

The preferred habitat of the LPC is mixed sand sagebrush- (*Artemesia filifolia*) or shinnery oak- (*Quercus havardii*) grasslands (hereafter described as native rangeland) (Taylor and Guthery 1980b, p. 6, Giesen 1998, p. 3-4). Trees and other tall woody vegetation are typically absent from these grassland ecosystems, except along water courses. Native grasslands occupied by the LPC often includes small shrubs which are important for summer shade, winter protection and as supplemental foods (Johnsgard 1979, p. 112). Landscapes supporting less than 63 percent native rangeland appear incapable of supporting self-sustaining LPC populations (Giesen 1998, p. 4).

Correspondingly, Crawford and Bolen (1976, p. 102) found that landscapes having greater than 20 to 37 percent cultivation may not support stable LPC populations.

The shinnery oak vegetation type is endemic to the southern great plains and is estimated to have historically covered an area of 2.3 million ha (over 5.6 million acres), although its current range has been considerably reduced through eradication (Mayes et al. 1998, p. 1609). The distribution of shinnery oak overlaps much of the historic LPC range in NM, OK, and TX (Peterson and Boyd 1998, p. 2). Shinnery oak is a rhizomatous shrub that reproduces slowly and does not invade previously unoccupied areas (Dhillion et al. 1994, p. 52). Mayes et al. (1998, p. 1611) documented that a single rhizomatous shinnery oak can occupy an area exceeding 7,000 sq m (1.7 ac). While not confirmed through extensive research throughout the plant's range, it has been observed that shinnery oak in some areas multiplies by slow rhizomatous spread and eventual fracturing of underground stems from the original plant. In this way, single clones have been documented to occupy up to 83 ha (205 ac) over an estimated timeframe of 13,000 - 43,000 years (Cook 1985, Anonymous 1997, p. 483), making shinnery oak possibly the largest and longest-lived plant species in the world.

The importance of shinnery oak as a component of LPC habitat has been demonstrated by several studies (Fuhlendorf et al. 2002, pp. 624-626, Bell 2005 p.15, 19-25). In a study conducted in west TX, Haukos and Smith (1989, p. 625) documented strong nesting avoidance by LPC of shinnery oak rangelands had been treated with the herbicide tebuthiuron (also see discussion under Factor E). Similar behavior was confirmed by three recent studies in NM examining aspects of LPC habitat use, survival, and reproduction relative to shinnery oak density and herbicide application to control shinnery oak.

First, Bell (2005, p. 20-21) documented strong thermal selection for, and dependency of LPC broods on, sand shinnery oak dominance in shrubland habitats. In this study, LPC hens and broods used sites within the sand shinnery community that had statistically higher percent cover and greater density of shrubs. Within these sites, microclimate differed statistically between occupied and random sites, and LPC survival was statistically higher in microhabitat that was cooler, more humid, and less exposed to the wind. Survivorship was statistically higher for LPC that used sites with >20 percent cover of shrubs than for those choosing 10–20 percent cover; in turn, survivorship was statistically higher for LPC choosing 10–20 percent cover than for those choosing <10 percent cover.

In a second study, Johnson et al. (2004, pp. 338-342) observed through telemetry methods that shinnery oak was the most common vegetation type in LPC hen home ranges. Hens were detected more often than randomly in or near pastures that had not been treated wto control shinnery oak. Although hens were detected in both treated and untreated habitats in this study, 13 of 14 nests were located in untreated pastures, and all nests were located in areas dominated by shinnery oak. Areas immediately surrounding nests also had higher shrub composition than the surrounding pastures. This study suggested that herbicide treatment to control shinnery oak adversely impacts nesting LPC.

Finally, a third study conducted by the Sutton Avial Research Center (Sutton Center), in cooperation with NMDGF, showed that over the course of four years and five nesting seasons, LPC in the core of occupied range in NM distributed themselves non-randomly among shinnery

oak rangelands treated and untreated with tebuthiuron (Patten et al. 2005a, 1273-1274). They demonstrated statistically that LPC strongly avoided habitat blocks treated with tebuthiuron, but were not affected by cattle grazing. Further, herbicide treatment explained nearly 90 percent of the variation in occurrence among treated and untreated areas. Over time, radio-collared LPC spent progressively less time in treated habitat blocks, with almost no use of treated pastures in the fourth year following herbicide application (25 percent in 2001; 16 percent in 2002; 3 percent in 2003 and 1 percent in 2004).

Leks are characterized by sparse vegetation and are generally located on ridges or grassy knolls (Giesen 1998, p. 4). Several authors, as discussed in Giesen (1998, p. 4) observed that roads, oil and gas pads, and other forms of human disturbance may encourage lek establishment. Giesen (1998, p. 9) reported that hens usually nest and rear broods within 3 km (1.7 mi) of leks and usually nest near a lek other than the one on which they mated.

Nests are constructed by females and generally consist of bowl shaped depressions in the soil (Giesen 1998, p. 9). Nests are lined with dried grasses, leaves and feathers and there is no evidence that nests are reused in subsequent years (Giesen 1998, p. 9). Typical nesting habitat can be described as native rangeland, although there is some evidence that the height and density of forbs and residual grasses is greater at nesting locations than on adjacent rangeland (Giesen 1998, p. 9). Nests are often located on north and northeast facing slopes as protection from direct sunlight and the prevailing southwest winds (Giesen 1998, p. 9). Giesen (1998, p. 9) reports that habitat used by young is similar to that of adults and the daily movements of the broods is usually 300 m (984 feet) or less. After the broods break up, the juveniles form mixed flocks with adult birds (Giesen 1998, p. 9) and habitat use is similar to that of adult birds. Giesen (1998, p. 4) reports that wintering habitat is similar to that used for breeding with the exception that small grain fields are used more heavily during this period than during the breeding season.

Prairie grouse require large expanses (i.e., 1024-10,000 ha) of unfragmented, ecologically diverse native rangelands to complete their life cycles (Woodward et al. 2001, p. 261, Flock 2002, p. 130, Fuhlendorf et al. 2002, p. 618, Davis 2005, p. 3), more so than almost any other grassland bird (Johnsgard 2002, p. 124). Although precise values have yet to be quantified, home range size and movements of individual animals help provide a rough estimate of the extent of land that may be required to sustain a population of LPC. As reported by Giesen (1998, p. 11) and Taylor and Guthery (1980a, p. 522), a single LPC may have a home range of 211 ha (512 ac) to 1,945 ha (4,806 ac). More recently, studies in KS demonstrated some birds may move as much as 50 km (31 mi) from their point of capture (Hagen et al. 2004, p. 71). While some overlap in home ranges is expected, rarely would those home ranges be expected to overlap completely. Taylor and Guthery (1980b, p. 11) used LPC movements in west TX to estimate the area needed to meet the minimum requirements of a lek population. They determined that a contiguous area of at least 32 sq km (3,200 ha; 7,900 ac) and having no less than 63 percent rangeland habitat are need to support a LPC population long-term. More recently, observations by scientists involved in LPC conservation have speculated that over 16,000 ha (40,000 ac) may actually be needed to sustain a single LPC lek (D. Wolfe, Pers. Com. 2008). Because LPC typically nest and rear their broods in proximity to a lek other than the one used for mating (Giesen 1998, p. 9), a complex of two or more leks is likely required to sustain a viable population of LPC. Hagen et al. (2004 p. 76) recommended that LPC management areas be at least 4096 sq km (1581 sq mi) in size. Because a population viability analysis for the LPC has

not yet been conducted, the specific extent of habitat needed to sustain a viable LPC population is unknown.

Historical Range/Distribution

Historically, the LPC occupied native rangeland in portions of southeastern CO (Giesen 1994b, p. 175-182, southwestern KS (Schwilling 1955, p. 10), western OK (Duck and Fletcher 1944, p. 68), the TX Panhandle (Henika 1940, p. 15; Oberholser 1974, p. 268), and eastern NM (Ligon 1927, pp. 123-127). Johnsgard (2002, p. 32) estimates the maximum historical range encompassed some 260,000 to 388,500 sq km (100,000 to 150,000 sq mi), with about two-thirds of the range occurring in TX. In 2007, cooperative mapping efforts by the CO Division of Wildlife (CDOW), KS Department of Wildlife and Parks (KDWP), NM Department of Game and Fish (NMGDF), OK Department of Wildlife Conservation (ODWC), and TX Parks and Wildlife Department (TPWD), in cooperation with the Playa Lakes Joint Venture, re-estimated the maximum occupied range (Figure 1). They determined the maximum occupied range, prior to European settlement, to have been approximately 456,087 sq km (176,096 sq mi) (Playa Lakes Joint Venture (PLJV) 2007, p. 1). The approximate historical range, by state, based on this cooperative mapping effort is 21,911 sq km (8,460 sq mi) in CO, 76,757 sq km (29,640 sq mi) in KS, 52,571 sq km (20,300 sq mi) in NM, 68,452 sq km (26,430 sq mi) in OK, and 236,398 sq km (91,280 sq mi) in TX.

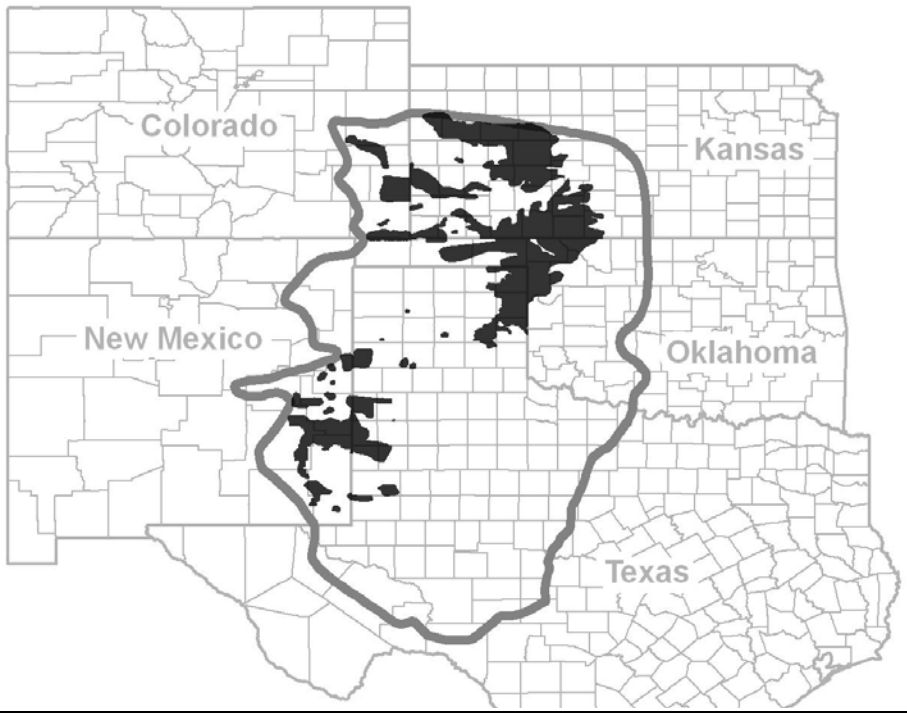

Figure 1. Estimated historic (perimeter circle) and current (black polygons) occupied LPC range in CO, KS, NM, OK and TX. Current (2007) range map layer courtesy of TPWD.

By the 1880s, the area occupied by LPC was estimated at 358,000 sq km (138,225 sq mi), and by 1969, the occupied range had declined to an estimated 125,000 sq km (48,263 sq mi) due to wide scale conversion of native prairie to cultivated cropland (Taylor and Guthery 1980b, p. 1,

based on Aldrich 1963, p. 537). By 1980, occupied range was estimated at 27,300 sq km (10,541 sq mi) (Taylor and Guthery 1980b, p. 4).

Current Range/Distribution

LPC still occur within each state (Giesen 1998, p. 3). During the 2007 mapping effort (PLJV, 2007, p. 1), the State wildlife agencies estimated the current LPC occupied range encompassed 64,414 sq km (24,871 sq mi) (Fig. 1). The approximate occupied range, by state, based on this cooperative mapping effort is 4,216 sq km (1,630 sq mi) in CO, 29,130 sq km (11,250 sq mi) in KS, 8,570 sq km (3,310 sq mi) in NM, 10,969 sq km (4,235 sq mi) in OK, and 12,126 sq km (4,680 sq mi) in TX.

The overall distribution of LPC within all states except KS has sharply declined, and the species is generally restricted to limited parcels of untilled native rangeland (Taylor and Guthery 1980b, pp. 2-5) or areas with significant Conservation Reserve Program (CRP) enrollments that were initially seeded with native grasses (Rodgers and Hoffman 2005, p. 122-123). The estimated current occupied range represents an 86 percent reduction in overall occupied range since pre-European settlement.

Population Estimates

Little information is available on LPC population size prior to 1900. Litton (1978, p. 1) suggested that as many as two million birds may have occurred in TX alone prior to 1900. Although, we are not aware of any independent analysis to corroborate Litton's estimate, and the basis for his estimate is unknown, the LPC was reportedly quite common throughout their range in CO, KS, NM, OK, and TX in the early twentieth century (Bent 1932, pp. 280-281, 283, Baker 1953, p. 8, Bailey and Niedrach 1965, p. 51, Sands 1968, p. 454, Fleharty 1995, pp. 38-44). By the 1930s, the species had begun to disappear from areas where it had been considered abundant and the decline was attributed to extensive cultivation, overgrazing by livestock and drought (Bent 1932, pp. 283-284, Baker 1953, p. 8, Bailey and Niedrach 1965, p. 51, Davison 1940, Lee 1950, p. 475, Oberholser 1974, p. 268, Sands 1968, p. 454). LPC abundance appeared to fluctuate somewhat during the 1940s and 1950s (Copelin 1963, p. 24, Snyder 1967, p. 121, Crawford 1980, p. 2), and by the early 1970s the total fall population may have been reduced to about 60,000 birds (Crawford 1980, p. 2). By 1980, the estimate of the total fall population was approximately 44,000 to 53,000 birds (Crawford 1980, p. 3).

State-by-State Information on Population Status

Each of the State wildlife agencies within the occupied range of the LPC provided us with information regarding the current status of the LPC within their respective states, and most of the following information was taken directly from agency reports, memos, and other status documents. Most states collect data in the form of one or both of the following indices: average lek size (i.e., number of males or total birds per lek); or density of birds or leks within a given area. In the absence of bird density, the number of active leks over large areas was recommended as the most reliable trend index for prairie grouse populations (Cannon and Knopf 1981, p. 777, Hagen et al. 2004, p. 79). Because birds or leks per square mile is the standard unit of measure for LPC population trend estimates, the following statewide status assessments are reported in that way, rather than using square kilometers as the unit of measure.

Colorado. LPC were likely resident in six counties in CO prior to European settlement (Giesen

2000, p. 140). At present, LPC are known to occupy portions of Baca, Cheyenne, Prowers, and Kiowa counties, but are not known to persist in Bent and Kit Carson counties. Populations in Kiowa and Cheyenne counties number less than 100 individuals and appear to be isolated from other populations in CO and adjacent states (Giesen 2000, p. 144). The LPC has been state-listed as threatened in CO since 1973. CDOW estimated 800 to 1,000 LPC in the state in 1997. Giesen (2000, p. 137) estimated the current population size, as of 2000, to be less than 1,500 breeding individuals.

A new survey method was initiated in 2004 designed to cover a much broader range of habitat types and a larger geographic area, particularly to include lands enrolled in the CRP. The new methodology resulted in the discovery of more leks and the documented use of CRP fields by LPC in CO. The number of LPC counted in 2005 was 203 birds, with high-count totals of 151 males, 21 females, and 31 of unknown sex (Yost 2005, p. 1). In 2005, 32 active leks were found--13 in Baca County, 1 in Kiowa County, and 18 in Prowers County, including 7 new leks. No known leks in Cheyenne County were surveyed in 2005 (Yost 2005, p. 2). Results in 2006 suggest that the population in Baca County continued to decline while the Prowers County population is increasing, with three new lek sites discovered there. Limited data suggest LPC populations in Kiowa and Cheyenne Counties are stable to increasing.

LPC numbers declined 75 percent from 2006 to 2007, from 296 birds observed to only 74. Active leks also declined from 34 in 2006 to 18 in 2007 (Verquer 2007, p. 2). Due to heavy snowfall, no cover and little food existed in southern Kiowa, Prowers, and most of Baca Counties for over 60 days. The impacts of drought conditions in 2006, coupled with the severe winter weather, probably account for the 2007 decline in the number of LPC observed (Verquer 2007, p. 2-3).

In addition to CDOW surveys, four individual routes with listening points were run on the USFS Comanche National Grasslands (NG) in Baca County. These routes were configured to pass through areas of native range and sand sage habitats where the LPC is known to occur. These routes complement lek counts conducted by the CDOW. On the Comanche NG, surveys revealed that the estimated area occupied by the LPC over the past 20 years was approximately 65,168 acres (Augustine 2005a). Surveys conducted during 1984 - 2005 identified 53 different leks on or immediately adjacent to USFS lands. Leks were identified based on the presence of at least one male. Lek censuses conducted from 1980 to 2005 showed the number of males counted per lek since 1989 has steadily declined (Augustine 2006, p. 4). The corresponding population estimate, based on number of males observed at leks, on the Comanche NG was highest in 1988 with 348 birds and the lowest in 2005 with approximately 64 birds and only 8 active leks (Augustine 2006, p. 4). The estimate of males/lek in 2005 declined nearly 75 percent from that of 1988, from 174 males/lek to 32 males/lek respectively. A comparision of the most recent information revealed that population estimates, based on counts of males at observed leks, on the Comanche NG have declined by 50 percent since 1995 (Augustine 2005b). In spring 2007, only two active leks and 18 males were counted (B. Cox, Comanche NG, pers. comm. 2007).

<u>Kansas.</u> In the early part of last century, LPC historical range included all or a part of 38 counties, but by 1997 the species was known to exist in only 19 counties. Since 1999, biologists have documented LPC expansion and reoccupation of 16 counties north of the Arkansas River,

primarily attributable to favorable habitat conditions created by implementation of the CRP program in those counties. Currently, LPC occupy approximately 29,130 sq km (11,247 sq mi) within all or portions of 35 counties in western KS. Greater prairie-chickens (GPC) in KS also have expanded their range and as a result, mixed leks of both lesser and greater prairie-chickens are increasingly common throughout an overlap zone of approximately 2,500 sq km (965 sq mi) in western KS, and hybridization of the species is now evident (Bain and Farley 2002, pp.683-687). The zone of overlap between GCP and LPC in KS covers all or portions of 11 counties. Two of the survey routes used by KDWP are located within this overlap zone; however, hybrids have been observed on only one of those routes. Hybrids make up about 2.5 percent of the number of birds observed on that route. Although the hybrids have not been removed from the population estimate, the number of hybrids observed are low.

In 2006, KDWP surveys along 15 LPC survey routes estimated 16.3 LPC per sq km (6.3 per sq mi), which is not statistically different from the 2005 estimate of 14.2 LPC per sq km (5.5 per sq mi). (Rodgers 2006, p. 3, Rodgers 2007b, p. 4). The average number of birds per lek increased slightly from 14.5 in 2005 to 15.4 in 2006, but the increase was not statistically significant. KDWP estimated the 2006 breeding population of LPC in the state at between 19,700 and 31,100 individuals (Rodgers 2007a, p. 1). The total breeding population estimates were derived using the National Gap Analysis Program whereby the population indices from each habitat type along the 15 survey routes were extrapolated for similar habitat types throughout total occupied LPC range statewide. Severe drought conditions during the spring and early summer of 2006 throughout KS, coupled with deep snow cover in January and February 2007 in southwestern counties, reduced the estimated 2007 population in KS to 3.9 birds/mi^2, a 38 percent decrease from 2006, which was statistically significant (Rodgers 2007b, p. 2).

On the USFS Cimarron NG, LPC are present primarily south of the Cimarron River. Surveys conducted on the Cimarron NG during 1988-1997 identified 44 leks and indicated that all NG land south of the Cimarron River (64,387 acres) was occupied. Spring lek counts conducted in 2005 along the KDWP survey route showed a decline from a mean of 10.1 birds/square mile during the first 15 years of the survey (1964-1978) to a mean of 4.9 birds/square mile during 1989-2004. More intensive census surveys conducted on the Cimarron NG during 1995-1999 and 2005 involved repeated counts of birds on all known leks. This lek-census method showed a stable population during 1995-1999 and provided population estimates for the NG varying annually from 173-283 birds (Smith and Smith 1999). This survey method was repeated in 2005 and gave a population estimate of 249 birds, indicating a stable population on the Cimarron NG between 1995 and 2005 (D. Augustine, USFS, pers. comm. 2005). Since 2005, Cimarron NG and KDWP have observed a dramatic population decline to an estimated 124 individuals in 2006 and 86 in 2007 (B. Cox, USFS, pers. comm. 2007). This represents a 65 percent decline over the last three years.

New Mexico. In the 1920s and 1930s, the former range of the LPC in NM was described as all of the sand hill rangeland of eastern NM, from TX to CO, and as far west as Buchanan in De Baca County. Ligon (1927, pp. 123-127) mapped the breeding range at that time as encompassing portions of seven counties, a small subset of what he described as former range. Ligon (1927, pp. 123-127) depicted the historic range in NM as encompassing all or portions of 12 counties. In the 1950s and 1960s, occupied range was more extensive than was the known occupied range in 1927 (Davis 2005, p. 6), indicating reoccupation of some areas since the late

1920s. Presently, the NMDGF reports that LPC are known or suspected from portions of seven counties and the occupied range of LPC in NM is conservatively estimated to encompass approximately 5,698 sq km (2,200 sq mi) (Davis 2006 p. 7) compared with its historic range of 22,390 sq km (8,645 sq mi). Based on the cooperative mapping efforts (Fig.1), occupied range in NM was estimated to be 8,570 sq km (3309 sq mi), considerably larger than the conservative estimate used by Davis. One possible reason for the difference in occupied range is that Davis (2006, p. 7) did not consider the known distribution to encompass any portion of Eddy County or southern Lea counties. Approximately 59 percent of the historic LPC range in NM is privately held, with the remaining historic and occupied range occurring on lands managed by the BLM, USFS and New Mexico State Land Office (Davis 2005, p. 12).

In the 1950s, the LPC population was estimated at 40,000 to 50,000 individuals, but by 1968, had declined to an estimated 8,000 to 10,000 individuals (Sands 1968, p. 456). NMDGF currently estimates the LPC population on non-Federal lands to be approximately 3,800 and the statewide population to be about 6,363 (Beauprez 2007, p. 16). However, other species experts consider the total number of LPC in NM to be much lower. Johnsgard (2002, p. 51) estimated the number of LPC in NM to number fewer than 1,000 individuals by 2001. Similarly, the Sutton Center, based on recent observations made over a 7 year period, estimate the NM LPC population to number between 1,500-3,000 individuals (D. Wolfe, Sutton Center, pers. comm. 2008, M. Patten, Sutton Center, pers. comm. 2007).

Roadside listening routes were first established to survey LPC in NM in 1998. Survey routes were located within known occupied and potential range. The original survey boundary included 182 townships which were comprised of habitats consisting of sandy and deep sand range sites supporting shinnery oak and native grasses. In 1999, the survey boundary was modified to consist of 29 townships. The survey used 19 routes from the 1998 survey and routes in 10 new, randomly selected townships within the core of LPC populations in east-central NM. In 2003, NMDGF established 10 additional roadside routes in the northeastern part of LPC historical range, east and south of Clayton, NM and east and south of Amistad, NM. These routes had been previously surveyed by NMDGF 1999. These new routes included areas near reported LPC sightings.

Since initiating the additional routes in 2003, NMDGF reports that no leks have been detected in northeastern NM, providing strong evidence that LPC no longer occupy their historical range within Union, Harding, and portions of northern Quay counties. However, individual LPC were photographed in northeastern NM by a local wildlife law enforcement agent in late 2007, indicating that the habitat in northeastern NM is still capable of supporting the species (G. Beauprez, NMDGF, pers. comm. 2008). The lack of any known leks in this region since 2003 suggests LPC populations in northeastern NM, if present, are very small.

In 2007, all 29 roadside routes within the core of occupied range in east central NM were surveyed. Of these 29 routes, 15 have been surveyed repeatedly since 1998. On the original 15 routes, the number of leks detected has fluctuated, ranging from a low of 23 in 1998 to a high of 68 in 2007 (Beauprez 2007, p. 8). However, the population trend, average number of birds per lek, along these routes has remained statistically stable.

The New Mexico State Game Commission owns and manages 29 Prairie-chicken Areas (PCAs)

ranging in size from 10 to 3,171 ha (29 to 7,800 ac) within the core of occupied range in east central NM. Additionally, the NMDGF purchased the 2,135 ha (5,275 ac) Sandhills Prairie Conservation Area (formerly the Lewis ranch) east of Milnesand in 2007. Surveys will be conducted on this area in 2008. These PCAs total 109 sq km (42 sq mi), or roughly 1.6 percent of the total occupied LPC range in NM. Instead of the typical roadside routes, the NMDGF conducts saturation surveys on each individual PCA to determine the presence of LPC leks and individual birds over the entire area of each PCA. In 2006, 27 of the 29 PCAs were surveyed, with 183 leks detected, either audibly or visually, on or near the PCAs (Davis 2006, p. 4). A total of 1,117 LPC were observed and counted across 100 of those leks. An increase in survey effort over the last 11 years has resulted in an increase in the number of leks detected and the number of LPC observed on PCAs. In 2007, 164 leks were detected on or near the PCAs, down slightly from 2006 (Beauprez 2007, p. 1). A total of 757 LPC were observed and counted across 89 of those leks. The PCAs are obviously important to persistence of the LPC in NM. However, considering the overall areal extent of the PCAs and that many PCAs are small and isolated, management of the surrounding private and federal lands is integral to viability of the LPC in NM.

In southeastern NM (i.e., area south of NM Highway 380), data from NMDGF surveys suggest LPC populations in this region remain low and continue to decline. The majority of historically occupied LPC habitat located south of Highway 380 occurs on BLM land. Snyder (1967, p. 121) has suggested that this region may be only marginally populated except during favorable climatic periods. In 2006, only one lek was detected and no leks were detected in 2007 (Beauprez 2007, p. 12). Best et al. (2003, p. 232) concluded anthropogenic factors have, in part, rendered LPC habitat south of Highway 380 inhospitable for long-term survival of LPC in southeastern NM. Similarly, NMDGF suggests that habitat quality currently limits recovery of these populations (Beauprez 2007, p. 12).

Oklahoma. LPC historically occurred in 22 OK counties. By 1961, Copelin (1963, p. 53) reported LPC from only 12 counties. By 1979, LPC were verified in eight counties, and the remaining population fragments encompassed an estimated area totaling 2,791 sq km (1,078 sq mi), a decrease of approximately 72 percent since 1944. At present, the ODWC reports LPC continue to persist in eight counties with an estimated occupied range of approximately 950 sq km (367 sq mi). Horton (2000, p.189) estimated the entire OK LPC population numbered fewer than 3,000 birds by 2000. A more recent estimate has not been conducted.

Long-term abundance estimates suggest a history of dramatic population fluctuations. Between 1968 and 2001, mean number of males per active lek varied from a high of 16.5 in 1975 to a low of 2.3 in 1995 (ODWC 2007, p. 6). Despite the wide fluctuation in numbers of males per active lek, the counts demonstrate a downward trend. During the period from 1968 to 1978, the mean number of males per lek averaged 12.5. From 1979 to 1989, the mean number of males per lek averaged 8.5. During the period from 1990 to 2001, the mean number of males per lek averaged 5.1. Beginning with the 2002 survey, male counts at leks were replaced with flush counts, which did not differentiate between the sexes of birds flushed from the surveyed lek (ODWC 2007, p. 2, 6). Between 1987 and 2007, the estimated density of active leks within occupied habitat varied from a high of 0.85 leks per sq km (0.33 per sq mi) in 1988 to a low of 0.13 leks per sq km (0.05 per sq mi) in 2004 and again in 2007. The ODWC is aware of 96 known historic and currently occupied leks in OK. During the mid-1990's all of these leks were active. Recent

survey efforts are lacking for most of these known lek locations and the exact number of currently occupied leks is unknown.

Texas. Systematic surveys to identify TX counties inhabited by LPC began in 1940 (Henika 1940, p. 4). Annual surveys to determine population trends of LPC in TX were initiated in 1952 (Lionberger 2005, p). From the early (Henika 1940, p. 15, Sullivan et al. 2000) to mid (Litton 1978, pp. 11-12)1940's to the early 1950's (Seyffert 2001, pp.108-112), the range of the LPC in TX was estimated to encompass all or portions of 34 counties. Species experts considered the occupied range at that time to be a reduction from the pre-settlement range. By 1989, TPWD estimated occupied range encompassed all or portions of only 12 counties (Sullivan et al. 2000). In 2005, TPWD reported that the number of occupied counties likely has not changed since the 1989 estimate. In March 2007, TPWD reported that LPC were confirmed from portions of 13 counties (Ochiltree, Lipscomb, Roberts, Hemphill, Gray, Wheeler, Donley, Bailey, Lamb, Cochran, Hockley, Yoakum, and Terry) and suspected in portions of another 8 counties (Moore, Carson, Oldham, Deaf Smith, Randall, Swisher, Gaines, and Andrews). LPC populations in TX currently persist in two disjunctive regions; the Permian Basin/Western Panhandle region and the Northeastern Panhandle (see Fig. 1.).

Annual LPC lek surveys were most recently conducted by TPWD in April of 2007 within the Permian Basin/Western Panhandle (study areas in Bailey, Yoakum, and Gaines counties) and in the Northeastern Panhandle (study areas in Gray, Hemphill, and Wheeler counties) regions. All of these study areas are located on private land and have been repeatedly surveyed since at least 1999. In 2006, the Permian Basin/Western Panhandle surveys estimated 7.9 males/lek and the lek density was estimated at 1.9 leks per sq km (0.74 per sq mi). These values are indicative of stable to increasing populations in this study area. The Northeastern Panhandle surveys estimated 7.7 males/lek with an estimated lek density of).54 leks per sq km (0.21 per sq mi). These values are indicative of stable to slightly declining populations in this study area (Lionberger 2007).

Occupied acreage in TX during March of 2007 was estimated to be 7,234 sq km (2,793 sq mi), based on those portions of the 13 counties where LPC are known to persist. Using an estimated mean density of 0.0088 LPC/ac (range 0.0034-0.0135 LPC/ac), the TX population is estimated at a mean of 15,730 with a broad range in the estimate of 6,077 to 24,132 LPC in the 13 counties where LPC are known to occur (Lionberger 2007).

Summary of State Information.
As described above, LPC populations can fluctuate considerably from year-to-year. For example, the number of males per active lek in OK varied from a high of 16.5 in 1975 to a low of 4.6 in 2000, and the estimated density of leks between 1987 and 2007 varied from a high of 0.85 leks per sq km (0.33 per sq mi) in 1988 to a low of 0.13 leks per sq km (0.05 per sq mi) in 2004 and again in 2007. In NM, the state reported the number of LPC counted at leks increased about 83 percent from 2001 through 2005, yet their analysis of lek survey data from 1998 to 2006 shows a statistically stable population trend. Fluctuations in wildlife populations are natural responses to variable weather conditions. The fluctuations add to the difficulty of evaluating population trends, particularly short-term trends, e.g. periods less than 5 years. Thus is possible to have statistically significant changes from one year to the next, but have a statistically stable population when considered over a longer period of time. This situation

makes it difficult to interpret very recent declines, such as the decline in 2007, as it is not clear whether it is a natural fluctuation related to drought, or represents a decline for other reasons and will persist. Table 1 summarizes the information described above regarding LPC populations in each state.

Table 1. Range and current population indices for LPC by state.

State	Historic Range	Current Range	Current Population Estimates 2005	2006	2007	Current Lek Estimates 2005	2006	2007
CO	6 counties	4 counties	203	296	74	32 active	34 active	18 active
KS	38 counties	35 counties 29,987 sq km (11,578 sq mi)	5.5/sq mi 19,700 – 31,100 (in 2006)	6.3/sq.mi	3.9/sq mi			
NM	7 counties 22,390 sq km (8,645 sq mi)	7 counties 5,698 sq km (2,200 sq mi)	6,363 (in 2007)			Within core area surveyed, leks ranged from a low of 23 in 1998 to a high of 64 in 2006, stable trend		
OK	22 counties	8 counties 950 sq km (367 sq mi)	< 3,000 (in 2000)			11 active 0.09/sq mi	7 active 0.05/sq mi	
TX	34 counties (1940's-50's)	13 counties 7,234 sq km (2,793 sq mi)	6,077 – 24, 132 (in 2007)			Permian Basin/Western Panhandle study area - 2006 0.74 leks/sq mi; stable to increasing populations Northeastern Panhandle study area – 2006: 0.21 leks/sq mi; stable to slightly declining populations		

THREATS

A. <u>The present or threatened destruction, modification, or curtailment of its habitat or range</u>.

<u>Conversion to Cultivated Agriculture</u>.
Because LPC require large areas (i.e., 1024-10,000 ha) of intact landscapes of mixed-grass, short-grass, and shrubland habitats (Giesen 1998, p.3-4, Bidwell et al. 2002, p. Hagen et al 2004, p. 71, 77), fragmentation and conversion of these mixed-grass, short-grass, and shrubland habitats have contributed to a significant reduction in the extent of LPC occupied range. Woodward et al. (2001 p. 271) concluded that habitat stability, particularly in shrublands, was extremely important to persistence of LPC within the landscape. Many habitats, once converted to other uses such as cultivated cropland, no longer provide suitable reproductive habitat for the LPC and restoration of ecologically meaningful amounts of converted rangeland is doubtful in the short term.

Several LPC experts have identified conversion of native sand sagebrush and shinnery oak rangeland to cultivation as an important factor in the decline of LPC populations (Copelin 1963, p. 8, Jackson and DeArment 1963, p. 733, Crawford and Bolen 1976, p. 102, Crawford 1980, p. 2, Taylor and Guthery 1980b, p. 2, Braun et al. 1994, LPC Interstate Working Group 1997, p. 3). Between 1915 and 1925, considerable areas of prairie sod were plowed in the Great Plains to

grow wheat (Laycock 1987, p. 4). By the 1930s, Bent (1932, pp. 283-284) speculated that extensive cultivation and overgrazing had already caused the species to disappear from areas where it had once been abundant. Because some grain crops provided increased winter food supplies, the initial conversion of some native prairie to cultivation may have been beneficial to the species. However, landscapes having greater than 20 to 37 percent cultivation may not support stable LPC populations (Crawford and Bolen 1976, p. 102). In the 1940s, 1970s, and 1980s, additional acres of previously unbroken grassland were brought into cultivation (Laycock 1987, p .4-5). Bragg and Steuter (1996) estimated that by 1993, only 8 percent of the bluestem-grama association and 58 percent of the mesquite-buffalo grass association as described by Kuchler (1985) remained.

In the U.S. Fish and Wildlife Service's (Service) June 7, 1998, 12-month finding for the LPC (63 FR 31400), the Service assessed the loss of native rangeland using the National Resources Inventory of the U. S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). The 1992 National Resources Inventory Summary Report provided estimates of change in rangeland acreage between 1982 and 1992, for each state. When considered state-wide, each of the five states with LPC showed a decline in the amount of rangeland acreage over that time period, indicating that loss of important LPC habitat may have continued to occur since the 1980s. However, estimates of rangeland between 1982 and 1992 for counties specifically within LPC range showed no statistically significant change, possibly due to small sample size and large variation about the mean.

The CRP was initiated in the 1985 Food Security Act and since that time has facilitated restoration of millions of acres of marginal and highly erosive cropland to grassland, shrubland and forest habitats (Riffell and Burger 2006, p. 6). CRP habitat encompasses a very significant portion of currently occupied range in most LPC states, particularly in KS where expansion of the LPC population is directly related to the amount of land enrolled in native CRP. Estimates of the extent of CRP in habitat occupied by LPC, as derived from the cooperative mapping effort delineated in Figure 1, is available for KS, OK and TX. Kansas has just over 363,000 ha (897,000 ac), OK has over 91,600 ha (226,000 ac) and TX some 167,600 ha (414,000 ac) in CRP. Based on the estimated amount of occupied habitat remaining in these states (Figure 1), CRP fields in KS comprise some 12.5 percent of the occupied LPC range, 8.3 percent of the occupied range in OK, and 13.8 percent of the occupied range in TX.

The importance of CRP habitat to the status and survival of LPC was recently emphasized by Rodgers and Hoffman (2005, p. 122-123). They determined that the presence of CRP which had been planted to native species of grasses facilitated the expansion of LPC range in CO, KS, and NM. The range expansion in KS resulted in strong population increases there (Rodgers and Hoffman 2005, p. 122-123). In OK and TX, and some portions of NM, CRP fields were planted with a monoculture of introduced grasses. Where introduced grasses were planted, LPC did not demonstrate a range expansion or an increase in population size (Rodgers and Hoffman 2005, p. 123). Reductions in CRP acreages, either by reduced enrollments or by conversion back to cultivation upon expiration of existing contracts, would further diminish the amount of suitable LPC habitat. This is particularly relevant in KS where CRP acreages planted to native grass mixtures facilitated an expansion of LPC range in that state. A reduction in CRP acreage could lead to contraction of the currently occupied range and reduced numbers of LPC rangewide.

The possibility exists that escalating grain prices due to the recent emphasis on generating domestic energy from biofuels, such as ethanol from corn, grain sorghum and switchgrass, combined with recent federal budget proposals that would reduce or eliminate CRP enrollments and renewals through Fiscal Year 2010, will result in an unprecedented conversion of existing CRP acreage within the Great Plains (Babcock and Hart, 2008, p. 6). In 2006, the USDA's Farm Service Agency (FSA) provided a small percentage of current CRP contract holders whose contracts are set to expire during 2007-2010 period with an opportunity (termed REX) to re-enroll (10-15 year terms) or extend (2-5 year terms) their contracts. The opportunity to re-enroll or extend their contracts was based on the relative environmental benefits of each contract. FSA conducted REX offers in two parts. The first part targeted contracts expiring in 2007 and was held in spring 2006. The second, for 2008-2010 expiring contracts, was held in summer of 2006. FSA required that holders of contracts set to expire in 2007 make known to FSA, by Sept. 30, 2006, their intention to either re-enroll their existing contract or allow it to expire. FSA also requested that holders of 2008-2010 expiring contracts make their intentions known to FSA by Dec. 31, 2006. In March of 2007 the USDA expected that some 23.9 million acres out of the total 28 million acres of eligible CRP contracts would be re-enrolled. The remaining 4.1 million acres would be eligible for conversion to crop production or other uses.

Although the large scale loss of CRP habitat poses a threat to the status of existing LPC populations, some eventual benefits have been identified. In particular, an analysis of LPC habitat quality within a subsample of 1,019 CRP contracts across all five LPC states was recently conducted by the Rocky Mountain Bird Observatory (Ripper and VerCauteren 2007, p 1-42). They found that, particularly in OK and TX, early signup contracts allowed planting of exotic monoculture grasses, such as old-world bluestem and weeping lovegrass, which provides poor quality habitat for LPC (Ripper and VerCauteren 2007, p. 11). While the report identified areas for habitat improvement among all CRP in all states, converting exotic grass fields to taller native grass species and enhancing the diversity of native forbs and shrubs within these contracts was recommended as a top priority for LPC recovery. Consequently, conversion of exotic fields to short-term farming activities, but eventual re-enrollment in native CRP, could improve local habitat quality in the long term above current conditions. However, the extent to which this might occur is currently unknown.

Livestock Grazing**.** Habitats used by LPC are largely dominated by a diversity of drought tolerant perennial grasses and shrubs. Grazing has always been an ecological force within the ecosystems of the Great Plains. The evolutionary history of the mixed-grass prairie has resulted in endemic bird species adapted to an ever-changing mosaic of lightly to severely grazed grasslands (Bragg and Steuter 1996, Knopf and Samson 1997). While livestock grazing is not inherently harmful to LPC, levels of grazing that alters the composition and structure of mixed grass habitats historically used by the LPC can be detrimental Much of the remaining remnants of mixed-grass prairie and rangeland, while still important to LPC, differ from conditions prior to European settlement. The present grazing, fire (usually to promote forage quality for livestock), and water management regimes (usually for livestock watering) are vastly different and less variable than historic conditions. These changes have considerably altered the composition and structure of mixed grass habitats historically used by the LPC. While native rangeland still persists in many areas of LPC historic range, modification of that rangeland has altered the suitability of those areas for LPC.

Because LPC depend on medium and tall grass species that are preferentially grazed by cattle, in regions of low rainfall, LPC habitat is easily overgrazed (Hamerstrom and Hamerstrom 1961, p. 290). Overgrazing and related deteriorated range condition is most readily observed through changes in plant composition and other vegetative characteristics (Stoddart et al. 1975 p. 267). Typical vegetative indicators include changes in the composition and proportion of desired plant species, leading to overall reduction in forage. Plant height and density may decline, particularly when plant regeneration is hindered, and composition shifts to increased proportion of less desirable species. When grasslands are in a deteriorated condition due to overgrazing, the soils have less water-holding capacity, and the availability of succulent vegetation and insects utilized by LPC chicks are reduced. The effects of overgrazing on habitat quality are similar to drought and are likely exacerbated by actual drought conditions (Davis et al. 1979, Merchant 1982, pp. 31-33) (see Factor E).

Grazing management favorable to persistence of LPC must ensure that a diversity of plants and cover types, particularly shrubs, remain on the landscape (Taylor and Guthery 1980b, p. 7, Bell 2005, p. 4) and that utilization levels leave sufficient cover in the spring to ensure that LPC nests are adequately concealed from predators. Information on the extent of overgrazing throughout LPC habitat is lacking. However, some studies have shown that overgrazing in portions of LPC occupied range is detrimental to the LPC. Taylor and Guthery (1980b, p. 2) believed overgrazing explained the demise of the LPC in TX but thought LPC could maintain low populations in some areas with high intensity, long-term grazing. In NM, Patten et al. (2006 p. 11, 16) found that grazing did not have an overall influence on where LPC occurred within their study areas but there was evidence that LPC did not nest in portions of the study area subjected to cattle grazing. In some areas within LPC range, long-term high intensity grazing results in insufficient amounts of lightly grazed habitat available to support successful nesting (Jackson and DeArment 1963, p. 737; Davis et al. 1979; Taylor and Guthery 1980b, p. 12,; Davies 1992, p. 8, 13). Grazing of native rangelands with domestic livestock often differs from grazing regimes historically present when these areas were grazed by free roaming herd of bison. Grazing regimes tend to be more uniform and are confined to specific pastures. When uniform livestock grazing of rangeland leaves less than adequate residual cover in the spring, it is detrimental to LPC populations (Bent 1932, p. 280; Davis et al. 1979; Cannon and Knopf 1980, p. 73-74; Crawford 1980, p. 3; Bidwell and Peoples 1991; Riley et al. 1992, p. 387; Giesen 1994a, p. 97), because grass height is reduced below that necessary to provide adequate nesting cover and desirable food plants are markedly reduced. Superior cover at and around nests is thought to increase nest success because the nest is better concealed from predators (Davis et al. 1979; Wisdom 1980, p. 33; Riley et al. 1992, p. 386; Giesen 1994a). Fencing to facilitate livestock management, while often necessary, leads to structural fragmentation of the landscape. This can be particularly detrimental to LPC in OK where settlement patterns resulted in smaller parcels (Patten et al. 2005b, p. 245). Additional information on fragmentation and the effects of fencing can be found in the section below and in the discussion under Factor E.

<u>Fragmentation.</u> Because much suitable habitat for LPC has been destroyed due to to agricultural conversion, and many remaining habitats negatively modified through grazing practices, fire suppression and other land uses that result in habitat conditions unsuitable for LPC, fragmentation of the remaining suitable habitat contributes to further alteration of LPC range (Crawford 1980, p. 5; Braun et al. 1994; Knopf 1996, p 146, Patten et al. 2005b, p. 235-236). Spatial habitat fragmentation often has a negative impact on population persistence and may

exacerbate the species extinction process (Wilcove et al. 1986) through several mechanisms. Once fragmented, the remaining fragments may be inadequate to support crucial life history requirements (Samson 1980). Habitat between remaining suitable fragments may support high densities of predators or brood parasites; and the probability of recolonization of unoccupied fragments decreases as distance from the nearest suitable habitat increases (Wilcove et al. 1986). As a group, grouse are considered to be particularly intolerant of extensive habitat fragmentation due to their short dispersal distances and other life history characteristics, such as specialized food habits and generalized anti-predator strategies (Braun et al. 1994). Patten et al. (2005b, p. 245), based on observations of radio tracked LPC in OK and NM, suggested that increased fragmentation in OK resulted in higher rates of mortality than in the less fragmented habitat in NM. In summarizing much of the literature on LPC conservation, Hagen et al. (2004, p. 76-77) stated that most experts agree that LPC are area sensitive species and that large quantities of suitable habitat are essential for population growth.

In addition to spatial habitat fragmentation, structural habitat fragmentation has been shown to be detrimental to LPC and forces avoidance or abandonment of otherwise suitable habitats (Hagen et al. 2004, pp. 74-75; Robel 2002). Structural habitat fragmentation is caused by the construction and operation of vertical structures, including towers, utility lines, fences, wind turbines, oil and gas wells, buildings, compressor stations. Ongoing research increasingly indicates that vertical features and structural habitat fragmentation may have significant negative impacts, such as general habitat avoidance and displacement, on LPC and other prairie grouse.

Most large remaining tracts of untilled native rangeland, and hence LPC habitat, occur on topographic ridges. Leks, the traditional mating grounds of prairie grouse, are consistently located on elevated grassland sites with few vertical obstructions (Flock 2002, p. 35). Because of the increased elevation, these ridges also are prime sites for wind turbine development. Telemetry research on LPC (Pitman et al. 2005, p.1267-1268) indicate that prairie grouse exhibit strong avoidance of tall vertical features such as utility transmission lines. Robel (2002) estimates that a single commercial-scale wind turbine creates a habitat avoidance zone for the greater prairie-chicken that extends as far as 1.6 km (1 mi) from the structure.

In a recent study (Pitman et al. 2005, p. 1267-1268), avoidance of elevated structures by LPCs has been identified, with no nesting or brood rearing within 300 m of power lines. This research also found no LPC nesting or lekking within 0.8 km (0.5 mi) of a gas line compressor station. LPC generally avoided human activity and seldom nested within 0.4 km (0.25 mi) of inhabited dwellings; LPC also were documented to avoid habitat within a 1.6 km (1 mi) radius of a coal-fired power plant (Pitman et al. 2005, p. 1267-1268).

Oil and gas development activities, particularly drilling, and road and highway construction also contributes to surface fragmentation of LPC habitat for many of the same reasons observed with other artificial structures (Hunt and Best 2004, p. 92). The incidence of oil and gas exploration has been rapidly expanding within the range of the LPC. A more thorough discussion of oil and gas activities within the range of the LPC is discussed below.

<u>Wind Energy Development.</u> According to the American Wind Energy Association (AWEA), a non-profit organization that promotes the wind energy industry, the 5 states within the historic range of the LPC are all among the top 12 states having the highest wind energy potential in the

U.S. (AWEA 2008a, p.1; citing a Pacific Northwest Laboratory 1991 report). The tubular towers of most commercial, utility scale onshore wind turbines are between 65 (213 ft) and 100 m (328 ft) tall. The most common system utilizes three rotor blades and can have a diameter of as much as 100 m. The total height of the system is measured when a turbine blade is in the 12 o'clock position and will vary depending on the length of the blade. With blades in place a typical system will easily exceed 100 m in height. A wind farm will vary in size depending on the size of the turbines and amount of land available. Spacing between turbines is usually 5-10 rotor diameters to avoid interference between turbines.

Commercial wind energy cannot be a viable enterprise when the ability to transmit the power to the users is lacking. Any discussion of the effects of wind energy development must also take into consideration the influence of the transmission lines critical to distribution of the energy generated by these structures. Transmissions lines can traverse long distances across the landscape and can be both above ground and underground. Most of the impacts 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 powerline towers are 30 to 38 m high but can be higher if the need arises. Local distribution lines are usually much shorter in height but all contribute to vertical fragmentation of the landscape.

As discussed in the previous section on structural habitat fragmentation, prairie grouse including the LPC did not evolve with tall vertical structures present on the landscape. The addition of wind turbines and their supporting infrastructure represents a significant change in the species' environment. Placement of vertical structures is a relatively new phenomenon over the evolutionary history of these species and the effects of these structures on their life history are only beginning to be evaluated. However, some information on the behavioral response of prairie grouse to these structures is available.

In general, prairie grouse have low tolerance to tall structures. Anderson (1969, p. 640-641) observed that greater prairie chickens abandoned lek territories when a 4 m (13 ft) tall wind break was artificially erected 52 m (170 ft) from an active lek. Robel (2002) estimates that a single commercial-scale wind turbine creates a habitat avoidance zone for the greater prairie-chicken that extends as far as 1.6 km (1 mi) from the structure. Structural habitat fragmentation caused by energy development also has been shown to cause LPC to avoid or abandon otherwise suitable habitats due to potential for increased predation by raptors or due to visual obstructions on the landscape (Hagen et al. 2004, pp. 74-75). Pitman (2005, p. 1267-1268) observed that female LPC selected nest sites that were significantly further from powerlines, roads, buildings and oil and gas wellheads than would be expected at random. Specifically, they seldom found LPC nests within 400 m of transmission lines and improved roads. Similar work by Hagen, as presented in Hagen et al (2004, p. 75) indicated that areas used by LPC were significantly further from these same types of features than areas not used by LPC. The Service has recommended that, due to behavioral avoidance of wind turbines, a 8 km (5 mi) voluntary no construction buffer be established around prairie grouse leks (Manville 2004, p. 1). Although considerably more study is needed, the available information clearly demonstrates that vertical structures are avoided by LPC and likely render otherwise suitable habitat as unsuitable.

Wind energy development is already occurring within the historic range of the LPC, some of which has impacted occupied habitat. As of June 30, 2008, the AWEA's database of existing

and planned wind projects showed 24 existing wind projects within the current occupied range of the LPC (www.awea.org/projects). Four of those projects were located in CO, 4 in KS, 5 in NM, 6 in OK and 5 in TX. Within the historic range of the LPC, but excluding the occupied range, another 72 projects were in the AWEA database, 68 of those projects were in TX. By the end of 2007, TX had the greatest installed megawatt capacity for wind energy of all states and CO had the sixth greatest (AWEA 2008b, p.7).

The potential influence of anticipated wind energy development to the status of the LPC can readily be evaluated for OK. In cooperation with ODWC, Service personnel in 2005 quantified the potential degree of wind energy development in relation to existing populations of LPC in OK. Using ArcView mapping software, all active and historic LPC lek locations in OK, as of the mid 1990s (n = 96), and the current occupied range, were compared with the OK Neural Net Wind Power Development Potential Model map created by the OK Wind Power Assessment (OWPA) project. The mapping analysis revealed that 35 percent of the recently occupied range in OK is within areas designated by OWPA as "excellent" for wind energy development. When both the "excellent" and "good" wind energy development classes are combined, some 55 percent of the occupied range lies is within those two classes.

When leks were examined, the same analysis revealed a nearly complete overlap on all known active and historic lek locations, based on the known active leks in the mid 1990s. Roughly 91 percent of the known LPC lek sites in OK are within 8 km (5 mi) of land classified as "excellent" for wind development (C. O'Meilia, Service, pers. comm. 2005). The analysis revealed that over half (53 percent) of all known lek sites occur within 1.6 km (1 mi) of lands classified as "excellent" for commercial wind energy development. This second metric is particularly relevant given the average home range for a LPC is about 10 sq km (4 sq mi) and that a majority of LPC nesting generally occurs within 1.6 km (1 mi) of active leks (Hagen and Giesen 2005). Using Robel's (2002) estimate derived for the greater prairie chicken of the zone of avoidance for a single commercial-scale wind turbine (1.6 km – 1 mi), development of commercial wind farms likely will have a significant adverse influence on reproduction of the LPC.

Unfortunately, similar analyses are not available for the other states due to a lack of appropriate data layers for those states. However, southwestern KS currently supports the largest population and distribution of LPC of all states. The influence of wind energy development on the LPC in KS would likely be no less severe than in OK. In 2006, the Governor of KS initiated the Governor's 2015 Renewable Energy Challenge, an objective of which is to have 1,000 megawatts (MW) of renewable energy capacity in KS by 2015 (Cita et al. 2008, p.1). A cost/benefit study (Cita et al. 2008, appendix B) found that wind was the most cost effective and likely renewable energy resource for KS. Modestly assuming an average of 2 MW per turbine—most commercial scale turbines are between 1.5 and 2.5 MW—some 500 turbines would be erected in KS if this goal is to be met. While not all of those turbines would directly overlap occupied range, the best wind potential in KS occurs in the western portions of the state (U.S. Department of Energy 2008). Inappropriate siting of wind energy facilities and associated facilities, including electrical transmission lines, appears to be a serious threat to LPC in western KS within the near future (R. Rodgers, KDWP, pers. comm. 2007).

In TX, the Public Utility Commission of TX recently directed the Electric Reliability Council of Texas (ERCOT) to develop transmission plans for wind capacity to accommodate between

10,000 and 25,000 MW of power (AWEA 2007). ERCOT is a regional transmission organization with jurisdiction over most of TX. The remainder, largely the TX panhandle, lies within the jurisdiction of the Southwest Power Pool. The establishment of Competitive Renewable Energy Zones (CREZs) by ERCOT within the state of TX will facilitate wind energy development throughout western TX (Figure 2). A recent assessment from ERCOT identified more than 130,000 MW of high-quality wind sites in TX, more electricity than the entire state currently uses. Wind energy development in the TX panhandle and portions of west TX represents a serious threat to extant LPC populations in the state. Once established, wind farms and associated transmission features would severely hamper future efforts to restore population connectivity and gene flow between existing populations which are currently separated by unfavorable land use in the TX panhandle.

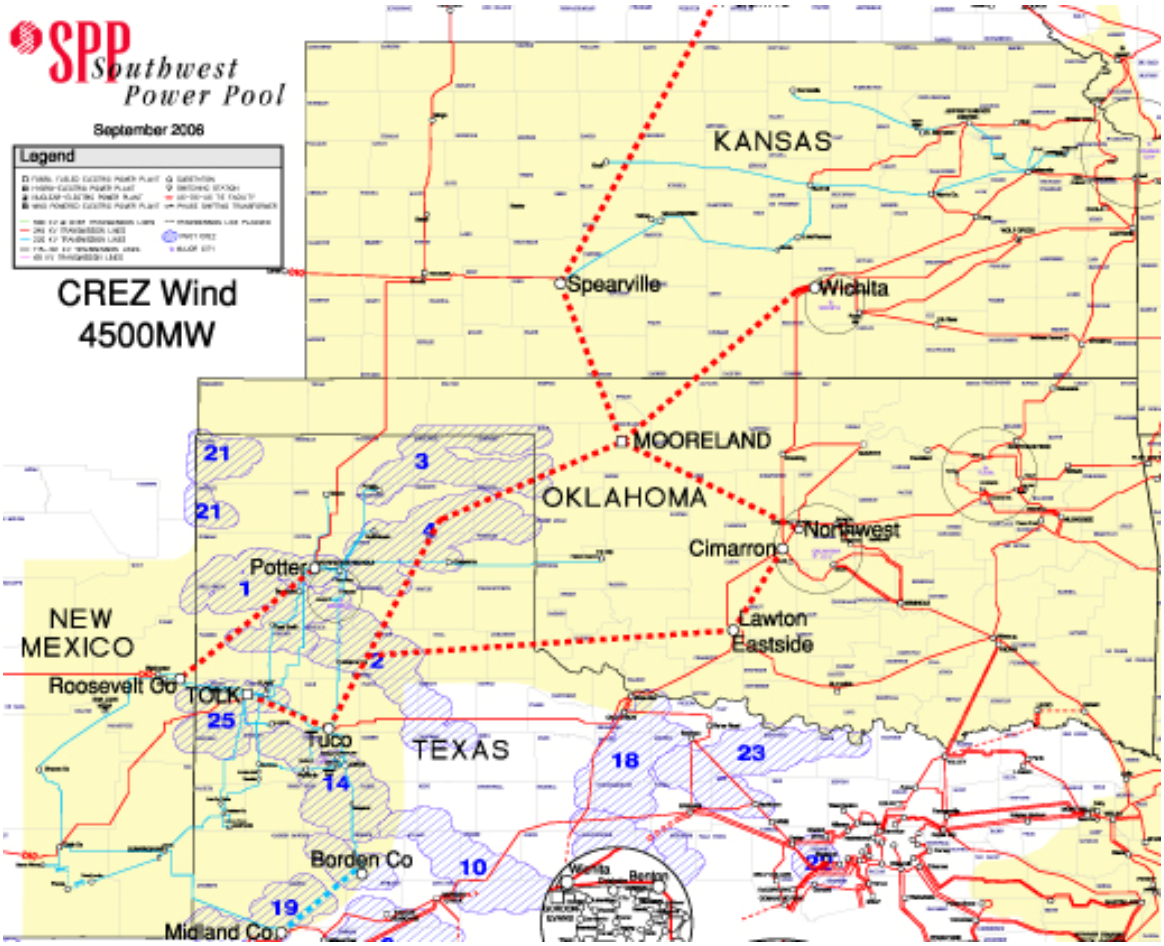

Figure 2. Planned transmission lines known as the X Plan (dashed red lines) that would provide access for 4,500 MW of new wind development in the TX Panhandle to major markets and cross currently occupied LPC habitat in KS, NM, OK, and TX. Competitive Renewable Energy Zones (in blue) are prioritized for development by number. The top four zones fall within occupied LPC range and within the only likely habitat corridor capable of reconnecting extant populations.

The TPWD LPC biologist reports that commercial wind energy development, based on the existing CREZ, threatens remaining LPC populations in both the Permian Basin/Western Panhandle and the Northeastern Panhandle regions of TX (Whitlaw 2007; see Fig. 2). The high

level of overlap between the LPC currently occupied range in TX and the CREZ which are designated for future wind energy development in the TX panhandle is shown in Figure 3. In addition, the Public Utility Commission of TX recently directed ERCOT to develop transmission plans for wind capacity to accommodate between 10,000 and 25,000 MW of power (AWEA 2007). The numbers within the identified CREZ, as shown on Figure 2, identify the development priority of each zone. The top four zones are located within occupied and historic LPC habitat in the TX panhandle.

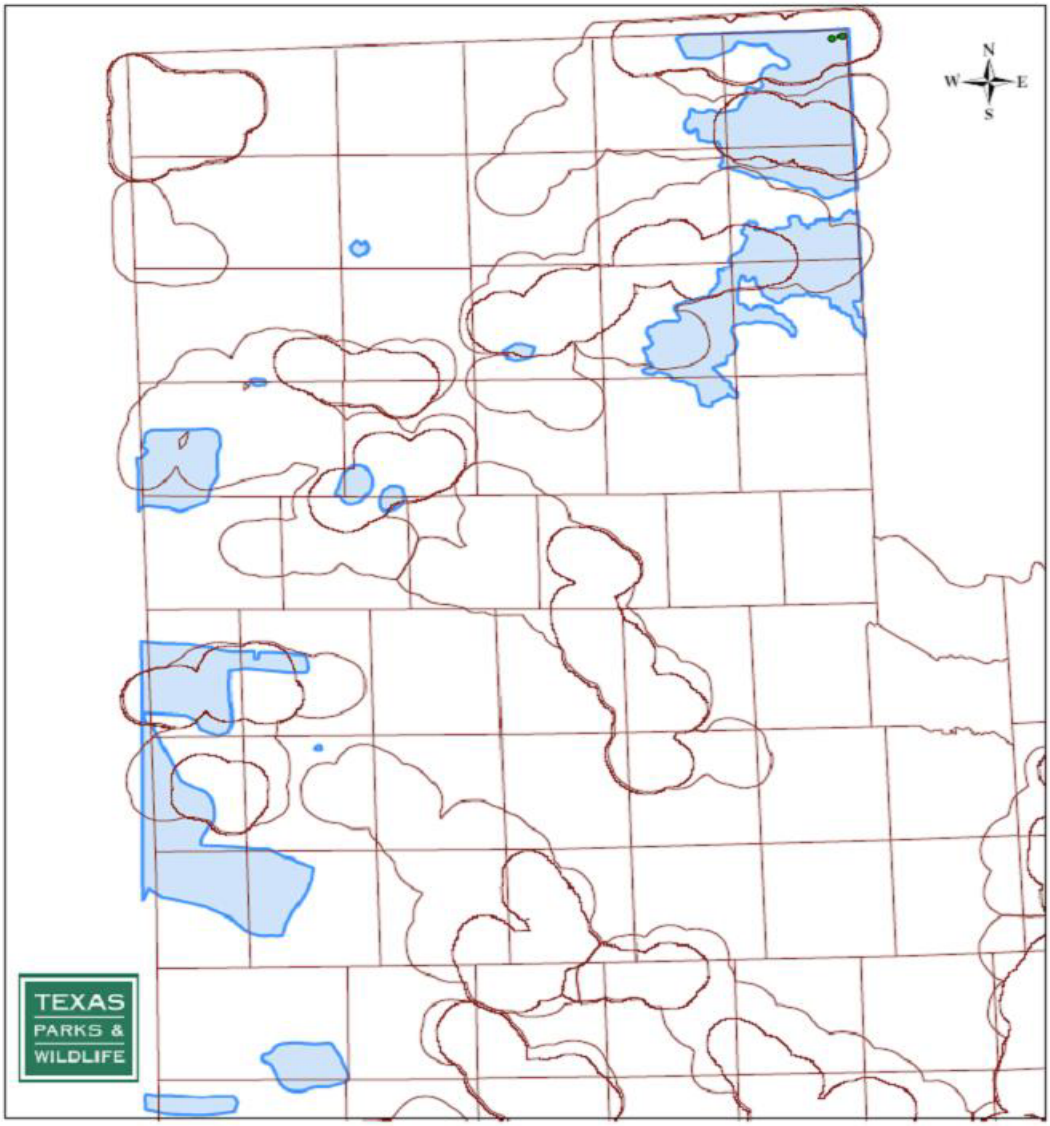

Figure 3. Map depicting the degree of overlap between occupied LPC habitat in TX (shaded) and Competitive Renewable Energy Zones designated for future wind energy development in the TX panhandle.

Development of high capacity transmission lines is critical to the development of the anticipated wind energy resources. According to AWEA (2007) every $1 billion invested in new transmission capacity enables the construction of $6 billion of new wind farms. Depicted on Figure 2 are the currently proposed electric transmission line upgrades which were provided to

the Service by the Southwest Power Pool. This map identifies approximately 423 km (263 mi) of proposed new transmission lines, commonly referred to as the "X Plan", that would be constructed to facilitate the completion of six proposed wind energy projects within LPC range in OK (Southwest Power Pool 2006). Completion of the "X Plan" also is intended to connect transmission capacity throughout all or portions of occupied LPC range in the four remaining states. Some portions of the "X Plan" have already been improved and completion of these and other sections of the plan will undoubtedly catalyze extensive wind energy development throughout much of the remaining occupied LPC range in KS, OK, and TX.

In CO, the U.S. Department of Energy (2008) rated the southeastern corner of CO as having good wind resources, the largest area of CO with that ranking. The area almost completely overlaps the currently occupied range of the LPC in CO. CDOW reported that commercial wind development is occurring in CO, but that most of the effort is currently centered north of the occupied range of LPC in southeastern CO.

Wind energy development in NM is a lower priority than other states within the range of the LPC. In NM, the potential for wind energy development in the currently occupied range of the LPC are only rated as fair (U.S. Department of Energy 2008). However some parts of northeastern NM, within LPC historical range have been rated as excellent. Northeastern NM is important to LPC conservation because this area is vital to efforts to re-established or re-connect the NM LPC population to those in CO and the TX panhandle.

In summary, wind energy development is occurring within occupied portions of LPC habitat. Where such development has occurred, these areas are no longer suitable for LPC even though many of the typical habitat components used by LPC remain. Proposed transmission line improvements will serve to facilitate further development of additional wind energy resources. Future wind energy developments, based on the known locations of areas with excellent to good wind energy development potential, likely will have substantial overlap with known LPC populations. Additional areas that are currently unoccupied but lie within the historic range and provide suitable habitat for the LPC also could be developed. These areas of unfragmented habitat are crucial to ongoing efforts to conserve the LPC. Fragmentation of these areas would further modify or curtail the range of the LPC and hamper efforts to conserve the species. Therefore, the Service considers the ongoing and large-scale potential for commercial wind power development, particularly in western KS, northwestern OK and the TX panhandle, to be a high-level threat to the survival of the species in the near future. Siting of wind farms and transmission lines in a manner that avoids fragmentation of LPC habitat is important and some wind power developers appear sensitive to concerns about siting such facilities.

<u>Oil and Gas Development.</u> Oil and gas development affects LPC by disrupting reproductive behavior (Hunt and Best 2004, p. 41) and by habitat fragmentation and conversion (Hunt and Best 2004, p. 92). Smith et al.(1998, p.) observed that almost one-half, 13 of 29, of the abandoned leks examined in southeastern NM had a moderate to high level of noise. Hunt and Best (2004, p. 92) found that abandoned leks in southeastern NM had more active wells, more total wells, and greater length of access road than active leks. They concluded that petroleum development at intensive levels is likely not compatible with populations of LPC (Hunt and Best 2004, p. 92)

Impacts from oil and gas development and exploration are reasons for the species' near absence throughout previously occupied portions of the Carlsbad BLM unit in southeastern NM (Belinda 2003). This is supported by research examining LPC losses over the past twenty years on Carlsbad BLM lands (Hunt and Best 2004). In this study, factor analysis of characters associated with active and abandoned leks was conducted to determine which potential causes were associated with the population decline. Those variables associated with oil and gas development explained 32 percent of observed lek abandonment (Hunt and Best 2004) and the consequent population extirpation.

Well densities are increasing dramatically throughout many portions of LPC range. Although the Service presently lacks the information to specifically quantify and analyze drilling activity throughout the entire historic and occupied range of the LPC, known activity within certain areas of the historic range demonstrates the magnitude of the threat. For example, the amount of habitat fragmentation due to oil and gas extraction in the TX Panhandle and western OK, associated with the Buffalo Wallow oil and gas field within the Granite Wash formation of the Anadarko Basin has steadily increased over time. In 1982 the rules for the Buffalo Wallow field allowed one well per 130 ha (320 acres). In May, 2005, the TX Railroad Commission changed the field rule regulations for the Buffalo Wallow oil and gas field to allow oil and gas well spacing to a maximum density of one well per 8 ha (20 ac) (Texas Railroad Commission pers. comm. 2007). When fully developed at this density, the region will have experienced a 16 fold increase in habitat fragmentation in comparison with the rates allowed prior to 2005. Since 2005, TPWD and Service biologists report that new oil and gas well development within prime occupied habitat in the northeastern portion of the TX panhandle within portions of Hemphill, Lipscomb, and Wheeler counties, TX is occurring at a rapid rate (Whitlaw 2007; J. Hughes, Biologist, Service, pers. comm. 2008). Although the specific rate of expansion is unquantified, at least one company has reported that they have drilled 150 wells in this formation since 2005 (Presentation by Forest Oil Corporation, March 6, 2008, Granite Wash Conference, Oklahoma Geological Survey).

In the BLM's special status species record of decision and approved resource management plan amendment (RMPA)(BLM 2008) some limited protections for the LPC in NM are provided by reducing the number of drilling locations, decreasing the size of well pads, reducing the number and length of roads, reducing the number of powerlines and pipelines, and implementing Best Management Practices (BMP) for development and reclamation. The RMPA provides guidance for management of some 344,000 ha (850,000 ac) of public land and 121,000 ha (300,000 ac) of federal minerals in Chaves, Eddy, Lea, and Roosevelt counties in NM. Implementation of these restrictions, particularly curtailment of new mineral leases, would be greatest in the Core Management and Primary Population Areas (BLM 2008, pp. 9-11). The Core Management and Primary Population Areas are located in the core of the LPC occupied range in NM. The effect of these BMP on the status of the LPC is unknown, particularly considering some 60,000 ha (149,000 ac) have already been leased in those areas (BLM 2008, p. 8). The plan does stipulate that measures designed to protect the LPC and sand dune lizard may not allow approval of all spacing unit locations or full development of the lease (BLM 2008, p. 8).

Oil and gas development and exploration is ongoing in the remaining states although the extent is currently unknown. Some development is anticipated in Baca County, CO, although the timeframe for initiation of those activities is uncertain (CDOW 2007). In OK, oil and gas

exploration statewide continues at a high level. Since 2004, the number of active drilling rigs has remained above 150, reflecting the highest level of sustained activity since the 'boom' years from the late 1970s through the mid-1980s in OK (Boyd 2007).

Fire Suppression. In grassland ecosystems, such as those in the Great Plains, which evolved with fire and ungulate grazing, the frequency and intensity of disturbances are critical to ecological processes, biological diversity and heterogeneity across multiple spatial scales (Collins 1992, pp. 2003-2005; Fuhlendorf and Smeins 1999, p. 732, 737). North American grasslands and shrub lands evolved under, and are maintained by, ungulate grazing and frequent fire. Both grazing patterns and fire frequency have been drastically altered since European settlement of the Great Plains. With few exceptions, burning of native rangelands was, and continues to be, perceived by landowners as destructive to rangelands, undesirable for maximizing cattle production, and likely to create wind erosion or "blowouts" in sandy soils. As a result, virtually all wildfires throughout LPC range were historically suppressed, and relatively little prescribed burning now occurs on private land.

While prescribed burning is now recognized as the preferred method to control and prevent tree invasion of native rangeland, prescribed fire is generally employed only after significant invasion has already occurred and landowners believe that forage production for cattle is becoming diminished. The threshold of tree invasion at which forage production is significantly reduced is far greater than the threshold at which grassland dependent and grassland obligate birds such as LPC can survive. For example, Coppedge et al. (2001, pp. 51-57) examined avian response to eastern red cedar (*Juniperus virginianus*) invasion into native and CRP grasslands in western OK using Breeding Bird Survey data spanning from the time period 1965 to 1995. They found that grassland bird populations declined or exhibited negative associations with woody vegetation gradients. In particular, western meadowlark (*Sturnella neglecta*) populations declined across a gradient of increasing encroachment, and were extirpated from areas with the most eastern red cedar. Woody plant invasion also affected habitat patch size, and areas with the least amount of woody cover retained core areas suitable for species associated with core patch size.

Because LPC habitat is characterized by extensive patches of treeless grassland and shrubland habitat (Giesen 1998, p. 3-4), the invasion of remaining native habitat within LPC range by woody species such as eastern red cedar is a growing concern. An analysis of the rate of spread of eastern red cedar trees in OK by OK State University and the OK Cooperative Extension Service indicated that by 1995, eastern red cedar invasion would consume approximately 308 ha (762 ac) of rangeland habitats in OK each day, on average, amounting to over 121,400 ha (300,000 ac) annually (T. Bidwell pers. comm. 2005). More recently, a time series infrared satellite mapping analysis conducted by the OK NRCS in 2005 revealed that eastern red cedar trees alone are invading native rangelands in western OK at a rate of approximately 5 percent per year (J. Eckroat, Eastern Red Cedar Taskforce, OK NRCS pers. comm. 2007; http://www.okcc.state.ok.us/Publications/redcedar-pub.pdf). Given that southern KS and the northeastern TX panhandle have similar rates of precipitation, fire exclusion, and grazing pressure compared to western OK, this rate of spread is likely also occurring throughout occupied LPC range in these areas.

Tree invasion in native rangeland has the potential to render significant portions of remaining occupied habitat unsuitable within the near term. Woodward et al (2001, p. 270-271)

documented a negative association between landscapes with increased woody cover and LPC population indices. Similarly, Fuhlendorf et al. (2002, p.625) examined the effect of landscape structure and change on population dynamics of LPC in western OK and northern TX. They found that landscapes with declining LPC populations had significantly greater increases in tree cover types (riparian, windbreaks, and eastern red cedar encroachment) than landscapes with sustained LPC populations.

Summary of Habitat Loss, Modification and Curtailment. LPC habitat destruction and modification range wide is presently occurring and the threatened destruction, modification and curtailment of LPC habitat and range is substantial due to human land use. The possible conversion of over a million acres of currently enrolled CRP grasslands within the next two years has the potential to cause the destruction or modification of 14 percent of occupied habitat. Wind energy development with its associated infrastructure development is on-going and the potential for additional wind energy facilities is substantial within nearly all occupied habitat in all states except NM, where it may impact historical habitat important to linking the NM population to populations to the north. Additionally, the continued loss and degradation of currently occupied habitat in several areas in the form of heavy grazing by livestock, woody invasion due to fire suppression, oil and gas development, and fragmentation are rendering portions of previously occupied range uninhabitable for the species.

B. Overutilization for commercial, recreational, scientific, or educational purposes.
In the late 19th century, LPC were subject to market hunting (Jackson and DeArment 1963). Harvest has been regulated since approximately the turn of the 20th century (Crawford 1980, pp. 3-4). Currently, the LPC is classified as a game species in KS, NM, OK, and TX, although the legal harvest is now closed in NM and OK.

In KS, the bag limit is one bird daily for LPCs located south of Interstate 70 and two birds for LPCs located north of Interstate 70. During the 2006 season, KS hunters expended 1,900 hunter-days and harvested approximately 200 LPC. Given the low number of LPCs harvested per year in KS relative to the population size, the statewide harvest is probably insignificant at the population level. In TX, LPC harvest is not allowed except on properties with an approved wildlife management plan specifically addressing the LPC. New harvest regulations in TX, which prohibit hunting except on lands with an established conservation plan for the species, and which limit maximum harvest to no more than five percent of the annual estimated population may protect the species from localized over-harvest while creating incentives for habitat improvement.

Collectively, the total annual harvest in both KS and TX is estimated to be fewer than 1,000 birds annually. Both Hunt and Best (2004, p. 93) and Giesen (1998, p. 11) do not believe hunting has an additive mortality although in the past, hunting during periods of low population cycles may have accelerated declines (Taylor and Guthery 1980b, p. 2). However, because most remaining LPC populations are now very small and isolated, and because they naturally exhibit a clumped distribution on the landscape, they are likely vulnerable to local extirpations through many mechanisms, including human harvest. Braun et al. (1994) called for definitive experiments that evaluate the extent to which hunting is additive at different harvest rates and in different patch sizes. They suggested conservative harvest regimes for small or fragmented grouse populations because fragmentation likely decreases the resilience of populations to

harvest. Sufficient information to determine the rate of localized harvest pressure is unavailable and, therefore, the Service cannot determine whether such harvest contributes to local population declines.

One new activity that has the potential to negatively affect individual LPC populations is the growing occurrence of public and guided bird watching tours of leks during the breeding season. The site-specific impact of recreational observations of LPC at leks is currently unknown. However, disturbance effects are likely to be minimal at the population level if disturbance is avoided by observers remaining in vehicles or blinds until LPC naturally disperse from the lek and observations are confined to a limited number of days and leks. Solitary leks comprised of fewer than ten males are most likely to be affected by repeated recreational disturbance. Research is needed to quantify this potential threat to local populations of LPC.

In summary, it is possible that LPCs harvested through sport hunting might be contributing to a decline of some populations, but we have no information that shows whether this is actually occurring and no basis on which to estimate whether it might be problem in some areas. We are not aware of any other forms of utilization that are negatively impacting LPC populations. Consequently, we conclude that overutilization is not a basis for concluding that listing the LPC is warranted.

C. Disease or predation.

Giesen (1998, p. 10) reported no available information on ectoparasites or infectious diseases in LPC, although several endoparasites, including nematodes and cestodes, are known to infect the species. In the spring of 1997, a sample of 12 LPC from Hemphill County, TX, were tested for the presence of disease and parasites. No evidence of viral or bacterial diseases, hemoparasites, parasitic helminths, or ectoparasites was found (Hughes 1997). The Lesser Prairie-chicken Interstate Working Group (1997) concluded that, while density-dependent transmission of disease was unlikely to have a significant effect on LPC populations, a disease that was transmitted independently of density could have drastic effects.

Reticuloendotheliosis (RE) is a viral disease documented from poultry, which has been found to cause serious mortality in captive Attwater's (*Tympanuchus cupido attwateri*) and greater prairie-chickens. Researchers surveyed blood samples from 184 LPC from three states during 1999 and 2000, for the presence of RE. All samples were negative, suggesting that RE may not be a serious problem for most wild populations of LPC (Wiedenfeld et al. 2002, p. 143).

The impact of West Nile Virus (WNV) on LPC is unknown. Ruffed grouse have been documented to harbor WNV infection rates similar to some corvids. For 130 Ruffed Grouse tested in 2000, all distant from known WNV epicenters, 21 percent tested positive. This was remarkably similar to American crows and blue jays (23 percent for each species), species with known susceptibility to WNV (Bernard et al. 2001, p. 681). Recent analysis of the degree of threat to prairie grouse from parasites and infectious disease concluded that microparasitic infections that cause high mortality across a broad range of galliform hosts have the potential to extirpate small, isolated prairie grouse populations (Peterson 2004).

Non-parasitic diseases caused by mycotoxins, as well as pesticides and other toxic compounds, have the potential to influence population dynamics. Further research is needed to establish

whether parasites regulate prairie grouse populations. Peterson (2004) urged natural resource decision makers to be aware that macro- and micro-parasites cannot be safely ignored as populations such as LPC become smaller, more fragmented, and increasingly vulnerable to the effects of disease. Some degree of impact of parasites and disease is a naturally occurring phenomenon for most species, and one element of compensatory mortality that occurs among many species. There is no information that indicates parasites or disease are causing, or contributing to, the decline of any LPC populations and at this time we have no basis for concluding that disease or parasite loads are threatening any LPC populations.

Prairie falcon (*Falco mexicanus*), northern harrier (*Circus cyaneus*), great-horned owl (*Bubo virginianus*), other unspecified raptors, and coyote (*Canis latrans*) have been identified as predators of LPC adults and chicks (Davis et al. 1979, Merchant 1982, p. 49, Haukos and Broda 1989, p. 182-183, Giesen 1994a, p. 96). Predators of nests and eggs also include Chihuahuan raven (*Corvus cryptoleucus*), striped skunk (*Mephitis mephitis*), ground squirrels (*Spermophilus spp*), and bullsnakes (*Pituophis melanoleucus*), as well as coyotes and badgers (*Taxidea taxus*) (Davis et al. 1979, Giesen 1998, p. 8). LPC predation varies in both form and frequency throughout the year, with raptor predation increasing coincident with lek attendance (Wolfe et al. 2007, p. 100).

Predation is a naturally occurring phenomenon and generally does not pose a risk to wildlife populations unless the populations are extremely small or have an abnormal level of vulnerability to predation. Predation on LPC may be especially important relative to nest success. Nest success and brood survival of greater prairie-chickens accounted for most of the variation in population finite rate of increase (Wisdom and Mills 1997, p. 308). Bergerud (1988, pp. 646, 681, 685) concluded that population changes in many grouse species are driven by changes in breeding success. An analysis of Attwater's prairie chicken supported this conclusion (Peterson and Silvy 1994). Recent demographic research on LPC in southwestern KS confirmed that changes in nest success and chick survival, two factors closely associated with vegetation structure, have the largest impact on population growth rates and viability (Hagen et al. 2008).

The community of prairie mammals has undergone a significant restructuring due to destruction of habitat, removal of keystone species and top predators, and the increase in generalists and introduced animals (Benedict et al. 1996, pp. 149-159.). The reduction in large canid populations (wolves (*Canis lupus*) and coyotes) following European settlement of the Great Plains (Caire et al. 1989, pp. 278,282-283) may have been responsible for an expansion in both population size and range of medium-sized, generalist predators such as skunk, raccoon (*Procyon lotor*), and fox (*Vulpes fulva, Urocyon cinereoargenteus*) (Bowles 1981, p. 38, Jones et al. 1983, Benedict et al. 1996, p. 157). These mesopredators are known to reduce nest success in ducks, quail and other ground nesting birds such as bobwhite quail and LPC (Guthery and Beasom 1977, p. 404, Sargeant et al. 1984, Garrettson et al. 1996, Henke and Bryant 1999 pp. 1066-1067).

Rates of predation on LPC also are affected by habitat quality. As habitat fragmentation increases, the effects of terrestrial nest predators on grouse populations may increase (Braun et al. 1978, p. 316). Similarly, as habitat quality decreases through reduction in vegetative cover due to grazing or herbicide application, predation of LPC nests, juveniles and adults are all expected to increase. For this reason, researchers maintain that ensuring adequate shrub 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, p. 101). However, there is not specific information that indicates predation is resulting in, or contributing to, a decline of any LPC populations.

Although we have information on disease in LPCs and impacts of predators on LPCs at various life stages, there is no information that indicates either disease or predation are causing or contributing to population declines. Consequently, disease and predation do not contribute to a basis for a finding that listing the LPC is warranted.

D. The inadequacy of existing regulatory mechanisms.
In 1973, the LPC was listed as threatened in CO under the State's Nongame and Endangered or Threatened Species Conservation Act. While this designation prohibits unauthorized take, possession, and transport, no protections are provided for destruction or alteration of LPC habitat. In the remaining states, the LPC is classified as a game species, although the legal harvest is now closed in NM and OK. Accordingly, the State wildlife agencies do have the authority to regulate possession of the LPC, set hunting seasons, and issue citations for poaching.

In July of 1997, the NMDGF received a formal request to commence an investigation into the status of the LPC within NM. This request began the process for potential listing of LPC under NM's Wildlife Conservation Act. In 1999 the recommendation to list the LPC as a threatened species under the Wildlife Conservation Act was withdrawn until more information was collected from landowners, lessees, and land resource managers who may be affected by the listing or who may have information pertinent to the investigation. In late 2006, NMDGF determined that LPC would not be state-listed in NM. NM's Wildlife Conservation Act, under which the LPC could have been listed, offers little opportunity to prevent otherwise lawful activities, including that activities addressed under factor A.

Regardless of each state's listing status, most occupied LPC habitat throughout its current range occurs on private land (Taylor and Guthery 1980b, p. 6), where State wildlife agencies have little authority to protect or direct management of the species' habitat. All five states in occupied range have incorporated the LPC as a species of conservation concern and management priority in their respective State Wildlife Action Plans. While identification of the LPC as a species of conservation concern does help heighten the public's awareness of the plight of the LPC, this designation provides no protection form direct take or habitat destruction or alteration.

The National Forest Management Act (NFMA) is the principal law regarding the planning and management of national forests and grasslands by the USFS. A new planning rule (36 CFR Part 219) took effect on April 21, 2008. The previous planning regulation that was in place regarding preparation of the existing land and resource management plans (LRMP) for National Forests and National Grasslands included a requirement for the USFS to identify species as management indicator species, if their population changes were believed to be indicative of the effects of management activities (36 CFR Ch. 11, Section 219.19). Under the new regulations, the concept of management indicator species was not included in the final rule. According to the new regulations, species that are identified as proposed and candidate species under the Endangered Species Act are now termed species-of-concern. The primary purpose of identifying species-of-concern is to put in place provisions that will contribute to keeping those species from being

listed as threatened or endangered.

In Region 2 of the USFS, the Pike and San Isabel National Forest's Comanche and Cimarron National Grassland Land and Resource Management Plan was the first LRMP developed and released under the new 2008 planning rule. The pre-decisional review version of the Cimarron and Comanche National Grasslands Land Management Plan was made available to the public on October 17, 2008. The LPC was included as a species-of-concern (USFS 2008, p. 35) The LRMP currently retains the Comanche LPC Habitat Zoological Area, now designated as a Colorado Natural Area, which encompasses an area of 4,118 ha (10,177 ac) that is managed to benefit the LPC. The area provides a special viewing area for the LPC, which has been closed. Current conditions on this area include existing oil and gas leases, two-track roads, utility corridors, and livestock grazing. Wildfires on the area have been suppressed over the last 30 years. The plan specifies that the desired future condition of the area would be to retain habitat conditions suitable for the LPC. Specifically the objectives of the plan identify steps that would be taken over the next 15 years to achieve the desired conditions. One objective would be to retain a minimum of 6,665 ha (16,470 ac) of sandsage prairie ecosystem for the LPC. Within the LPC Habitat Area, over the next 15 years a minimum of 500 acres would be treated to increase native plant diversity.

Design criteria identified in the current LRMP for management of the sandsage prairie include 1) limited construction of new structures or facilities typically within 3.2 km (2 mi) of a known LPC leks or populations if those structures and facilities would negatively impact the LPC, 2) protect leks, nesting habitat and brood rearing habitat from surface disturbances (e.g., dog training, drilling and various forms of construction) between March 15 to July 15, and 3) provide adequate residual cover during nesting periods. Within the LPC Habitat Area, design criteria include limiting or using livestock grazing in a manner that does not negatively impact LPC nesting habitat. The USFS also committed to monitoring any changes in distribution and abundance of the LPC on the National Grasslands.

The USFS, under the old planning rule, also contracted with LPC experts to prepare a succinct evaluation of species of potential viability concern, addressing eight factors pertinent to species viability. A Technical Conservation Assessment for the LPC (Robb and Schroeder 2005, p. 8) was completed and confirms the need to retain sensitive species status designation for the LPC. Species conservation assessments produced as part of the Species Conservation Project are designed to provide land managers, biologists, and the public with a thorough discussion of the biology, ecology, conservation, and management of the LPC based on existing scientific knowledge. The assessment goals limit the scope of the work to summaries of scientific knowledge, discussion of broad implications of that knowledge, and outlines of information needs. The assessment does not seek to develop specific prescriptions for management of populations and habitats. Instead, it provides the ecological background upon which management should be based and focuses on the consequences of changes in the environment that result from management (i.e., management implications). This comprehensive document can be found on the web at http://www.fs.fed.us/r2/projects/scp/assessments.

The other Federal land occupied by LPC is administered by the BLM in NM. The BLM currently manages approximately 342,969 surface ha (847,491 ac) in eastern NM. They also

oversee another 120,529 ha (297,832 ac) of Federal minerals below private surface ownership. The core of currently occupied LPC habitat in NM is within the Roswell BLM Resource Area. However, the Carlsbad BLM Resource Area comprised much of the historic southern periphery of the species' range in NM. Roughly 41 percent of the known historic and most of the currently occupied LPC range occurs on BLM land. The BLM's amended RMPA (BLM 2008) provides some limited protections for the LPC in NM by reducing the number of drilling locations, decreasing the size of well pads, reducing the number and length of roads, reducing the number of powerlines and pipelines, and implementing Best Management Practices for development and reclamation. Implementation of these protective measures, particularly curtailment of new mineral leases, would be greatest in the Core Management and Primary Population Areas (BLM 2008, pp. 9-11). The Core Management and Primary Population Areas are located in the core of the LPC occupied range in NM. The effect of these BMP on the status of the LPC is unknown, particularly considering some 60,000 ha (149,000 ac) have already been leased in those areas (BLM 2008, p. 8). The amended RMPA lacks explict measures designed to improve the status of the LPC, has no level of certainty that resources will be available to carry out the management plan, has limited regulatory or procedural mechanisms in place to carry out the efforts, lacks monitoring efforts, and allows exceptions to the BMP under certain conditions, which could negate the benefit of the conservation measures.

The amended RMPA does stipulate that implementation of measures designed to protect the LPC and sand dune lizard may not allow approval of all spacing unit locations or full development of a lease (BLM 2008, p. 8). In addition, the RMPA prohibits drilling and exploration in LPC habitat between March 1 and June 15 of each year (BLM 2008, p. 8). No new mineral leases will be issued on approximately 32 percent of Federal mineral acreage within the RMPA planning area (BLM 2008, p.8), although some exceptions are allowed on a case-by-case basis (BLM 2008, pp. 9-11). Within the Core Management Area and Primary Population Area, new leases will be restricted in occupied and suitable habitat; however if there is an overall increase in reclaimed to disturbed acres over a 5-year period, new leases in these areas will be allowed (BLM 2008, 11). Considering Hunt and Best (2004, p. 92) concluded that petroleum development at intensive levels likely is not compatible with populations of LPC, additional development in the Core Management Area and the Primary Population Area may hinder long-term conservation of the species in NM. The RMPA allows lease applicants to voluntarily participate in a power line removal credit to encourage removal of idle power lines (BLM 2008, p. 2-41). In the Sparce and Scattered Population Area and the Isolated Population Area to the south, where LPCs are now far less common than in previous decades (Best and Hunt 2004), new leases will not be allowed within 2.4 km (1.5 mi) of a lek (BLM 2008, p. 11).

The ineffectiveness of certain imposed energy development stipulations near leks for the purpose of protecting grouse on Federal lands has been recently confirmed for sage grouse. Holloran (2005, p. 57) and Naugle et al. (2006a) documented that sage grouse avoid energy development (coalbed methane) not only in breeding and nesting habitats, but also in wintering habitats. They assert that current "Best Management Practices" in use by Federal land management agencies that place timing stipulations or limit surface occupancy near greater sage-grouse leks result in a human footprint that far exceeds the tolerance limits of sage grouse. Ultimately, they recommended that effective conservation strategies for grouse must limit the cumulative impact of habitat disturbance, modification, and destruction in all habitats and at all times of the year (Holloran et al. 2005, p. 58, Naugle et al. 2006b). Additional research on the effect of petroleum

development on LPC is needed. However available information on the LPC (Hagen et al. 2004, p. 74-75, Hunt and Best 2004, p. 92, Pitman et al. 2005, p. 1267-1268) indicates that the effect is often detrimental.

Prior to an unofficial moratorium in the late 1990's on spraying tebuthiuron on shinnery oak on State and BLM lands, 100,000 acres of shinnery oak in
NM and 1,000,000 acres of shinnery oak in TX were treated for agriculture and cattle grazing. In September 2007, the NRCS issued Biology Technical Note 53 (NRCS 2007), which is guidance on herbicide management of shinnery oak in the lesser prairie chicken and dunes sagebrush lizard (*Sceloporus arenicolus*) occupied range. The guidance is not supported by prairie chicken specialists, and was not supported by the Service. Generally the NRCS recommends that shinnery oak should not exceed 20 percent of the total ungrazed plant composition, by weight, on sites where it naturally occurs. Consequently, landowners may apply to NRCS to receive federally-funded cost share assistance to reduce shinnery levels to 20 percent of the total plant composition on their land, typically by applying tebuthiuron or other herbicides. In some instances, landowners receiving these funds instruct herbicide applicators to apply herbicides at rates which effectively achieve full eradication of shinnery oak, using private funds to offset the additional cost. Inherent to this practice is the fact that few landowners elect to treat shinnery oak without Federal assistance due to the significant expense of tebuthiuron application. Eradication of shinnery oak below the 20 percent level has been shown to be detrimental to LPC (Bell 2005, p. 20-21). NRCS is currently revising their guidance and spraying schedule to better address shinnery oak habitat for the LPC. Of additional concern is that the NM State Land Office has adopted the NRCS (2007) guidance for use on State property.

Because less than four percent of the species' overall range occurs on Federal lands, the Service recognizes that the LPC cannot be fully recovered on Federal lands alone. However, no laws or regulations currently protect LPC habitat on private land, aside from State harvest restrictions. Therefore, the Service views decisions regarding the management and leasing of Federal lands and minerals within existing LPC range as important to the future conservation and persistence of the species.

Since 2004 the construction of commercial wind energy projects near and within occupied LPC habitat has raised concerns about potential negative effects such projects may have on the species, if constructed at large scales in occupied range. As discussed under Factor A., a rapid expansion of transmission lines and associated wind energy development throughout large portions of occupied LPC range is occurring. Because most wind development activities are privately funded and are occurring on private land, wind energy siting and development and operation falls outside the purview of the National Environmental Policy Act of 1969 (NEPA) and other Federal conservation statues and regulatory processes. As a result, little opportunity for timely and appropriate environmental review and consultation by Federal, State, and local conservation entities exists.

The current lack of regulatory oversight and public notice requirements for the purchase of wind rights and construction of wind generation and related transmission facilities is a concern. Specifically, the Service is unaware of any State or Federal mechanisms that require potential wind energy producers to disclose the location, size, and anticipated construction date for pending projects or require analysis under the provisions of the NEPA. Lacking the ability to

obtain pertinent siting information or analyze alternative siting locations, neither the Service nor State wildlife agencies have the ability to accurately influence the size and or timing of wind generation construction activities within occupied LPC habitat.

In conclusion, most occupied LPC habitat occurs on private land, where State wildlife agencies have little authority to protect LPC or facilitate and monitor management of LPC habitat beyond regulating recreational harvest. Because most LPC habitat destruction and modification on private land occurs through otherwise lawful activities such as agricultural conversion, livestock grazing, energy development, and fire exclusion, few if any regulatory mechanisms are in place to substantially alter human land uses at a sufficient scale to protect LPC populations and their habitat. While almost no regulatory protection is in place for the species, regulatory incentives, in the form of county, State and national legislative actions, have been created to facilitate the expansion of structural fragmentation of occupied LPC habitat, such as from oil, gas, and wind energy development. For the remaining four percent of occupied habitat currently under Federal management, habitat quality depends primarily on factors related to multiple use mandates, such as livestock grazing and oil, gas and wind power development activities. Because prior leasing commitments and management decisions on the majority of occupied parcels of Federal land offer little flexibility for reversal, any new regulatory protection for uncommitted land units are unlikely to achieve substantial benefits for or recovery of the species in the short term.

We note also that the existing regulatory mechanisms at the Federal and State level have not been sufficient to preclude the decline of the species, and that under existing mechanisms the present and threatened destruction, modification, and curtailment of LPC habitat and range (as described in factor A, above) is ongoing. Consequently, we conclude that the inadequacy of existing regulatory mechanisms contributes to a basis for concluding the listing the LPC is warranted.

E. Other natural or manmade factors affecting its continued existence.

Drought. Drought is considered a universal ecological driver across the Great Plains (Knopf 1996, p.147). Infrequent, severe drought may cause local extinctions of annual forbs and grasses that have invaded stands of perennial species and recolonization of these areas may be slow (Tilman and El Haddi 1992). In this way, drought may impact LPC through its effect on seasonal growth of vegetation necessary to provide nesting and roosting cover, food, and opportunity for escape from predators (Merchant 1982, p. 51, Peterson and Silvy 1994, p. 227, Morrow et al. 1996, pp. 596-597). The sensitivity of LPC to drought was discussed by Crawford (1980, p. 4, 5) and Hamerstrom and Hamerstrom (1961, p. 289). Precipitation appears to affect LPC adult population trends with a potential lag effect (Giesen 2000, p. 145). That is, rain in one year promotes more vegetative cover for eggs and chicks in the following year, which enhances their survival. The effects of drought are likely exacerbated by land use practices, but no studies have clearly demonstrated such cumulative impacts on populations (Hagen and Giesen 2005, p. 1).

LPC home ranges have been documented to be larger in drought years (Copelin 1963, p. 37, Merchant 1982, p. 39), and recruitment may be depressed following drought years (Merchant 1982, pp. 43-48, Morrow 1986, p. 597, Giesen 1998, p. 11). Nest failure and poor chick survival in general (Merchant 1982, p. 56) may drive population trends more than annual changes in adult survival (Hagen 2003, pp. 176-177). Along with other prairie grouse, LPC have high

reproductive potential in years of adequate precipitation conditions. Although drought conditions are unlikely to be the sole causative factor in long-term LPC population declines, the effects of drought on population growth rate may exacerbate the extirpation risk to small, fragmented populations.

The current five-year weighted drought trend throughout large portions of LPC range in the southwestern U. S. is predicted to continue in the short term (D. Darndt, Climatologist, OK Climatological Survey, pers. comm. 2007). Consequently, LPC population indices are expected to decline rapidly in most states in 2007 and remain low possibly through the spring of 2008 (CDOW 2007, Rodgers 2007a, p. 1). While the spring 2008 lek surveys were not completed as of this writing, biologists in most states have verbally confirmed a continued reduction of LPC population indices following drought conditions in 2006 and severe winter conditions in 2006 and early 2007 (R. Rodgers, KDWP, pers. comm.; R. Horton, ODWC, pers. comm., D. Wolfe, Sutton Center, pers. comm., B. Cox, USFS, pers. com. 2007) For example, in 2007 LPC lek indices from surveys in Hamilton county, KS declined by nearly 70 percent from 2006 levels, and are the lowest on record (R. Rodgers, KDWP, pers. comm., 2007). In combination with other mounting threats, the Service views the population reductions as a result of drought conditions in 2006, as well as the current low precipitation trend (OK Climatological Survey 2007), as an additional threat to vulnerable portions of the remaining population throughout all states.

<u>Nest Parasitism and Competition by Exotic Species.</u> Pheasants (*Phasianus colchicus*) are non-native species that overlap the range of the LPC in KS and portions of CO, OK, and TX (Johnsgard 1979, p. 121). Hen pheasants have been documented to parasitize nests of several species, including lesser and greater prairie-chicken (Hagen et al. 2002, pp. 522-524, Vance and Westemeier 1979, p. 223, Kimmel 1987, p. 257, Westemeier et al. 1989, pp. 640-641). Consequences of nest parasitism vary, and may include abandonment of the host nest, reduction in number of host eggs, lower hatching success, and parasitic broods (Kimmel 1987, p. 255). Predation rates also may increase with incidence of nest parasitism (Vance and Westemeier 1979, p. 224). Further consequences are hypothesized to include the imprinting of the pheasant young from the parasitized nest to the host species, and later attempts by male pheasants to court females of the host species (Kimmel 1987, pp. 256-257). Male pheasants have been observed disrupting the breeding behavior of greater prairie-chickens on leks (Sharp 1957, Follen 1966, pp. 16-17, Vance and Westemeier 1979, p. 222). In addition, pheasant displays toward female prairie-chickens almost always cause the female to leave the lek (Vance and Westemeier 1979, p. 222). Thus, an attempt by a male pheasant to display on a prairie-chicken lek could disrupt the normal courtship activities of prairie-chickens.

Only one published account of LPC nest parasitism by pheasants exists (Hagen et al. 2002, pp. 522-524, although biologists from KPWD, ODWC, Sutton Center, TPWD, and the OK Cooperative Fish and Wildlife Research Unit have given more than10 unpublished accounts of such occurrences. Westemeier et al. (1998, p. 858) documented statistically that for a small, isolated population of greater prairie-chickens in Illinois, nest parasitism by pheasants significantly reduced the hatchability of nests. Based on their research findings, they submit that in areas with high pheasant populations, the survival of isolated, remnant flocks of prairie-chicken may be enhanced by management intervention to reduce nest parasitism by pheasants (Westemeier et al. 1988, p. 861. While Hagen et al. (2002, p. 523) documented a rate of only 4

percent parasitism of LPC nests in KS, the sample size was small (3 of 75 nests), and may not reflect actual impacts across larger time, geographic and precipitation scales. Competition with and parasitism by pheasants may be a potential factor that could negatively affect vulnerable LPC populations at the local level, particularly if remaining native rangelands become increasingly fragmented (Hagen et al. 2002, p. 524). More research is needed to understand and quantify impacts of pheasants on LPC populations range wide.

Insecticides. To date, no studies have been conducted examining potential effects of agricultural insecticide use on LPC populations. However, significant impacts from pesticides to other prairie grouse have been documented. Of approximately 200 sage grouse known to be feeding in a block of alfalfa sprayed with dimethoate, 63 were soon found dead, and many others exhibited intoxication and other negative symptoms (Blus et. al. 1989, p. 1139). Because LPC are known to selectively feed in alfalfa fields throughout their range, the Service believes there may be cause for concern that similar impacts may be occurring.

Herbicides. Mixed sand sagebrush and shinnery oak rangelands are well documented as preferred LPC habitat, and long term stability of shrubland landscapes has been shown to be particularly important to the species (Woodward et al., 2001, p. 271). Consequently, herbicide application to native rangelands for the purposes of permanently decreasing or eliminating the shrub component to increase forage production for livestock reduces habitat quality for LPC throughout the species' range. Herbicide application (primarily 2,4-D and tebuthiuron) to reduce or eliminate shrubs from native rangelands is a common ranching practice throughout LPC range. Through foliar and pellet application, respectively, these herbicides are designed to kill or suppress by repeatedly defoliating dicotyledon plants such as forbs, shrubs and trees, while causing no significant damage to monocotyledon plants such as grasses.

Several studies have shown that shrub removal, primarily by herbicide application, is one mechanism that may be contributing to observed declines of LPC (Fuhlendorf et al. 2002, pp. 624-626, Bell 2005 Haukos and Smith 1989, p. 625). Observations by Johnson et al. (2004, pp. 338-342) suggest that herbicide treatment to control shinnery oak adversely impacts nesting LPC. Bell (2005, p. 20-21) documented strong thermal selection for, and dependency of LPC broods on, sand shinnery oak dominance in shrubland habitats. Both Bell (2005, p.) and Patten et al. (2005a, p.) revealed that survivorship was statistically higher for LPC that used sites with >20 percent cover of shrubs than for those choosing 10–20 percent cover; in turn, survivorship was statistically higher for LPC choosing 10–20 percent cover than for those choosing <10 percent cover. In particular, shrub cover (especially of shinnery oak), canopy height, and mid-height density were markedly and statistically higher at LPC nest sites than at random sites.

These findings are important for two reasons. First, the distribution of shinnery oak overlaps much of the historic LPC range in NM, OK, and TX (Peterson and Boyd 1998, p. 2). Both Bell (2005) and Patten et al. (2005b) found that LPC select for and survive better in habitats with at least 20 percent shinnery oak cover. However, once shinnery oak is eradicated, it is unlikely to recolonize treated areas. Shinnery oak is a rhizomatous shrub that reproduces very slowly and does not invade previously unoccupied areas (Dhillion et al. 1994, p. 52). Shinnery oak rhizomes do not appear to be viable in sites where the plant was previously eradicated, even decades after treatment. While shinnery oak has been germinated successfully in a laboratory setting (Pettit 1986), little documentation exists that shinnery oak acorns successfully germinate

in the wild (Wiedeman 1960, Dhillion et al. 1994, p. 52). In addition, shinnery oak produces an acorn crop in only about three of every 10 years (Pettit 1986). A more thorough synthesis of shinnery oak life history and management can be found in Peterson and Boyd (1998. p. 1-15).

Lacking reproduction by acorns, timely recolonization of treated areas, or any established propagation or restoration method, the application of tebuthiuron at approved rates in most states effectively eliminates high quality LPC habitat. Because large tracts of shrubland communities are decreasing, and native shrubs drive reproductive output for ground nesting birds in shinnery oak rangelands (Guthery et al. 2001, p. 116), Bell (2005) asserted that it is likely that LPC will become extinct if permanent losses of shrubland plant communities continue.

Second, in most LPC states where shinnery oak occurs, the Ecological Site Descriptions used by NRCS, which establish the pre-settlement plant community for the agency, generally indicate that shinnery oak should not exceed 20 percent of the total ungrazed plant composition, by weight, on sites where it naturally occurs. As a result, landowners may apply to NRCS to receive federally-funded cost share assistance to apply herbicides to reduce shinnery levels to 20 percent of the total plant composition on their land. In practice, the Service has been advised anecdotally that many landowners receiving these funds instruct herbicide applicators to apply herbicides at full eradication rates, the cost of which they offset with private funds. Inherent to this practice is the fact that few landowners elect to treat shinnery oak without Federal assistance due to the significant expense of tebuthiuron application. In 2008, the NRCS informed the Service that it plans to implement its recent guidance (NRCS 2007) and resume spraying shinnery oak in 2008 in LPC habitat. In its recently released RMPA (BLM 2008), the BLM will allow spraying of shinnery oak in LPC habitat where it does not overlap with the dunes sagebrush lizard.

Although the Service cannot at this time quantify how many acres of shinnery oak are treated annually with tebuthiuron or other herbicides using Federal cost share funds, we can determine that the effect of such treatments, which reduce shinnery cover to 20 percent or lower, are detrimental to LPC. The extent to which Federal dollars are used in each state for this purpose is unknown, but in combination with privately-funded eradication efforts, it is likely to be significant. Efforts by the Service to quantify this potential threat range wide are ongoing.

Hybridization. The sympatric occupation of habitat and leks by greater prairie-chicken and LPC in central KS may pose a potential threat to the species in that region. Historical records document that the species' ranges overlapped considerably, but that habitat partitioning was clearly evident based on the abundance of sand-adapted vegetation. The relative frequency of natural hybridization prior to European settlement is unknown. Because current populations north of the Arkansas River in KS are generally characterized as low density and very dependent upon the residual habitat structure of fragmented tracts of CRP lands, those populations may be ephemeral depending on implementation of CRP projects and stochastic environmental factors. Low population density also may increase the susceptibility of LPC to hybridization and exacerbate the potentially negative effects of hybridization. To date, the fertility of hybrid individuals throughout subsequent generations has not been rigorously tested. The immediate and long-term influence of hybridization on the species is unknown and warrants investigation.

Collision Mortality. Wire fencing is ubiquitous throughout the Great Plains as the primary

means of confining livestock to ranches and pastures, or excluding them from areas not intended for grazing such as CRP, agricultural fields, and public roads. As a result, thousands of miles of fencing, primarily barbed wire, have been constructed throughout LPC range. Like most grassland wildlife throughout the Great Plains, LPC evolved in open habitats free of vertical features or flight barriers. Fences, power lines or other wire structures are an unnatural threat to prairie grouse that, until recently, were seldom perceived as significant at the population level (Wolfe et al. 2007, p. 101).

Prompted by reports of high collision rates in European grouse (Petty 1995, p. 3; Baines and Summers 1997, p. 941; Bevanger and Broseth 2000, p. 124; 2004, p. 72) and seemingly unnatural rates of mortality in some local populations of LPC, the Sutton Center began to investigate line collision and collision mortality in LPC. From 1999 to 2004, researchers recovered 322 carcasses of radio marked LPC in NM, OK, and portions of the TX panhandle. For LPC in which the cause of death could be determined, 42 percent of mortality in OK was attributable to collisions with fences, power lines or automobiles. In NM, only 14 percent of mortality could be traced to collision. The difference in rate of observed collision between states is attributable to differences in the amount of fencing on the landscape resulting from differential land settlement patterns in the two states (Patten et al. 2005a).

With between 14 and 42 percent of adult LPC mortality currently attributable to collision with human-induced structures, Wolfe et al. (2007, p. 101) assert that the negative effect of fence collisions on long term population viability for LPC cannot be understated. As an example, Moss (2001, p. 256) modeled the estimated future population of capercaille grouse (*Tetrao urogallus*) in Scotland and found that by removing fence collision risks, the entire Scotland breeding population would consist of 1,300 instead of 40 females by 2014. Similarly, recent experiments involving fence marking to increase visibility resulted in a 71 percent overall reduction in grouse collisions in Scotland (Baines and Andrew 2003, p.174).

To quantify the magnitude of threat due to construction of new fencing in LPC habitat, the Service obtained information from the OK NRCS regarding the construction of new fencing through Federal cost-share assistance in Fiscal Year 2006 in occupied LPC counties (R. Zetterberg pers. comm. 2007). In total, approximately 177.3 km (110 mi) of new fencing was constructed in these counties in a single year. While the Service has no method to determine what amount of new fencing was constructed specifically in occupied LPC habitat in OK or the other four states, the estimates provided by NRCS illustrate that a significant amount of new fencing is actively being constructed both privately and through financial incentives offered by Federal conservation-based programs and policies. More investigation is necessary to fully quantify the magnitude of this ongoing activity and its impact on LPC range wide.

Climate change. The Intergovernmental Panel on Climate Change (IPCC) has concluded that warming of the climate is unequivocal and continued green house gas emissions at or above current rates would cause further warming (IPCC 2007a, p. 51, 60, 86). The IPCC also projects that there will very likely be an increase in the frequency of hot extremes, heat waves, and heavy precipitation (IPCC 2007a, p. 89). However, very little specific information related to the effects of climate change on LPC status is known. While populations of LPC in the southwestern part of their range are likely to be most acutely affected, populations throughout their range into CO and KS are likely to be impacted as well.

Warmer air temperatures may influence LPC habitat quality through factors such as increased evapo-transpiration, increased evaporation, and decreased soil moisture. Warmer air and surface soil temperatures and decreased soil moisture near nest sites have been correlated with lower survival and recruitment in some ground nesting birds such as the LPC (Bell 2005, p. 16, 21) and bobwhite quail (Guthery et al. 2001, p.113-115). Patten et al. (2005a, p.1275) observed that on average LPC avoided sites that were hotter, drier and more exposed to the wind. Other species of grouse have already exhibited significant and measurable negative impacts attributed to global climate change. For example, capercaillie grouse in Scotland have been shown to nest earlier than in historic periods in response to warmer springs yet reared fewer chicks (Moss et al. 2001, p.58). The resultant lowered breeding success as a result of the described climactic change was determined to be the major cause of the decline of the Scottish capercaillie (Moss et al. 2001, p. 58). While some limited information points to possible impacts to the LPC or its habitat from climate change, we lack of sufficient information to predict the effect of climate change on the LPC.

Small Population Size And Lek Mating System. A number of harmful effects, such as reduced reproductive success and loss of genetic variation/diversity, begin to express themselves as population sizes decline. These effects may be exacerbated by the lek mating system characteristic of many grouse species. The following discussion, taken from Johnsgard (2002, p. 129), analyzes the influence of the lek mating system on prairie grouse. The lek mating system works only when populations are dense enough to provide the visual and acoustic stimuli necessary to attract pre-breeding females to the lek. Once present, the lek must be large enough to assure that the matings will be performed by the most physically and genetically fittest males. Lek breeding already tends to promote inbreeding owing to the limitations caused by relatively few males siring offspring. The tendency of female LPC and other prairie grouse to typically nest near a lek other than the one on which they mated is an innate mechanism which can help reduce the effects of inbreeding. The remaining small and fragmented LPC populations which exist over portions of the currently occupied range indicates that such harmful effects may already be, or soon will be occurring. Further examination of the viability of existing LPC populations will be needed to thoroughly describe the effects of small population size on persistence of the species.

In summary, threats to LPC survival from natural and manmade factors include drought, pheasant nest parasitism and harassment, herbicide use, collision mortality, and small population size. The effects of climate change on the LPC are largely unknown but could be expected to exacerbate certain threats such as drought. All of these factors can affect habitat quality and reduce LPC survival and reproductive success. The long term effect of hybridization with greater prairie-chickens is unknown, but is likely symptomatic of weakened populations coupled with human alteration of historic landscapes. The application of shrub-killing herbicides continues throughout the species' range. The effects of drought, and of human-caused impacts such as deaths due to collisions (e.g., as a result of fencing) collectively are contributing to the basis for concluding that listing the LPC is warranted.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

Since 2004, the Sutton Center has worked to reduce or eliminate the significant LPC mortality

observed from fence collisions on their study areas in OK and TX. Through Private Stewardship Grant Funding, the Sutton Center has either physically removed unnecessary fencing or applied visual fence markers of their own design on the top wires of approximately 204 km (127 mi) of barbed wire fence in Beaver and Ellis counties, OK, and Hemphill County, TX. These actions have been concentrated within 1.6 km (1 mi) of active LPC leks. Collectively, these conservation activities have the potential to significantly reduce the threat of collision mortality on 32,633 ha (81,060 ac) of prime occupied LPC habitat. Anecdotally, since the initiation of their marking efforts, the Sutton Center has observed no collision mortality along marked spans of fencing that, prior to marking, were observed to be especially fatal to LPC (D. Wolfe, Sutton Center, pers. comm. 2008). The Service's NM Partners for Fish and Wildlife Program is initiating a similar fence marking effort this year in NM. While Sutton's fence marking efforts have the potential for significant benefit to the LPC if implemented on a sufficient scale, the Service has determined that the current rate of new fence construction through NRCS cost-share funding in the same counties exceeds that that has been removed by Sutton (K. Norton, NRCS, pers. comm. 2007). As a result, local benefits of fence removal and marking are not expected to have a population-level impact, although without the fence removal and marking efforts, the amount of mortality due to fence collisions likely would be higher.

TPWD hosted a series of landowner meetings and listening sessions in six of the 13 counties confirmed to be occupied by the LPC in TX (Hemphill, Wheeler, Gray, Bailey, Cochran, and Gaines). Private landowners and the general public were invited to discuss LPC conservation and management, receive information, and provide input on programs and incentives that are available for managing LPC on privately owned habitats. In response to these meetings, TPWD worked with the Service and landowners to finalize the first statewide umbrella Candidate Conservation Agreement with Assurances (CCAA) for LPC in TX in 2006. To date, however, TPWD has received no enrollments under this CCAA (H. Whitlaw pers. comm. 2008; T. Cloud pers. comm. 2008).

TPWD also continues to fund LPC research projects. In conjunction with several TX universities, TPWD is evaluating the use of aerial line transects and forward-looking infrared (FLIR) technology to survey LPC; TPWD also is providing initial funding and coordination support for development of a spatially explicit population viability analysis for LPC in TX. Other ongoing research includes evaluation of LPC population response to shinnery oak treatments, and evaluation of relationships among LPC, raptors, and oil-gas infrastructure. Additionally, in 2007 The Nature Conservancy of TX acquired approximately 6,000 acres of private ranchland in Yoakum and Terry counties to restore and protect habitat for the LPC. The Service views this as a geographically important acquisition that helps secure LPC populations within potential recovery and connectivity corridors.

As discussed under Factor D, (inadequacy of existing regulatory mechanisms), in November of 2003 the USFS Region 2 (Rocky Mountain Region), revised the Regional Forester's sensitive species list. The Region contracted with experts to prepare succinct evaluations of species of potential viability concern, addressing eight factors pertinent to species viability. These evaluations were used by Regional biologists as a basis for determining whether each of nearly 1,000 pre-screened species met the criteria for Regional sensitive species status. A Technical Conservation Assessment for the LPC (Robb and Schroeder 2005, p. 8) was completed and

confirms the need to retain sensitive species status designation for the LPC. This document can be found on the web at http://www.fs.fed.us/r2/projects/scp/assessments.

In January 2003, a working group composed of local, State and Federal officials, along with private and commercial stakeholders, was formed to address conservation and management activities for the LPC and sand dune lizard (SDL) in NM. This working group, formally named the New Mexico Lesser Prairie-Chicken/Sand Dune Lizard Working Group, worked diligently for 2.5 years resulting in the publication of the Collaborative Conservation Strategies for the Lesser Prairie-Chicken and Sand Dune Lizard in New Mexico (Strategy) in August 2005. This Strategy provided guidance in the development of BLMs Special Status Species Resource Management Plan Amendment (RMPA), approved in April 2008, which also addresses the concerns and future management of LPC and SDL habitats on BLM lands, and established the LPC Habitat Preservation Area of Critical Environmental Concern. Both plans prescribe active cooperation among all stakeholders to reduce and/or eliminate threats to these species in NM. As an outcome, the land use prescriptions contained in the RMPA now serve as baseline mitigation (for both species) to those operating on Federal lands or non-Federal lands with Federal minerals. Following approval of the RMPA, a Candidate Conservation Agreement (CCA) was drafted between the Service, BLM, Center of Excellence for Hazardous Materials Management (CEHMM), and participating cooperators that addresses the conservation needs of the LPC and SDL on BLM lands in NM. Through this CCA, CEHMM will work with participating cooperators who voluntarily commit to implementing or funding specific conservation actions that will reduce and/or eliminate threats to these species. The CCA builds upon the BLMs RMPA for southeast NM. The RMPA established the foundational requirements that will be applied to all future Federal activities, regardless of whether a permittee or lessee participates in this CCA. The strength of the CCA comes from the implementation of additional conservation measures that are additive, or above and beyond those foundational requirements established in the RMPA. In addition to the CCA, a Candidate Conservation Agreement with Assurances (CCAA) has been developed in association with the CCA to facilitate conservation actions for the LPC and SDL on private and State lands in southeastern NM. The CCA/CCAA has been open for public comment and is anticipated to be signed and officially adopted by the Service and BLM in December 2008.

Other important conservation actions in NM occurred in 2007; principal among them was the acquisition of 2,137 ha (5,280 ac) of private ranchland in Roosevelt County by the State Game Commission using NM State Land Conservation Appropriation funding. This property adjoins two existing Commission-owned PCAs, and is expected to provide local conservation benefit for LPC in portions of NM.

Finally, much attention has been directed to the decline of prairie grouse nationwide, as evidenced through special sessions, symposia, and solicited publications throughout professional conservation arenas. In particular, the spring 2004 edition of The Wildlife Society Bulletin contains a host of publications relevant to recent LPC management, including formal guidelines for management of the species and its habitats (Hagen et. al. 2004, pp. 69-82). The North American Grouse Partnership, in cooperation with the National Fish and Wildlife Foundation and multiple State wildlife agencies and private foundations, has embarked on the preparation of the prairie grouse portions of an overarching North American Grouse Management Strategy (Strategy). The LPC portion of this Strategy is being developed under the leadership of the

Lesser Prairie-chicken Interstate Working Group in cooperation with the Playa Lakes Joint Venture, and is independently identified as the Lesser Prairie-chicken Conservation Initiative. This Strategy would provide clear recovery actions and define the levels of funding necessary to achieve management goals for all species of grouse in North America. The final draft of the prairie grouse portions of this strategy, encompassing 65 million acres of grassland habitat in the U. S. and Canada, was officially released and unanimously endorsed by the Association of Fish and Wildlife Agencies in late March, 2008.

The Service views the increased emphasis and exposure for prairie grouse as positive for the conservation and recovery of the LPC. However, many of these important conservation efforts will fail to materialize if adequate funding and institutional participation is lacking.

SUMMARY OF THREATS (including reasons for addition or removal from candidacy, if appropriate)

The most serious threats to the lesser prairie-chicken are loss of habitat from conversion of native rangelands to introduced forages and cultivation, recent and anticipated conversion of CRP lands to cropland, cumulative habitat degradation caused by inappropriate livestock grazing practices, wind energy development, oil and gas development, woody plant invasion of open prairies due to fire suppression, inappropriate herbicide applications, and habitat fragmentation caused by structural and transportation developments. Many of these threats may exacerbate the normal effects of periodic drought on lesser prairie-chicken populations. In many cases, the remaining suitable habitat has become fragmented by the spatial occurrence of these individual threats. Habitat fragmentation can be a threat to the species through several mechanisms: remaining habitat patches may become smaller than necessary to meet the requirements of individuals and populations, necessary habitat heterogeneity may be lost to areas of homogeneous habitat structure, areas between habitat patches may harbor high levels of predators or brood parasites, and the probability of recolonization decreases as the distance between suitable habitat patches expands. Existing regulatory mechanisms have not been adequate to halt the decline of LPC populations and habitat.

Based on the information described above, we find that this species is warranted for listing throughout all of its range. Therefore, it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

____Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES:

1. Reduce or eliminate upland construction of fence lines and utility lines within occupied habitat and for five miles surrounding all occupied habitat, especially near leks. If fence lines cannot be removed, it is recommended that the top and third wires of lines near active LPC leks be conspicuously marked to minimize collision mortality.
2. Limit or eliminate the federally-funded application of tebuthiuron herbicide in remaining shinnery oak habitats and 2, 4-D herbicide in sand sagebrush habitats.

3. Encourage range wide adherence to the Service's Voluntary Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines, released in July 2003, (http://www.fws.gov/habitatconservation/wind.pdf)
4. Work cooperatively with energy-related industry to avoid, minimize and compensate for impacts to LPC populations and habitats.
5. Work with partners to target re-enrollments and new contracts under CRP and related agricultural conservation programs to benefit LPC.
6. Minimize further fragmentation of remaining Federal lands within current and historic LPC range by abandoning the use of ineffective timing, noise and distance stipulations near active or historic leks. Instead, future energy leasing, exploration and development, or other fragmenting human land uses within essential LPC habitats should be limited.
7. Establish secure and well-funded financial incentive mechanisms for private landowners to provide ungrazed or very lightly grazed native rangeland habitats that are suitable for LPC use, and are not subject to herbicidal shrub control practices.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	**2***
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: We have determined that the overall magnitude of threats to the LPC throughout its range is now high. The magnitude of threats to LPC depends primarily on the quality, integrity and scale of remaining habitat. At present, long term habitat destruction and modification due to ongoing and increasing agricultural activities, increasing energy development, tree invasion due to fire suppression, collision mortality from fences and power lines and fragmentation are continuing and significant throughout the entire range. Foreseeable threats to habitat degradation caused by human land use also exist. Since last year's LPC candidate assessment, reports indicate that funding for and construction of primary transmission lines to facilitate extensive wind generation construction throughout LPC occupied portions of KS, OK and TX is planned to begin this year, concomitant with wind energy development in all LPC states. In addition,

projected, near-term changes in CRP enrollments, largely due to escalating commodity prices and emphasis on biofuel production, are likely to result in massive conversion of important LPC habitat to cropland production. This is especially problematic in KS where native CRP plantings have resulted in increased LPC populations and range over the last decade. As a result of the coalescence and interaction of these threats, the Service concludes that the cumulative magnitude of threats to the LPC and its habitat is now high.

Imminence: The majority of threats to remaining LPC populations are ongoing and foreseeable within the near term, thus they are considered imminent. Remaining populations are becoming increasingly isolated and vulnerable to stochastic environmental impacts (e.g., drought) as well as the effects of human habitat fragmentation. This is particularly true for isolated populations of LPC in the Permian Basin/western panhandle of TX, populations residing on USFS lands in southeastern CO and areas south of Highway 380 in southeastern NM. The impending loss of these populations, together with the magnitude of threats to the species overall, supports the Service's decision to elevate the listing priority for the LPC.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: CO, KS, NM, OK, and TX

Indicate which State(s) did not provide any information or comments: None

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2008 Candidate Assessment – lesser prairie-chicken

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: _____ 4/24/2008
Regional Director, Fish and Wildlife Service Date

Concur: _____ 11/26/2008
Deputy Director, Fish and Wildlife Service Date

Do not concur: _____ _____
Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review: October, 2008
Conducted by: Stephanie A. Manes and Ken Collins

ATTACHMENT 2

Candidate Conservation Agreement for the Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) and Sand Dune Lizard (*Sceloporus arenicolus*) In New Mexico

USFWS, US Bureau of Land Management, and Center of Excellence for Hazardous Materials Management. 2008. Candidate Conservation Agreement for the Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) and Sand Dune Lizard (*Sceloporus arenicolus*) In New Mexico. Available online: http://www.fws.gov/southwest/es/NewMexico/documents/CCA_CCAA_LPC_SDL_2008_final_signed.pdf. Accessed 17 February 2009.

Candidate Conservation Agreement

for the

Lesser Prairie-Chicken
(*Tympanuchus pallidicinctus*)

and

Sand Dune Lizard
(Sceloporus arenicolus)

In New Mexico

Developed cooperatively by:
U.S. Fish and Wildlife Service
U.S. Bureau of Land Management
Center of Excellence for Hazardous Materials Management

December 8, 2008

Executive Summary

In 1995, the U.S. Fish and Wildlife Service (FWS) was petitioned to list the lesser prairie-chicken (*Tympanuchus pallidicinctus*) (LPC) as threatened under the authority of the Endangered Species Act of 1973, as amended. The FWS ruled that listing of the LPC was warranted but precluded because of other higher priority species. The LPC was then designated as a candidate for listing as threatened in 1997. Similarly, in 2001, the FWS determined listing was warranted but precluded for the sand dune lizard (*Sceloporus arenicolus*) (SDL), formally known as the dunes sagebrush lizard, and it was designated as a candidate for listing as threatened.

This Candidate Conservation Agreement (CCA) for the LPC and the SDL represents a collaborative effort between the FWS, the Bureau of Land Management (BLM), and the Center of Excellence for Hazardous Materials Management (CEHMM). The CCA builds upon the BLMs "Special Status Species Resource Management Plan Amendment" (RMPA) (completed in April 2008) for southeast New Mexico. The RMPA established the foundational (minimum) requirements that will be applied to all future Federal activities, regardless of whether a permittee or lessee participates in this CCA. The strength of the CCA comes from the implementation of additional conservation measures that are additive, or above and beyond those foundational requirements established in the RMPA.

The CCA is a voluntary agreement, administered by CEHMM, with Participating Cooperators. Certificates of Participation (CPs) will be issued by CEHMM pursuant to this CCA in order to facilitate the voluntary cooperation of the oil and gas industry, livestock producers, and other interested stakeholders, thereby providing conservation benefits to the LPC and/or the SDL. When fully implemented, it will provide guidance for the conservation and management of the LPC and/or SDL, by reducing and/or eliminating threats to these species. Participating Cooperators will implement conservation measures and contribute funding or provide in-kind services for conservation as part of their CPs. Funds contributed as part of this CCA may or may not be used on the enrolled property since other habitat areas may be a higher priority for implementation of conservation measures. The conservation measures implemented by Participating Cooperators would generally consist of habitat restoration and enhancement activities, and minimizing habitat degradation not required by current regulation aimed at reducing and/or eliminating current threats to the species.

This CCA, combined with the accompanying Candidate Conservation Agreement with Assurances (CCAA) for non-Federal landowners (jointly referred to as the CCA/CCAA) is based on adaptive management principals and thus, is a living document. Using adaptive management principals, the FWS and/or the BLM can add or make necessary modifications to existing conservation measures currently found in this CCA/CCAA. Additionally, new conservation measures can be implemented through future CPs if the FWS and/or the BLM find such measures to be necessary to facilitate the continued conservation of the LPC and/or SDL. Any adaptive management modifications will apply only to future CPs. It is also important to note that the CCA is the parent document for the CCAA, which addresses non-Federal lands.

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I. INTRODUCTION

If and when a species becomes listed under the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. § 1531, *et seq*.), that action triggers both a regulatory and a conservation responsibility for Federal, State, and private landowners. These responsibilities stem from section 9 of the ESA that prohibits "take" (i.e., harass, harm, pursue, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct) of listed species. Along with the section 9 prohibitions, Federal agencies must ensure that their actions will not jeopardize the continued existence of the listed species and carry out programs for the conservation of listed species.

In the western United States many species that are candidates for listing under the ESA occur on both Federal and non-Federal lands. Non-Federal property owners whose operations may have impacts on candidate species on private lands sometimes have the opportunity to voluntarily enter into a Candidate Conservation Agreement with Assurances (CCAA) in order to implement conservation measures aimed at reducing and/or eliminating threats to candidate species and to ensure that their land operations can continue unaffected if the species is listed in the future. However, property owners whose operations rely on using a combination of land ownership types (i.e., Federal and non-Federal) are concerned that assurances provided to them under a CCAA do not apply to Federal lands, even if they implement conservation measures across all land ownership types where they operate. These property owners, as well as Federal lessees/permittees, are seeking greater certainty that if they implement conservation measures to enhance the habitat of candidate species, any yet listing occurs, they would not be required to change their activities on Federal lands in a way that could significantly impact their operations. In New Mexico, property owners, Federal lessees and permittees, the U.S. Fish and Wildlife Service (FWS), and the Bureau of Land Management (BLM) were concerned about activities on public/Federal lands that might affect the status of two candidate species, the lesser prairie-chicken (*Tympanuchus pallidicinctus*) (LPC) and the sand dune lizard (*Sceloporus arenicolus*) (SDL), formally known as the dunes sagebrush lizard.

As a result of these concerns, in January 2003, a working group composed of local, State and Federal officials, industry representatives, and private and commercial stakeholders, was formed to address conservation and management activities for the LPC and SDL. This working group, formally named the New Mexico Lesser Prairie-Chicken/Sand Dune Lizard Working Group, worked diligently for 2.5 years resulting in the publication of the *Collaborative Conservation Strategies for the Lesser Prairie-Chicken and Sand Dune Lizard in New Mexico* (Strategy) in August 2005. This Strategy provided guidance in the development of BLMs Special Status Species Resource Management Plan Amendment (RMPA), approved in 2008, which also addresses the concerns and future management of LPC and SDL habitats on BLM lands. Both plans prescribe active cooperation among all stakeholders to reduce and/or eliminate threats to these species in New Mexico. As an outcome, the land use prescriptions contained in the RMPA now serve as baseline mitigation (for both species) to those operating on Federal lands or non-Federal lands with Federal minerals.

This Candidate Conservation Agreement (CCA) between the FWS, BLM, Center of Excellence for Hazardous Materials Management (CEHMM), and Participating Cooperators will address the

conservation needs of the LPC and SDL in New Mexico. Through this CCA, CEHMM will work with Participating Cooperators who voluntarily commit to implementing or funding specific conservation actions that will reduce and/or eliminate threats to these species. CEHMM is a 501(c)(3) organization, established in 2004, that is dedicated to cutting edge applied research programs, community support, education, and cooperative conservation. Flagship projects include participation in the recovery and conservation of listed and candidate species, including LPC conservation and recovery (including captive propagation), SDL conservation and recovery, riparian conservation, and conservation education.

The CCA will provide a mechanism for implementing and monitoring conservation measures that are not explicitly addressed in or applicable to the RMPA. Any conservation measures undertaken by Participating Cooperators as a result of this CCA are measures above and beyond those prescribed in the RMPA. A future decision to list either species would take into consideration actions planned and/or implemented pursuant to this CCA as well as land use prescriptions contained in the RMPA. However, such a decision would also need to consider threats facing the LPC and SDL now and into the foreseeable future throughout all or a significant portion of their current range. Since this CCA is designed to address the activities of lessees and permittees on Federal lands, a companion CCAA will also be used to address the needs of both species on non-Federal lands within New Mexico.

Benefits of this CCA

The most significant benefit of this CCA is that it will guide conservation actions for the LPC and SDL in order to improve the status of these species within New Mexico. In comparison to well-intentioned, but uncoordinated conservation efforts, this CCA provides a comprehensive and strategic landscape level approach to addressing the conservation needs of the LPC and SDL. Although the FWS cannot absolutely guarantee that listing will never be necessary, this CCA seeks to implement conservation measures on Federal lands, which, when combined with those benefits that would be achieved if conservation measures in the CCAA are implemented, would preclude or remove any need to list the LPC and SDL. It is important to note that "preclude or remove any need to list" is based upon the removal of threats and stabilization or improvement of the species. The decision to list is a regulatory process and no CCA or CCAA can predetermine the outcome. The actions and successes of this CCA/CCAA will be evaluated in accordance with FWS Policy for Evaluation of Conservation Efforts (2003). This will then be factored into the five-factor analysis of the listing decision.

This CCA is designed to include conservation measures that reduce and/or eliminate threats, on Federal lands. If enough Participating Cooperators on non-Federal lands implement conservation measures through their participation in the CCAA, the likelihood that the species will be listed will be greatly reduced. The implementation of conservation measures through the CCA and CCAA combined make it much less likely that lessees and permittees will bear additional conservation burdens on Federal lands. Again, this high degree of certainty that no additional conservation measures will be required of Participating Cooperators would result from their implementation of conservation measures listed in this CCA, which are specifically designed to reduce and/or eliminate threats to the LPC and SDL.

In the event either species is listed, incidental take coverage provided by the section 7 conference opinion (see discussion below) for conservation actions undertaken on Federal lands would be converted to a biological opinion. This coverage, provided in advance of any possible listing, may serve to protect Participating Cooperators from additional disruption should one or both species become listed.

CCA Relationship to Section 7 of the ESA

Although not required by the ESA, prior to the approval of the CCA/CCAA, the FWS will conduct a section 7 "conference opinion" pursuant to section 7(a)(4) of the ESA to identify and resolve potential conflicts between the proposed action (in this case the Federal actions are: the approval of this agreement between two Federal agencies and a non-governmental entity; and the potential issuance of a section 10(a)(1)(A) permit for the attendant CCAA, should either species be listed at some time in the future) and the two candidate species. Any Federal agency has the option of conducting a 7(a)(2) conference for non-listed species to ensure that the actions they authorize, fund, permit, or carry out are not likely to jeopardize the existence of those species. The FWS supports a proactive approach to conserving candidate species, which may reduce and/or eliminate the need for future protection under the ESA.

The FWS will issue a section 7 conference opinion analyzing the potential effects to the LPC and SDL from the proposed action and the implementation of conservation measures as identified in this CCA. A decision to list either of the species covered by this CCA would be based on the five factor threats analysis required under the ESA. The overall effects of the CCA and its components would be considered in the listing determination. Should either species covered under the conference opinion become listed, the FWS would review the conference opinion in coordination with BLM. If no significant changes have been made in the CCA or other information used in the conference opinion, the FWS would confirm the conference opinion (as is) as the biological opinion and include an incidental take statement (required for the biological opinion). It is the goal of this CCA to ensure adequate conservation measures, sufficient adaptive management, and monitoring obligations to allow the conference opinion to be converted into a biological opinion on the effective date of any decision to list the LPC and/or SDL.

II. PURPOSE OF THE CCA

The primary purpose of this CCA is to:

- develop, coordinate, and implement conservation actions to reduce and/or eliminate known threats to the LPC and SDL within the current and historic range of both species in New Mexico,
- support ongoing efforts, especially those of New Mexico Department of Game and Fish (NMDGF) to establish/re-establish and maintain viable populations of both species in occupied and suitable, but unoccupied habitats,
- serve as a landscape-scale umbrella document for conservation measures implemented by CEHMM and Participating Cooperators,

- encourage development and protection of suitable LPC and SDL habitat by giving Participating Cooperators incentives to implement specific conservation measures (as described in their CP),
- provide Participating Cooperators a high degree of certainty that the conservation measures agreed to in the CP would be considered in the biological opinion, and thus, would reduce the likelihood of additional land use restrictions to Participating Cooperators that might otherwise apply should the LPC and/or SDL become listed, and
- allow industry to continue most of their operations while protecting and improving habitat conditions for the LPC and/or SDL.

III. AUTHORITY

Sections 2, 7, and 10 of the ESA allow the FWS to enter into this CCA with other cooperating partners. Section 2 of the ESA states that encouraging interested parties, through Federal financial assistance and a system of incentives, to develop and maintain conservation programs is a key to safeguarding the Nation's heritage in fish, wildlife, and plants. Section 7 of the ESA requires the FWS to review programs it administers and utilize such programs in furtherance of the purposes of the ESA. By entering into this CCA, the FWS is utilizing its authority to enter into this type of agreement to further the conservation of the Nation's fish and wildlife resources. Lastly, under the CCAA, should either species become listed, section 10(a)(1)(A) of the ESA authorizes the issuance of permits to "enhance the survival" of a listed species.

Additionally, the Federal Land Policy and Management Act (FLPMA, Section 307, 43 USC 1737), which provides overall direction to the BLM for conservation and management of public lands, allows the BLM to participate in conservation agreements. The BLM manual, Section 6840 ("Special Status Species Management") provides overall policy direction to BLM managers to conserve listed threatened or endangered species on BLM administered lands, and to assure that actions authorized on BLM administered lands do not contribute to the need to list species deemed by the BLM to be "sensitive." Finally, the BLMs "Guide to Agreements" notes that "Cooperative Management Agreements" are typically long-term agreements with other parties interested in joint management of wildlife habitats or other areas.

IV. SPECIES INVOLVED

Lesser Prairie-Chicken

The LPC is a species of prairie grouse endemic to the southern high plains of the United States, commonly recognized for its feathered feet, stout build, ground-dwelling habit, and elaborate breeding behavior. Plumage of the LPC is characterized by a cryptic pattern of alternating brown and buff-colored barring, with body length ranging from 38-41 centimeters (cm) (15-16 inches (in)) (Johnsgard 1973). LPC average body mass is 752 grams (g) for males and 712 g for females (Giesen 1998). Males have long tufts of feathers on the sides of the neck that are erected during courtship displays. Males also display brilliant yellow supraorbital eyecombs and reddish esophageal air sacs during courtship displays (Copelin 1963; Johnsgard 1983).

LPCs are polygynous and exhibit a lek mating system. Males gather to display on leks at dusk and dawn beginning in late February and extending through early May (Copelin 1963; Hoffman 1963; Crawford and Bolen 1976). Dominant older males occupy the center of the lek, while younger males occupy the periphery and compete for central access (Ehrlich et al. 1988). Females arrive at the lek in early spring; peak hen attendance at leks is during mid-April (Copelin 1963; Haukos 1988). The sequence of vocalizations and posturing by males, often described as "booming, gobbling, yodeling, bubbling, or duetting," has been described by Johnsgard (1983) and Haukos (1988). After mating, the hen selects a nest site, usually 1-3 kilometers (km) (0.6-2 miles (mi)) from a lek (Giesen 1994a), and lays an average clutch of 10-14 eggs (Bent 1932). Second nests attempts may occur when the first attempt is unsuccessful. Incubation lasts 23-26 days and young leave the nest within hours of hatching (Coats 1955). Nest failure is prevalent during extended periods of drought. For example, nest success was 54 percent (7 of 13 nests hatched) in New Mexico during a year of average precipitation, but it was zero percent (out of 11 nests zero nests hatched) during a year of severe drought (Merchant 1982). Broods remain with females for 6-8 weeks. LPCs have a relatively short life span and high annual mortality. Campbell (1972) estimated a 65 percent annual mortality rate and a 5-year maximum life span, although one individual nearly 7 years old has been recently documented in the wild (Wolfe et al. 2004). Giesen (1998) provides a comprehensive summary of LPC breeding behavior, habitat, and phenology.

The historic range of the LPC encompassed habitats with sandy soils supporting shinnery oak (*Quercus harvardii*)-bluestem (*Andropogon* sp.) and sand sage (*Artemisia filifolia*)-bluestem communities in the high plains of southeastern Colorado, southwestern Kansas, western Oklahoma, west Texas, the Texas panhandle, and eastern New Mexico (Bailey 1928). In New Mexico, Ligon (1961) reported the historic range as being the sandhill-bluestem plains, an approximately 120 km (75 mi) wide swath from the northeast border with Colorado to the southeast border with Texas and in northern De Baca County to 48 km (30 mi) west of Ft. Sumner.

In the early twentieth century, LPCs were reportedly common throughout their five-state range (Bent 1932; Baker 1953; Sands 1968; Fleharty 1995). The area occupied by the LPC in the 1880s was first estimated as 358,000 square kilometers (km^2) (138,225 square miles (mi^2)), and by 1969 it had declined to an estimated 125,000 km^2 (48,263 mi^2) due to wide-scale conversion of native prairie to cultivated cropland (Taylor and Guthery 1980; Aldrich 1963). In 2007, mapping efforts by the Colorado Division of Wildlife, Kansas Department of Wildlife and Parks, NMDGF, Oklahoma Department of Wildlife Conservation, and Texas Parks and Wildlife Department, in cooperation with the Playa Lakes Joint Venture, re-estimated the pre-settlement occupied range to be approximately 456,403 km^2 (176,218 mi^2) (Playa Lakes Joint Venture 2007). Although LPC still occur at some level within each state (Giesen 1998), based on these estimates, the species' distribution has been reduced nearly 86 percent since the time of European settlement (Playa Lakes Joint Venture 2007). The increase in the amount of LPC occupied range since 1980, as previously reported by Taylor and Guthery (1980), is primarily attributable to the short-term expansion of native grassland habitat in Kansas and Colorado under the Conservation Reserve Program (CRP) (Rodgers and Hoffman 2005).

In the 1920s and 1930s, the former range of the LPC in New Mexico was described as all of the sandhill rangeland of eastern New Mexico as far west as De Baca County. Ligon (1927) mapped the breeding range as encompassing portions of seven counties, a small subset of what he described as former range. In the 1950s and 1960s, occupied range was more extensive, indicating reoccupation of some areas. Presently, the NMDGF reports that LPCs are known from portions of seven counties and the occupied range of the LPC in New Mexico is estimated to encompass approximately 5,698 km^2 (2,200 mi^2) (Davis 2006) compared with its historic range of 22,390 km^2 (8,645 mi^2). Private and State land supports approximately 40 percent of the LPC population in New Mexico, with the remaining occurring on lands managed by BLM (Davis 2006). In the 1950s, the LPC population was estimated at 40,000 to 50,000 individuals, but by 1972 the population had declined to an estimated 6,000 to 10,000 individuals. NMDGF currently estimates the LPC statewide population to be about 9,443 individuals (Beauprez 2008).

In New Mexico, the most recent LPC population decline began in 1989. LPC counts on leks dropped dramatically in the BLM Caprock Wildlife Habitat Management Area and in west-central Lea County (Smith et al. 1998). Estimated hunter harvest also declined sharply (Cowley 1995), resulting in closure of hunting seasons in New Mexico in 1996. Although the decline may have been precipitated by drought conditions and reduced nest success, it is also likely that population recovery during the drought was hampered by habitat fragmentation and low recruitment. Since 2005, weather conditions have improved resulting in population increases, and Federal and State agencies have focused staff time and funding to address habitat concerns. From 1998-2008 LPC populations within the core area of southern Roosevelt, northern Lea, and eastern Chaves counties have increased (Beauprez 2008). The LPC population south of U.S. Highway 380 in southeastern Chavez County has shown a significant decline over the same ten-year period, even though 5 leks were detected in 2008, the largest number of leks detected since 1998 (Beauprez 2008). The BLM has implemented stipulations and conditions of approval to conserve LPC habitats since the 1980s. Along with its partners, the BLM has also been implementing legacy oilfield reclamation and rangeland restoration programs since 2005 to enhance LPC habitat.

Sand Dune Lizard

The SDL is native to a small area of southeastern New Mexico and west Texas. A habitat specialist, the SDL only occurs in sand dune complexes associated with shinnery oak (Degenhardt et al. 1996), with areas often separated by large stretches of unsuitable habitat.

A history of oil and gas development and shinnery oak removal for grazing within suitable habitat, including dunal complexes, has increased fragmentation of SDL habitat. This fragmentation, within a small and possibly shrinking geographic range, has led to concern over the future survival of the species and a petition was submitted to the FWS on June 6, 2002 for the protection of the species under the ESA. Prior to receiving the petition to list, through its own internal process, the FWS determined in 2001 that listing was warranted, but precluded because of other higher priority species and the SDL was designated as a candidate for listing. Since 2001, BLM has been actively implementing lease stipulations and conditions of approval for permits to conserve SDL habitat in New Mexico. Additionally, the BLM is actively providing education and outreach to users of the public land regarding SDL habitat needs, including the importance of shinnery oak in maintaining its habitat.

The SDL prefers active and semi-stabilized sand dunes associated with shinnery oak and scattered sandsage. The oaks provide dune structure, shelter, and habitat for the species' prey base. SDLs are found in large dunes with deep, wind hollowed depressions called blowouts, where they remain under vegetation or loose sand during the hot part of the day and at night. These large, deep dunal blowouts (greater than 3 m deep and 32.9 m long) provide superior habitat with more area for cover (for thermoregulation and predator avoidance) and steeper slopes needed as breeding habitat. SDLs avoid shallow blowouts.

Sand grain size is also important when determining which areas within the species' range SDLs will be found. Using laboratory and field experiments to determine sand grain preference, it was determined that SDLs select sites with more medium sand grains (250-354 micrograms (µm)) and do not use less course (fine and extra fine grain) sands, perhaps because it inhibits respiration when SDLs bury themselves in order to avoid predators or regulate their temperature (Fitzgerald et al 1997). The landscape created by the shinnery oak sand dune community is a spatially dynamic system. Areas that contain components of suitable (large, deep blowouts with preferred grain size, steepness, and cover to support populations of SDL) will not always provide suitable habitat. With natural processes like wind and rain, areas that are currently shinnery flats could build into dune complexes that support SDLs. The movement of this dynamic system could be interrupted by habitat fragmentation that would stop the natural shift in dunes and cause the current dune structures to collapse. For this reason, the establishment of corridors is critical to maintaining the dynamic nature of this system.

SDLs are active between April and October during optimal temperatures (Sartorius et al 2002). Females can reach sexual maturity during their first spring following hatching and produce one to two clutches per year, each averaging 4-5 eggs. Hatchlings emerge between July and September. The species feeds on ants, small beetles, crickets, grasshoppers, and spiders. Most feeding takes place within or adjacent to patches of vegetation, usually shinnery oak habitat. Individuals are diurnal and wary, and will seek protection and shelter in burrows, under the sand, beneath leaf litter, and under the shinnery oak canopy (BLM 2006). Within a dune complex, the shinnery flats between dune blowouts are used for movement by females seeking nesting sites and for dispersal of recent hatchlings (Painter 2007). Therefore, it is imperative that connectivity be considered across interdunal areas.

SDLs are known only from a system of shinnery oak sand dunes located in southeastern New Mexico and west Texas. In New Mexico, the habitat area encompasses only 455,000 acres (711 mi^2) of BLM, State of New Mexico Land Office (NMSLO), and private lands. The species range in New Mexico consists of 71,396 acres of State trust lands, 286,355 acres of public lands managed by BLM, and 97,025 acres of private property. Seventy-one percent of the minerals within the range of the SDL are federally owned and fall under BLM lease stipulations and their RMPA. Within the geographic range of the species, habitat is localized and fragmented where known populations are separated by vast areas of unoccupied habitat. Fitzgerald et al. (1997) observed isolated areas of apparently suitable habitat that did not contain SDLs. It is possible that these observations are the result of local extinction events in isolated areas where recolonization is either impossible or has not yet occurred (Snell et al. 1997). It is also possible that these areas have never been occupied and other factors such as competition with or

predation by other species prevent SDL occupation in otherwise suitable habitat. Recent surveys by the BLM have reconfirmed the presence of SDLs within the known geographic range of the species. The BLM has also developed a habitat predictability model to help redefine the parameters of the known geographic range. Several SDLs have been located just outside of the known geographic range, but within shinnery dune habitat, and have included juveniles, indicating that more individuals were likely present (Bird 2007). In Texas, land ownership within the range of the SDL is currently unquantified, but initial research has indicated that both private and State-owned lands contain suitable habitat for the species in west Texas (Laurencio et al. 2006). At this time, a range-wide population estimate for the SDL has not been calculated (C. Painter, New Mexico Department of Game and Fish, pers. comm. 2007).

V. THREATS

Section 4(a)(1) of the ESA lists five factors that must be considered when determining if a species should be listed as threatened or endangered. A species may be listed due to one or more of these factors. These include:

(A) present or threatened destruction, modification, or curtailment of its habitat or range;
(B) over-utilization for commercial, recreational, scientific, or educational purposes;
(C) disease or predation;
(D) inadequacy of existing regulatory mechanisms; and
(E) other natural or manmade factors affecting its continued existence.

Lesser Prairie-Chicken

A. Loss, Destruction, Modification, or Fragmentation of Habitat

Much of the suitable LPC habitat across the species historic multi-state range has been lost due to a conversion to agriculture or modified through grazing practices and other factors (Crawford 1980; Braun et al. 1994). Direct conversion of rangeland to other land uses is the most prevalent cause of LPC habitat fragmentation throughout its range. Other sources of impact on the structure and continuity of grassland habitats include the construction of the infrastructure associated with oil and gas extraction and wind farm development.

Impacts from Land Conversion to Agriculture

Prairie grouse require large expanses of unfragmented, ecologically diverse native rangelands to complete their life cycles (Flock 2002). Intact landscapes of mixed-grass, shortgrass, and shrubland habitats are essential to the LPC (Giesen 1998; Bidwell et al. 2002). Conversion of native sandsage-shinnery oak rangeland to cultivation is an important factor in the decline of LPC populations (Copelin 1963; Jackson and DeArment 1963; Crawford and Bolen 1976; Crawford 1980; Taylor and Guthery 1980; Braun et al. 1994; LPC Interstate Working Group 1997). Landscapes having greater than 20 to 37 percent cultivation may not support stable LPC populations (Crawford and Bolen 1976). In the 1940s, 1970s, and 1980s, additional acres of previously unbroken grassland were brought into cultivation (Laycock 1987). Bragg and Steuter (1996) estimated that by 1993, only 8 percent of the bluestem-grama association and 58 percent of the mesquite-buffalo grass association as described by Kuchler (1985) remained. When considered State-wide, each of the five states with extant LPC populations showed a decline in

the amount of rangeland acreage over that time period, indicating that loss of important LPC habitat may still be occurring.

The U. S. Department of Agriculture's Conservation Reserve Program (CRP) was initiated in the National Food Security Act of 1985, as amended (Farm Bill), and since that time has resulted in millions of acres of marginal and highly erodable cropland returned to grassland, shrubland, and forest habitats (Riffell and Burger 2006), much of which is used by LPCs. Lands enrolled into CRP grass cover support LPC populations in a significant portion of occupied range, particularly in Kansas where expansion of the LPC population is directly related to the amount of land enrolled in CRP planted to a native grass mix. The importance of CRP habitat to the survival of the LPC was recently emphasized by Rodgers and Hoffman (2005). CRP grasslands are often the only ungrazed or lightly grazed component of existing landscapes accentuating their importance to the species for nesting, thermal, and escape cover. In total, approximately 8,760 km^2 (2,163,087 ac; 3,382 mi^2) of CRP within the occupied range of the LPC is under potential imminent threat of being returned to agricultural production. Although it is unlikely that LPCs occupy all CRP tracts within all counties with existing LPC populations, the FWS is only able to analyze the LPC occupancy of CRP tracts at the county level. Nonetheless, the county level CRP projections are a good indicator of habitat trends within occupied portions of counties. The projected CRP loss within two years in all occupied counties of all states amounts to approximately 14 percent of the total occupied range, based on the most recent estimates of the LPC's current range. In New Mexico, approximately 578,832 acres of CRP lands are potentially available to the LPC, of which only 57,883 acres are comprised of native grasses (Playa Lakes Joint Venture 2008).

Impacts from Livestock Grazing

Grazing is one of the dominant land uses on public and private lands throughout the range of LPCs. The evolutionary history of the mixed-grass prairie resulted in endemic bird species adapted to a mosaic of lightly to heavily grazed areas (Bragg and Steuter 1996; Knopf and Samson 1997). In some areas within LPC range where heavy grazing has removed tallgrass and midgrass cover, insufficient amount of lightly grazed habitat is available to support successful nesting (Jackson and DeArment 1963; Davis et al. 1979; Crawford 1980; Taylor and Guthery 1980; Davies 1992). Uniform or widespread livestock grazing of rangeland, to a degree that leaves less than adequate residual cover remaining in the spring, is considered detrimental to LPC populations because grass height is reduced below that necessary for secure nesting cover and desirable food plants are markedly reduced (Bent 1932; Davis et al. 1979; Crawford 1980; Bidwell and Peoples 1991; Riley et al. 1992; Giesen 1994b). Residual cover at and around nests is thought to increase nest success because the nest is better concealed from predators (Davis et al. 1979; Wisdom 1980; Riley et al. 1992; Giesen 1994b).

The impacts of grazing on LPC habitat can vary widely, depending on climatic conditions, the state or health of range vegetation, and the type of grazing regime utilized. Drought tends to magnify grazing impacts, as both processes reduce plant cover (Giesen 2000). When forage is reduced by drought, what remains tends to be grazed more heavily unless animal numbers are reduced. As a result, some grazed areas may supply adequate habitat during periods of normal rainfall, but may be unable to support LPCs during periods of drought (Merchant 1982). Intensive and/or persistent grazing may reduce or eliminate residual tallgrass cover needed for

nesting (Davis et al. 1979; Riley et al. 1992). Heavy grazing that repeatedly interrupts plant succession over a broad area may result in the conversion of tallgrass prairie to shortgrass or forb-dominated habitat (Hoffman 1963; Jackson and DeArment 1963; Litton et al. 1994) or shrub-dominated landscapes.

Impacts from Alternative Energy Development

A rapid expansion of transmission lines and associated wind energy development throughout large portions of occupied LPC range is currently occurring. Except in New Mexico, wind energy development with its associated infrastructure is an on-going and increasing threat to nearly all occupied habitat in all states within the LPC's range where it threatens historical habitat important to linking the New Mexico population to populations to the north. However, little is known about how wind energy development will affect LPCs and their habitat. Construction of turbine towers and powerlines, turbine noise, and the movement of turbine blades during operation have the potential to disturb nesting LPCs (Robel et al. 2004). However, behavioral avoidance of these structures by prairie grouse has the potential to greatly increase the negative impacts in the project area. Effects resulting from habitat fragmentation may negatively affect local LPC populations by decreasing the area of habitat available for nesting and brood-rearing (Pitman et al. 2005). The behavioral response of the greater prairie-chicken is similar to that of the LPC and it has been predicted that nesting and brood-rearing hens of both species will avoid large wind turbines by at least a one-mile radius (Robel et al. 2004). Fragmentation and changes in habitat structure may increase the amount of edge, which may serve as travel lanes for terrestrial predators (Kuehl and Clark 2002), and are consequently avoided by nesting prairie grouse (Robel 2002; Pitman et al. 2005). In addition to the effects of habitat fragmentation, prairie grouse avoidance of vertical structures (Anderson 1969; Manes et al. 2002), and human disturbance activities may further impact LPC movements and habitat use (Robel 2002). Therefore, this type of land use change has the potential to negatively impact the LPC. Consequently, the BLM in its RMPA (2008), stated that applications to permit wither solar or wind energy in public lands within the RMPA planning area will not be approved unless the applicant can demonstrate that there will be no negative impacts to LPCs.

Impacts from Oil and Gas Development

Energy exploration and development occur on public and private surface lands throughout the range of the LPC in New Mexico. The effects of oil and gas development on LPCs are poorly understood; however, recent studies on prairie grouse have suggested that development of oil and gas resources negatively impacts this species, particularly during the breeding season (Lyon and Anderson 2003; Pitman et al. 2005). Because LPCs require large contiguous tracts of prairie ecosystems to fulfill their life history requirements, the cumulative impacts of roads and increased traffic, well pads, pipelines, overhead transmission lines, compressor stations, and production facilities not only result in direct habitat loss, but in fragmentation of remaining suitable habitat (Pitman et al. 2005). Prairie grouse avoid roads, power lines, and other man-made infrastructures (Pitman et al. 2005). Crawford and Bolen (1976) noted that LPC leks adjacent to heavily traveled roads were abandoned at a higher rate than those found further from anthropogenic disturbance. The effect of daily vehicular traffic associated with maintenance of oil and gas operations along these road networks can also impact breeding activities and may further decrease the availability of habitat (Braun et al. 2002). Collisions with overhead transmission lines cause direct mortality to LPCs and may further limit LPC populations

(Bidwell et al. 2003). Transmission lines also provide perches for raptors, which could potentially increase the mortality rate of LPCs (Bidwell et al. 2003). Noise associated with oil field activities may impact breeding activities if mating display vocalizations are disrupted by background noise (Davis 2006). Braun et al. (2002) noted that sage-grouse lek attendance was lower on breeding grounds located in close proximity to active mineral resource developments compared to less disturbed lek sites. Braun (1986) speculated that if noises associated with oil field activity deter recruitment of yearling sage-grouse males to breeding grounds, leks may become extirpated or is abandoned the proper term.

Studies to assess whether sounds from oil and gas exploration may have played a role in the abandonment of a number of historically active lek sites in southeast New Mexico show that abandoned lek sites were exposed to higher ambient noise levels than active sites (Hunt 2004). The same study also reports a significantly higher number of operating wells within one mile of abandoned lek sites. Whether this pattern of lek abandonment reflects sensitivity to noise or some other form of disturbance associated with intensive oil and gas development, or is a response to factors not associated with drilling, remains unknown. However, all of these studies emphasize the importance of taking behavioral avoidance into consideration when assessing development impacts on LPC habitat. The majority of these issues described above are addressed by the RMPA (BLM 2008), and timing stipulations have been in place since the implementation of the RMP in 1997 (BLM 1997).

Impacts from Habitat Fragmentation

Suitable habitat for LPCs has been lost due to conversion to agriculture and modified through grazing practices and other factors, such that remaining suitable habitat is increasingly fragmented and isolated (Crawford 1980; Braun et al. 1994). Fragmentation may threaten local LPC populations through several mechanisms: habitat juxtaposition and remaining patches of rangeland may be smaller than necessary to support populations (Samson 1980); necessary habitat heterogeneity may be lost; habitat between patches may accommodate high densities of predators; and ability to move and/or disperse among suitable patches of habitat may decrease (Wilcove et al. 1986; Knopf 1996).

Direct conversion of rangeland to some other land use is the most extreme of several possible causes of fragmentation of LPC habitat. Other sources of impact on the structure and continuity of grassland habitats include infrastructure associated with resource extraction, roads, power lines, fences, buildings, and tree plantings or windbreaks. As a group, prairie grouse may be particularly sensitive to habitat fragmentation due to their short dispersal distances and landscape-scale habitat requirements (Braun et al. 1994). Recent LPC declines in the southern portion of its range in New Mexico, although probably at least in part drought-related, have led to concern over the effects of fragmentation caused by gas and oil exploration and drilling. While it is often difficult to describe cause-and-effect linkages between specific sources of fragmentation and eventual population responses, recent studies have found LPC population declines in New Mexico to be associated with several measures of overall habitat fragmentation, including patch size, edge density, and total rate of landscape change (Woodward et al. 2001; Fuhlendorf et al. 2002).

Impacts of fragmentation are cumulative and often are mediated by behavioral responses to whatever change is occurring on the land. A growing body of evidence suggests that LPCs actively avoid areas in proximity to vertical structures that may provide hunting perches for raptors, human activity, and noise, particularly during nesting (Robel et al. 2004). Studies have shown that prairie grouse, including LPCs, may avoid or nest at reduced rates in areas near roads, power lines, compressor stations, and inhabited dwellings (Braun et al. 2002; Lyon and Anderson 2003; Pitman 2003; Robel et al. 2004). Recent studies in Kansas showed that LPCs seldom nest or raise their broods within approximately 580 feet of oil or gas wellheads, 1,200 feet of electrical transmission lines, 2,600 feet of improved roads, and 4,000 feet from buildings (Robel et al. 2004; Pitman et al. 2005). Nest site avoidance at these distances effectively eliminates a large percentage of available nesting habitat. Thus, the presence of these man-made features may result in LPC abandonment of areas containing a high percentage of otherwise suitable habitat, effectively increasing the impact of these features far beyond their physical footprint.

LPC habitat loss and modification range-wide continues to occur due to human land use. Additionally, the continued loss and degradation of currently occupied habitat, in the form of heavy grazing, oil and gas development, and fragmentation are rendering portions of previously occupied range uninhabitable for the species. The loss of habitat, though addressed by RMPA measures (BLM 2008), will be reduced by the implementation of this CCA.

Mixed sand sagebrush and shinnery oak rangelands are well documented as preferred LPC habitats, and long term stability of shrubland landscapes has been shown to be particularly important to the species (Woodward et al. 2001). Consequently, herbicide application on native rangelands to decrease or eliminate the shrub component and increase grass forage for livestock reduces habitat quality for LPC throughout the species' range. Herbicide application (primarily 2,4-D and tebuthiuron) to reduce or eliminate shrubs from native rangelands is a common ranching practice throughout the species range.

In a study conducted in west Texas, Haukos (1989) documented strong nesting avoidance of tebuthiuron-treated shinnery oak rangelands. Similar behavior was confirmed by three recent studies conducted in New Mexico that examined aspects of LPC habitat use, survival, and reproduction relative to shinnery oak density and herbicide application. First, Bell (2005) documented strong thermal selection for, and dependency of LPC broods on, sand shinnery oak dominance in shrubland habitats. In this study, LPC hens and broods used sites within the sand shinnery community that had statistically higher percent cover and greater density of shrubs.

In a second study, Johnson et al. (2004) observed through telemetry methods that the most common vegetation types in LPC hen home ranges were those dominated by shinnery oak. Hens were detected more often than randomly in or near pastures untreated with herbicides. Although hens were detected in both treated and untreated habitats in this study, 13 of 14 nests were located in untreated pastures, and all nests were located in areas dominated by shinnery oak. Areas immediately surrounding nests also had higher shrub composition than the surrounding pastures. This study suggested that herbicide treatment to control shinnery oak adversely impacted nesting LPC.

Finally, a third study conducted by the Sutton Center, in cooperation with the NMDGF, showed that over the course of four years and five nesting seasons, LPCs in the core of occupied range in New Mexico distributed themselves non-randomly among shinnery oak rangelands treated and untreated with tebuthiuron (Patten et al. 2005). They demonstrated statistically that LPCs strongly avoided habitat blocks treated with tebuthiuron, but were not affected by cattle grazing. Further, herbicide treatment explained nearly 90 percent of the variation in occurrence among treated and untreated areas.

B. Overutilization for commercial, recreational, scientific, or educational purposes

In the late 19th century, LPCs were subject to market hunting (Jackson and DeArment 1963). Harvest has been regulated since the turn of the 20th century (Crawford 1980). Currently, the LPC is classified as a game species in Kansas, New Mexico, Oklahoma, and Texas, although the legal harvest is now closed in New Mexico and Oklahoma. Overutilization through recreational hunting is not considered a main cause of LPC population declines. However, because most remaining LPC populations are now very small and isolated, and because they naturally exhibit a clumped distribution on the landscape, they are likely vulnerable to local extirpations through many mechanisms, including human harvest (Crawford 1980, Taylor and Guthery 1980). One new activity that has the potential to negatively affect individual LPC populations is the growing occurrence of bird watching by the public and guided tours, especially of leks during the breeding season. The site-specific impact of recreational observations of LPCs at leks is currently unknown. However, disturbance effects are likely to be minimal at the population level if disturbance is avoided by observers remaining in vehicles or blinds until LPCs naturally disperse from the lek and observations are confined to a limited number of days and leks. Solitary leks comprised of fewer than ten males are most likely to be affected by repeated recreational disturbance. Research is needed to quantify this potential threat to local populations of LPC (FWS 2008).

C. Disease or predation

Giesen (1998) reported no available information on ectoparasites or infectious diseases in LPCs, although several endoparasites, including nematodes and cestodes are known to infect the species. The Lesser Prairie-Chicken Interstate Working Group (1997) concluded that, while density-dependent transmission of disease was unlikely to have a significant effect on LPC populations, a disease that was transmitted independently of density could have drastic effects. The avian reticuloendotheliosis virus (REV) is a viral disease documented in poultry, which has been found to cause considerable mortality in captive Attwater's prairie-chickens (*Tympanuchus cupido attwateri*) and greater prairie-chickens (*T. cupido*). In 1999 and 2000, researchers surveyed blood samples from 184 LPCs from three states to determine if REV was present in the species. However, all samples were negative, suggesting that REV may not be a serious problem for most wild populations of LPC (Wiedenfeld et al. 2002).

The impact of West Nile Virus (WNV) on the LPC is unknown. Ruffed grouse have been documented to harbor WNV infection rates similar to some corvids. For 130 ruffed grouse tested in 2000, all distant from known WNV epicenters, 21 percent tested positive. This was remarkably similar to American crows and blue jays (23 percent for each species), species with known susceptibility to WNV (Bernard et al. 2001). Recent analysis of the degree of threat to prairie grouse from parasites and infectious disease concluded that microparasitic infections that

cause high mortality across a broad range of galliform hosts have the potential to extirpate small, isolated prairie grouse populations (Peterson 2004). Currently, CEHMM is conducting a regional assessment of WNV within the indigenous populations of Chihuahuan ravens (*Corvus cryptoleucus).* Ravens were chosen as environmental sentinels for this study due to their omnivorous/scavenging nature and susceptibility to avian pathogens such as the WNV. Many of the nesting areas currently being investigated overlap with the known occupied range of the LPC. Data collected during this investigation will be made available in the event that WNV becomes a suspect in any suspicious LPC population decline.

Prairie falcon (*Falco mexicanus*), northern harrier (*Circus cyaneus*), great-horned owl (*Bubo virginianus*), other unspecified raptors, and coyote (*Canis latrans*) have been identified as predators of LPC adults and chicks (Davis et al. 1979; Merchant 1982; Haukos and Broda 1989; Giesen 1994a). Predators of nests and eggs also include Chihuahuan raven, striped skunk (*Mephitis mephitis*), ground squirrels (*Spermophilus spp*), and bullsnakes (*Pituophis melanoleucus*), as well as coyotes and badgers (*Taxidea taxus*) (Davis et al. 1979; Giesen 1998). LPC predation varies in both form and frequency throughout the year, with raptor predation increasing during lek attendance (Wolfe et al. 2007). Although the FWS has found no information on disease in LPCs and impacts of predators on LPCs at various life stages, there is no indication that either of these factors have risen to the level that they threaten the continuing existence of the species.

D. The inadequacy of existing regulatory mechanisms

In 1973, the LPC was listed as threatened in Colorado under the State's Nongame and Endangered or Threatened Species Conservation Act. In July of 1997, the NMDGF received a formal request to commence an investigation into the status of the LPC within New Mexico. In 1999, the recommendation to list the LPC as a threatened species under the Wildlife Conservation Act, was withdrawn until more information could be collected from landowners, lessees, and land resource managers who may be affected by the listing or who may have information pertinent to the investigation. In 2006, the NMDGF determined that the LPC would not be State-listed in New Mexico. Regardless of each State's listing status, most occupied LPC habitat throughout its current range occurs on private land (Taylor and Guthery 1980), where state wildlife agencies have little authority to protect or direct management of the species' habitat. Additionally, no laws or regulations currently protect LPC habitat on private land, aside from State harvest restrictions. There is no protection afforded to a candidate species under the ESA.

E. Other natural or manmade factors affecting its continued existence

Impacts from Drought

Drought is considered a universal ecological driver across the Great Plains (Knopf 1996). Infrequent, severe drought may cause local extinctions of annual forbs and grasses that have invaded stands of perennial species and recolonization of these areas may be slow (Tilman and El Haddi 1992). In this way, drought may impact LPC through its effect on seasonal growth of vegetation necessary to provide nesting and roosting cover, food, and opportunity for escape from predators (Merchant 1982; Peterson and Silvy 1994; Morrow et al. 1996). The sensitivity of LPC to drought was discussed by Crawford (1980) and Hamerstrom and Hamerstrom (1961).

Precipitation appears to affect LPC adult population trends with a potential lag effect (Giesen 2000). That is, rain in one year promotes more vegetative cover for eggs and chicks in the following year, which enhances their survival. The effects of drought are likely exacerbated by land use practices, but no studies have clearly demonstrated such cumulative impacts on populations (Hagen and Giesen 2005). Along with other prairie grouse, LPC have a high reproductive potential in years of adequate conditions. In New Mexico, southern portions of the species range, which on average receive less total precipitation (i.e., Carlsbad area), are impacted more frequently and more severely by drought. LPC populations in these areas may have always been smaller and more variable than those farther to the north, although population data are insufficient to say this with certainty. Thus, drought conditions are unlikely to be the sole causative factor in long-term LPC population declines. The effects of drought on population growth rate may be more significant in small, fragmented populations.

Impacts from Collision Mortality

Wire fencing is common throughout LPC range as a means of confining livestock to ranches and pastures, or excluding them from areas not intended for grazing such as CRP, agricultural fields, and public roads. Like most grassland wildlife, LPC evolved in open habitats free of vertical features or flight barriers. Fences, power lines, or other wire structures are an unnatural threat to prairie grouse that, until recently, were seldom perceived as significant at the population level (Wolfe et al. 2007).

From 1999 to 2004, researchers recovered 322 carcasses of radio marked LPC in New Mexico, Oklahoma, and portions of the Texas panhandle. In New Mexico, only 14 percent of mortality could be traced to collision. Collision mortality is not unique to LPC, and is increasingly reported in several species of North American grouse. Sage grouse appear to be similarly vulnerable to fence collisions. However, additional investigation is necessary to fully quantify the magnitude of this ongoing threat to LPC rangewide.

With 14 percent of adult LPC mortality in New Mexico attributable to collision with man-made structures, the negative effect of fence collisions on long-term population viability for the LPC cannot be understated. Ligon (1951) expressed concern that spread of these features in eastern New Mexico might severely limit LPC populations; however, the full extent of collision mortality is unknown and difficult to measure. However, the Sutton Center has developed a low-cost method of marking barbed-wire fences to make them more visible to LPCs. Approximately 96 miles of fence have been marked in Oklahoma and the panhandle of Texas by this method (Donald Wolfe, Sutton Avian Research Center, pers. comm. 2008). Initial findings in 2007 indicated a marked drop in bird-fence collisions post-marking. Marking fences in core LPC habitats in New Mexico would be an inexpensive, easily implemented way to minimize one source of LPC mortality.

Sand Dune Lizard

A. Loss, Destruction, Modification, or Fragmentation of Habitat

Because the range of the species was not formally described until 1997, it is difficult to determine the extent of habitat loss range-wide. Increased fragmentation of shinnery oak-dune habitat from removal of shinnery oak for agriculture, cattle grazing, and oil and gas development may isolate SDL populations, increasing the likelihood of extinction (Snell et al. 1997). Habitat

disturbance has already occurred within the range of the species, and there is little doubt that the current distribution and range is a small, but unquantified part of its historic range (Snell et al. 1997). Removal of shinnery oak dune complexes within occupied or suitable, unoccupied habitat poses a serious threat to a species that depends on a very specialized dynamic system. Because the dune system is dynamic and dependant on sand movement, removing shinnery oak from occupied and suitable, unoccupied areas could impact the system's ability to form and stabilize dunes while maintaining connectivity among patches of habitat within the species' range.

Impacts from Oil and Gas Extraction

Currently, 61 percent of land within the New Mexico range of the SDL has been leased by private landowners, BLM, or NMSLO for oil and gas exploration. Within the 455,000 acres of shinnery oak-dune habitat in New Mexico, there are 3,078 oil pads/injection wells and 259 gas wells. Excluding associated roads, each oil pad averages two acres and each gas pad averages three acres. Currently, there is approximately 24,000 acres of caliche (material composed of calcium carbonate and clay used to stabilize road surfaces in an otherwise sandy substrate) pad disturbance, not including roads, within the area occupied by the species. The negative impacts of roads going through habitat include increased mortality due to collisions, soil compaction, decreased stability of microclimates, behavioral modification, loss of habitat and habitat quality, inhibited access to resources, subdivisions of populations into smaller more vulnerable habitat patches, division of the ecosystem with artificial linear gaps, generation of abrupt edges, and introduction of non-native, invasive weed species (Ingelfinger and Anderson 2004; Jaeger et al. 2005; Endriss et al. 2007; Delgado Garcia et al. 2007). Shinnery oak requires permeable sand in order to become established and grow and does not grow in areas with high amounts of calcium carbonate in the sand (Peterson and Boyd 1998). Habitat fragmentation and the reduction of overall shinnery dune habitat will impact survivorship, growth, and reproductive ability; lead to smaller effective populations; and decrease connectivity between populations (Chan et al. 2008). The size of habitat patches and suitable dune complexes will influence the probability of individual patches going extinct in this dynamic system. It is important to view the shinnery oak dune system as dynamic in order to maintain connectivity between patches in each of the geographic areas across the SDLs known range (Chan et al. 2008). When large habitat patches are divided into smaller patches there is increased edge habitat, decreased interior habitat, and increased probability of local extinction. The majority of the well pads are clustered in the southern part of the species' range in an area 5 mi wide and 16 mi across at its greatest length within the swath of habitat between US Highway 82 and US Highway 62. In this area, there are 142 mi^2 where there are greater than thirteen wells per section (1 mi^2).

Impacts from Cattle Grazing

Alteration of native range to increase grass production for domestic livestock is the main impetus for shinnery oak removal; thus, livestock grazing can pose a significant indirect threat to the species (see following paragraph). Domestic livestock and wildlife grazing practices that reduce the ability of the land to sustain long term plant and animal production (Smith et al. 1996) may lead to the loss of grassland cover, mortality of plant species, and increased erosion. Further, improper grazing practices and increased conversion of rangelands to agricultural production may lead to habitat fragmentation and loss by promoting conditions favorable for shrub encroachment and by increasing infrastructure development, such as roads, drinkers, windmills,

water pipelines, and fences (Dinerstein et al. 2000). These land management activities are compounded by extended drought periods and altered hydrologic functions.

Impacts from Tebuthiuron

Tebuthiuron is an herbicide used to remove shinnery oak from areas in order to convert them to agricultural land or increase grass forage production in areas used for livestock grazing. Direct correlation of the species' decline is not linked to the actual application of tebuthiuron, but instead is linked to the long-term effects associated with the removal of shinnery oak habitat. Snell et al. (1997) found that removal of shinnery oak through herbicide treatment resulted in a dramatic reduction and extirpation of SDLs. The study showed that the species' numbers dropped 70 to 90 percent in areas chemically treated compared to adjacent untreated plots. Some plots experienced 100 percent population loss (Snell et al. 1997). Ongoing removal of shinnery oak on State and private lands in New Mexico is an imminent threat to the species with long-term negative effects.

Impacts from Off Highway Vehicles (OHV)

Established OHV areas such as Mescalero Sands North Dune OHV Area is historically occupied, Shugart Dunes is not currently occupied, and the Square Lake Dune complexes are adjacent to currently occupied SDL habitat. OHV use in these areas will be limited to existing road, trails, and unvegetated dunes (BLM 2008). Unauthorized and authorized OHV activities could cause soil compaction, degrade shinnery oak, flatten dunes, and can crush SDL and their eggs (Painter 2004). However, the BLMs RMPA (2008) halted cross country driving by OHVs. Through the RMPA, OHV use within LPC and SDL habitat is now limited to existing roads and trails.

Impacts from Alternative Energy Development

Eastern New Mexico is highly suitable for wind and solar energy development. The infrastructure for wind and solar energy would cause similar habitat fragmentation as that produced by oil and gas development. Although there is no specific information available to implicate wind or solar energy development as a threat to the SDL at this time, there is concern regarding potential effects if wind and solar development were to occur in the species' habitat. More information is necessary to determine what, if any effects will result from specific alternative energy projects that will be located within SDL habitat. However, the BLMs RMPA (2008) stated that applications to permit either solar or wind energy on public land within the RMPA planning area will not be approved unless the applicant can demonstrate that there will be no negative impacts to SDLs.

B. Overutilization for commercial, recreational, scientific, or educational purposes

SDL is not a commercially valuable species, but may be increasingly sought by collectors because of its increasing rarity. Areas inhabited by this species are open to public access, and populations that are thought to be small and localized could become impacted and possibly extirpated by overcollecting. Scientific collecting is not thought to represent a significant threat to localized populations because voucher specimens are collected in very low numbers and at a very low frequency.

C. Disease or Predation

Impacts from Predators

During radio telemetry experiments, pit fall studies, and surveys a number of predators were observed eating SDLs. A nesting ecology study conducted by Hill and Fitzgerald (2007) showed that 20 percent of female SDLs were preyed upon by coachwhips (large, swift, diurnal snakes that feed primarily on SDLs). Twice coachwhips were found leaving pitfall buckets, once with a SDL in its mouth.

Another predator, the loggerhead shrike (*Lanius ludovicanius*) is found in the Mescalero Sands habitat. These small predatory birds occur in many habitats from remote deserts to suburban areas. They perch on trees, shrubs, poles, fences, and utility wires and swoop down to capture their prey. Loggerhead shrikes have weak feet that are of little use for grasping prey while eating. Instead, they impale their prey on sharp objects, such as stout thorns or barbed-wire fences, and use their sharp bills to consume their catch (Alderfer 2006). SDLs have been found impaled on barbed-wire fences within shinnery oak dunes (Jones and Holmes 2003).

Impacts from Increased Competition and Predation

The side blotched lizard is a generalist lizard species that is found throughout the range of the SDL. Researchers studying the SDL have acknowledged that the side-blotched lizard is a direct competitor for resources with the SDL (Sena 1985) and have been documented to directly compete for insect prey (Sias and Snell 1996). In areas where there are large dune blowouts in shinnery dune complexes, the dominant lizard species is the SDL. As the habitat becomes marginal with smaller dune blowouts adjacent to shinnery flats or non-suitable habitat and in areas that have more habitat disturbance and greater edge effects, more side blotched lizards are present than SDLs (Painter 2007).

Impacts from Disease and Parasitism

There are no specific studies on the impacts of disease or parasitism that focus on SDL, but studies have been conducted on close relatives within the *Sceloporus* genus. *Sceloporus* lizards infected with malaria have reduced volumes of red blood cells, reduced hemoglobin, impaired physical stamina, reduced fat stores, lower fecundity, and smaller testes (Klukowski and Nelson 2001). Other lizards in the genus *Sceloporus* have parasitic helminthes in their gut. These helminthes have not been found in high number in SDLs, but further investigation should be done to determine if disease or parasites impact this species. Therefore, disease and parasitism are not currently known to be a threat to SDLs, but may need to be investigated in areas where their population losses are unexplained.

D. The inadequacy of existing regulatory mechanisms

Although the NMDGF lists the SDL as endangered under the New Mexico Wildlife Conservation Act, the species is not afforded any habitat protection. The NMSLO does not currently place any protection on sensitive species such as the SDL on lands they administer and there are no other local or State regulatory mechanisms pertaining to the SDL in New Mexico. The species is not currently listed as threatened or endangered in Texas. There is no Federal protection afforded a candidate species under the ESA. Additionally, there are no other federally-listed species within the range of the SDL that might provide umbrella protection for

the species. However, the BLM is actively providing education and outreach to users of the public land regarding SDL habitat needs, including the importance of shinnery oak in maintaining its habitat.

E. Other natural or manmade factors affecting its continued existence.

The species is an extreme habitat specialist associated with a single plant species that exists in an ecosystem that was previously more widespread and is now relict. Factors such as short life span, small clutch size, and the presence of natural competitors and predators contribute to the precarious status of this species. The species occurs in a fragmented range where populations are not connected for genetic exchange and are vulnerable to genetic drift and population loss due to random events. Because the species is not known to cross large expanses of unsuitable habitat, there is little chance of suitable habitat being recolonized without human intervention. Additionally, many natural events can quickly impact the shinnery oak system that would be equal to spraying with an herbicide or mechanically removing vegetation. Sudden Oak Death, drought, freezes, infestation of root boring insects, and a known lepidopteran parasite can quickly defoliate and kill giant stands of shinnery oak (Peterson and Boyd 1998).

Impacts from Exposure to Toxic Chemicals and Hydrogen Sulfide (H_2S) Emissions

Oil fields can contain a variety of activities that release toxic pollutants including petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAH) (e.g., phenanthrene, fluoranthene, and benzo[a]anthracene), oil spills, and air pollutants (U.S. Environmental Protection Agency 1999). Abdulla et al. (2008) reported that tissue samples taken from a sand dwelling lizard in Kuwait and its insect prey base (ants) contained PAH concentrations that increased with increasing exposure to these pollutants. Abdulla et al. (2008) reported that the concentrations of PAHs in lizard and ant tissues could impact the function of vital organs. Lizards may not be able to remove these chemicals from their system quickly due to their slow metabolic rate and simple enzyme system (Al-Hashem et al. 2007). The exposure to oil field chemicals also impacts the behavior and foraging time for sand lizard species (Abdulla et al. 2008). The sand dwelling lizard in Kuwait is of similar size and resides in similar habitat to SDL. Because much of SDL's habitat is located in small dune patches within oil and gas fields, the potential for exposure to toxic pollutants including both oil spills and chemical leaks is high.

Sias and Snell (1997) found that the number of SDLs decline with the increase in number of well pads per section. This could be due to the destruction of the shinnery oak habitat and the presence of the caliche pads and roads. It could also be due to the presence of H_2S gas emissions, other air pollutants, and other pollution-generating activities associated with petroleum extraction and processing near oil and gas wells. For example, H_2S is a highly toxic gas that is released during petroleum extraction and is the dominant reduced sulfur gas in oil fields (Tarver and Dasgupta 1997). During petroleum extraction H_2S is removed from the petroleum, and the emissions are released into the air where they can remain for a day or less. H_2S is denser than air and tends to sink to the ground where it remains until it is neutralized (Lusk and Kraft 2006). Lusk and Kraft (2006) measured H_2S near Loco Hills, New Mexico (25 miles east of Artesia) where historically large populations of sand dune lizards were once found. They reported concentrations of H_2S as high as 33 parts per million (ppm) there for approximately 32 minutes. Most of the sulfur emitted by producing wells, tank batteries, production facilities, gas plants, sweetening plants, and pipelines may ultimately end up in the

soil. Surface soil tests in active oil fields in Texas found sulfate levels to range between 20-200 ppm near active facilities (Tarver and Dasgupta 1997). This is relevant because SDLs dig-in just below the soil surface during hot parts of the day and at night, and thus would be in direct contact with the sulfates in the soil.

VI. CERTIFICATES OF PARTICIPATION (CP)

A CP is the mechanism for Participating Cooperators to voluntarily become part of this CCA while the LPC and SDL are still in candidate status. The procedure entails each Participating Cooperator signing a CP for a particular parcel of land (enrolled property), and agreeing to implement conservation measures on the enrolled property and contribute funding, land, or provide in-kind services for conservation efforts that will benefit the LPC and/or SDL either on or off-site of the enrolled property. Even though the owner of a lease or allotment may change over time, the CP will remain tied to the enrolled property described in the CP.

The Center of Excellence for Hazardous Materials Management (CEHMM), a 501(c)(3) will be responsible for enrolling Participating Cooperators. The FWS, BLM, and NMDGF will work cooperatively to determine which conservation measures are the highest priorities. It is important to note that funds or in-kind services (work conducted by a Participating Cooperator on lands for which they hold a lease or permit from the BLM) associated with a CP may or may not be used on the enrolled property as described under its corresponding CP since that area may not encompass the highest priority area identified for conservation actions by the BLM and the FWS. It is important to note that if a Participating Cooperator chooses to perform in-kind conservation services, the Participating Cooperator must perform these services on the equivalent amount of acreage as if these conservation services had been contracted through CEHMM.

Participating Cooperators will benefit from voluntarily enrolling in the CCA (via the CP) in several ways:

- In the event the LPC and/or SDL becomes listed under the ESA, the Participating Cooperator would receive a high degree of certainty that the biological opinion is unlikely to change from the conference opinion. As a result, it would be unlikely that more stringent restrictions or additional conservation measures would be required.
- In the event of listing, the Participating Cooperator could continue working under the terms of the CP without the additional requirement of a new section 7 consultation, requiring a minimum of 145 days to complete or until a programmatic assessment is completed.
- The Participating Cooperator could gain public relations benefits from their contribution toward LPC and SDL conservation.

VII. CONSERVATION MEASURES

This section describes the approaches and strategies for conserving, and reducing and/or eliminating threats to the LPC and SDL. These approaches and strategies are based on ecological and biological principles to ensure a long-term approach to the protection and

management of the LPC and SDL. Therefore, the ultimate goal of this CCA is to facilitate conservation of the LPC and SDL in southeastern New Mexico.

For example, Participating Cooperators can agree to protect and enhance existing populations and habitats, restore degraded habitat, create new habitat, augment existing populations of LPC, restore historic populations, fund research studies, or undertake other activities on their Federal leases/allotments which improve the status of the LPC and SDL. The management activities included in this CCA should reduce and/or eliminate threats to the species. Each CP will be negotiated on a case-by-case basis where Participating Cooperators will contribute funds to accomplish conservation measures above and beyond those required in the RMPA, and implement agreed upon conservation measures on the enrolled property. While it is not necessary to conduct all conservation measures listed below on every property enrolled under this CCA, approved conservation measures will be undertaken as necessary to reduce and/or eliminate a particular threat (See Appendix E). CEHMM, in coordination with the FWS and BLM, may use contributed funds to conduct conservation measures on non-Federal lands (private or State) if those landowners agree, in writing through the CCAA, to allow the implementation of the specified conservation measures on their lands. The goal is to implement the highest priority conservation measures needed (regardless of land ownership) to reduce and/or eliminate threats to both species, as determined by the FWS, BLM, and NMDGF with input by CEHMM. As new information or empirical data becomes available, conservation measures can be modified or added through adaptive management to achieve greater species conservation.

Conservation measures to benefit the LPC include, but are not limited to: improving habitat and increasing populations by coordinating vegetation treatments with ongoing activities, decreasing habitat fragmentation, propagating and releasing and/or translocating individuals, and conducting research conducive to adaptive management of the LPC. Measures to benefit the SDL include, but are not limited to: preventing further habitat fragmentation and conducting research conducive to adaptive management of the SDL. The specifics of the conservation measures aimed at benefitting the LPC and SDL are listed below.

In order to ensure conservation measures provide the greatest possible benefit, and ultimately are sufficient to reduce extinction risk to acceptable levels, using funds provided by Participating Cooperators, a Population Viability Analysis (PVA) will be undertaken for both the SDL and LPC in New Mexico and contiguous areas of western Texas. PVA is a mathematical modeling and simulation process using the best available demographic and distributional information that allows for the comparison of extinction risk under a variety of different future scenarios. The PVA will allow managers to evaluate the relative value of different suites of conservation actions in reducing extinction risk. The PVA will be an invaluable tool for optimizing the use of conservation funds generated through the CCA, and will play a key role in annual and long-term planning of CCA conservation activities aimed at reducing and/or eliminating threats to the LPC and/or SDL.

Prior to the completion of the PVA for these species, conservation measures will be developed by FWS, BLM, NMDGF, and other cooperating agencies. The Strategy will guide the development of these conservation measures. The results of biological monitoring combined

with compliance monitoring will be used to evaluate the effectiveness of the conservation measures. The results of the PVA will be added to this information to evaluate the effectiveness of conservation measures and the emphasis place on various conservation strategies with in an adaptive management frame work.

RMPA Foundational Requirements

In April of 2008, BLM completed the Special Status Species Resource Management Plan Amendment for southeast New Mexico. The RMPA established foundational requirements to be applied to all future activities for Federal surface and Federal minerals (including private surface used for Federal mineral development). Regardless of whether a permittee or lessee participates in this CCA, these RMPA foundational requirements will be applied to all activities requiring Federal authorization within the RMPA area (refer to Appendix D). While these RMPA requirements make up the foundation of protection provided to habitat for the LPC and SDL, the strength of the CCA comes from implementing additional conservation measures that are additive, or above and beyond those in the RMPA.

Lesser Prairie-Chicken

Participating Cooperators will implement the following types of conservation actions. The following is a suite of conservation measures that can be applied to enrolled properties (as applicable to a Participating Cooperators' enrolled property) in addition to the foundational requirements established in the RMPA:

1. Establish Plans of Development for enrolled properties.

2. Remove caliche pads and roads on legacy wells where there is no responsible party.

3. Construct all infrastructures supporting the development of a well (including roads, power lines, and pipelines) within the same corridor.

4. Construct new infrastructures in locations which avoid occupied and suitable LPC habitat.

5. Bury new distribution power lines that are planned within 2 miles of occupied LPC habitat (measured from the lek).

6. Minimize total new surface disturbance by utilizing alternative techniques such as co-locating wells, directional drilling, and interim reclamation of drill pads to minimum area necessary to operate the well.

7. Provide escape ramps in all open water sources.

8. Install fence markers along fences that cross through occupied habitat within 2 miles of an active lek.

9. Design grazing management plans to meet habitat specific goals for individual ranches that may include stocking rates, rotation patterns, grazing intensity and duration, and contingency plans for varying prolonged weather patterns including drought.

10. Remove mesquite vegetation that invades into the soils preferred by LPC.

Sand Dune Lizard

Participating Cooperators will implement the following types of conservation actions. The following is a suite of conservation measures that can be applied to enrolled properties (as applicable to a Participating Cooperators' enrolled property) in addition to the foundational requirements established in the RMPA:

1. Allow no surface occupancy within 200 meters of areas designated as occupied or suitable, unoccupied dune complexes or within delineated shinnery oak corridors. These complexes will be determined by FWS, BLM, and NMDGF biologists or their designee within the known geographic range of the SDL. These areas will be determined at a landscape scale rather than a dune-by-dune scale and will also delineate corridors for movement between occupied and suitable dune complexes.

2. Remove caliche pads and roads on legacy wells where there is no responsible party.

3. Route and construct new roads, buried pipelines, and power lines outside of occupied and suitable shinnery dune complexes as delineated by FWS and BLM.

4. Limit seismic exploration to areas outside of occupied and suitable shinnery dune complexes as delineated by the FWS and BLM.

5. Establish Plans of Development for enrolled properties.

6. Submit a predetermined schedule for pipeline and facility maintenance to ensure proper functioning equipment in sensitive habitats to avoid potential accidental pollution events.

7. Prohibit tebuthiuron spraying within 500 m of suitable and occupied habitat (dune complexes) or within corridors that connect dune complexes that are within 2000 m from each other.

8. Prohibit OHV traffic within occupied or suitable dune complexes by signing and closing roads.

9. Remove mesquite vegetation that invades into the soils preferred by SDL.

VIII. RESPONSILBILITIES OF THE PARTIES

CEHMM shall be responsible for:

- Implementing and administering this CCA;
- Determining the conservation commitment and enrolling Participating Cooperators in accordance with this CCA via CPs;
- Meeting with Participating Cooperators to provide technical assistance if they plan to

implement (rather than contributing funds towards) conservation measures;

- Conducting compliance reviews of projects being implemented by Participating Cooperators;
- Using contributed funds to contract and inspect projects.
- Monitoring projects (using existing FWS, BLM, and NMDGF monitoring protocols) in order to determine success and adaptations needed;
- Conducting outreach and public education efforts to promote the conservation of both species;
- Securing permission to complete projects on private and State lands, where appropriate;
- Annually leading a meeting with the FWS, BLM, NMDGF, and interested Participating Cooperators to review progress from the previous year, seek potential solutions for factors that are hampering conservation of LPCs/SDLs, and discuss actions that would benefit the LPC/SDL to be initiated in the upcoming year;
- Tracking expenditure of funds and preparing an annual report on implementation of this CCA/CCAA;
- Using no more than 10 percent of contributed funds for their administrative responsibilities under this CCA;
- Maintaining a digital photo database to document project (i.e., conservation measure) performance. This database will be one tool in the analysis of conservation measures for adaptive management of the CCA;
- Auditing, at CEHMM's expense, by an independent party annually to account for expenditures and accomplishments; and
- Holding the CP for each enrolled property, with copies to all Parties (i.e., Participating Cooperator, FWS, and BLM).

The FWS and BLM shall be responsible for:

- Designing and prioritizing the conservation projects (or types of projects) to be completed;
- Evaluating monitoring data to determine if conservation measures are providing the desired conservation benefit to the LPC and SDL;
- Fostering a conservation commitment with NMDGF for the conservation of these species;
- Reviewing and approving CPs as submitted by CEHMM;
- Holding CEHMM harmless from any claim or liability arising from this CCA; and

The BLM shall be responsible for:

- Completing environmental assessments and clearances for mitigation measures implemented on public land and
  Developing and maintaining a Geodatabase (database) that will track CCA and CCAA certificates. This database will allow the FWS, BLM, CEHMM, and other participating agencies to view and track information on a Geographic Information Systems (GIS). The database will have attributes that track individual projects, Participating Cooperators, and enrolled/benefitting locations associated with the CCA and CCAA certificates. The database, in conjunction with GIS, will allow for tracking and statistics with the use of shapefiles and maps. All information gathered in the database will be distributed to CEHMM as necessary for inclusion in annual reporting processes. Information provided to CEHMM will be delineated into acres/projects completed, acres/projects in progress, and acres/projects planned for habitat enhancement. This database would include, but is not

limited to, financial contributions, completed in-kind services, and the implementation of on-the-ground projects. CCAA information on private lands will not be available for release without written consent from private landowners. Oils and gas plans of development are considered proprietary information (confidential), and is not available for release under Freedom of Information Act inquiries.

Participating Cooperators shall be responsible for:

- Enrolling in this CCA by entering into a CP with CEHMM;
- Completing any in-kind conservation measures outlined in their CP or contribute funding towards conservation measures (based on Appendix C); and
- Allowing CEHMM, BLM, NMDGF, or FWS personnel to survey and monitor enrolled properties for LPC and SDL populations, suitability of habitat, and effectiveness of conservation measures.

IX. FUNDING

Funds contributed by Participating Cooperators will be held and utilized by CEHMM to accomplish conservation measures. Under this Agreement, no funds will be exchanged between the Parties (FWS, BLM, and CEHMM). A team consisting of government managers and specialists from at least the FWS and BLM will meet annually with the CEHMM to develop a strategy to guide project and conservation measure prioritization. Final prioritization of conservation projects will be the responsibility of the FWS and BLM. The criteria for determining priority conservation areas will include occupancy by the LPC and/or SDL, the potential for occupancy by the LPC and/or SDL (e.g., connectivity, absence of major threats to the species) on a given site, as well as quality and quantity of suitable habitat for both species. The team will coordinate actions with other, ongoing conservation activities, including in-kind services, to provide the greatest benefit to both species. Funds for research, monitoring, and education may also be set aside each year, as appropriate. In addition to completing conservation measures identified in CPs, Participating Cooperators will contribute funds (according to Appendix C) for off-site conservation measures to benefit the LPC and/or SDL.

X. ADAPTIVE MANAGEMENT

This CCA is based on adaptive management principals. The FWS and the BLM agree and recognize that implementation of the conservation measures herein must be consistent with the concepts and principals of adaptive management. The effectiveness of the conservation measures, monitoring methods, and new technologies will be reviewed by the FWS, BLM, and NMDGF on an annual basis. Upon such evaluation, appropriate modifications to the conservation measures will be incorporated to further enhance the goals of this CCA. Additionally, research projects that are designed to determine the effectiveness of management practices will be encouraged and utilized to determine what adaptive management is necessary.

XI. DURATION OF THE CCA

This CCA will remain in effect until one or more parties (CHEMM, BLM, or FWS) terminate it. Any signatory may withdraw from this agreement at any time by providing 30 days written notice to all other signatories. Any signatory may propose changes to this agreement. Such changes will be in the form of an amendment and may be considered at any time after a 30-day notice to all parties. No amendment shall be valid unless executed by all parties to this agreement. All parties will meet at least annually to review the CCA and its effectiveness to determine whether revision is necessary. If CEHMM terminates their participation in the CCA, any unexpended funds will be transferred to a 501(c)(3) designated by the FWS and BLM.

XII. SIGNATURES

IN WITNESS WHEREOF, THE PARTIES HERETO have, as of the last signature below, executed this CCA to be in effect as of the date of the last signature.

Regional Director
U.S. Fish and Wildlife Service, Southwest Region

12-8-08
Date

State Director
U.S. Bureau of Land Management, NM/OK/TX/KS

12/08/08
Date

Executive Director
Center of Excellence for Hazardous Materials Management

12-08-08
Date

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XIII. APPENDICES

Appendix A

CERTIFICATE OF PARTICIPATION
In the
Candidate Conservation Agreement for the Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) and Sand Dune Lizard (*Sceloporus arenicolus*)

This certifies that the Participating Cooperator of the property described herein is included within the scope of the above named Candidate Conservation Agreement (CCA) for the lesser prairie-chicken (LPC) and sand dune lizard (SDL) under the authority of Section 10(a)(1)(A) of the Endangered Species Act of 1973, as amended (ESA), 16 U.S.C. 1531-1544.

The goal of all Parties is to reduce and/or eliminate threats to the LPC and/ or SDL. By agreeing to conduct the conservation measures described herein, and contribute funding or provide in-kind services for conservation, the Parties agree that should the LPC or SDL become listed, there is a high degree of certainty that additional measures would not be required on the enrolled land legally described below. If a Participating Cooperator chooses to no longer provide the conservation measures in the Certificate of Participation (CP), protections described herein are no longer applicable.

Participating Cooperator's Name: _____
_____
_____
_____
_____

Address: _____
_____
_____
_____
_____
_____

Legal Description of Enrolled Lands (Also attach a detailed map): _____
_____
_____

_____
_____
_____
_____
_____
_____
_____

Total Acres of Enrolled Lands (all lands covered by permit): _____
_____
_____

Description of Conservation Measures to be accomplished by Participating Cooperator:
_____
_____
_____
_____
_____
_____

Total funds to be contributed by Participating Cooperator based on the table in Appendix C:
$_____

Succession and Transfer. This CP is tied to the land described above and cannot be transferred to other land, and shall be binding on successors and transferees. If the lease is transferred, the new owner(s) will have the same rights and obligations with respect to this CP as the original owner. For oil and gas Participating Cooperators, the CP is good for the term of the lease, or as long as the lease is held by production.

This CP is a voluntary agreement between the Center of Excellence for Hazardous Materials Management (CEHMM) (as administrator of the CCA between the Bureau of Land Management (BLM) and the U.S. Fish and Wildlife Service (FWS)) and the Participating Cooperator. Through this CP, the Participating Cooperator voluntarily commits to implement or fund specific conservation actions that will reduce and/or eliminate threats to the SDL and /or the LPC. Funds contributed as part of this CP will be used to implement conservation measures. The funds will be directed to the highest priority habitat area, which may or may not be this enrolled property. By signing below, the Participating Cooperator acknowledges that they have read and understand the CCA. They further acknowledge that this CCA may not be sufficient to prevent the listing of either species.

IN WITNESS WHEREOF THE PARTIES HERETO have executed this Certificate of Participation to be in effect on the date of the last signature below.

_____

Participating Cooperator (Permittee or Leaseholder/Operator)

Date_____

_____

Center of Excellence for Hazardous Materials Management

Date_____

_____

FWS Authorized Officer

Date_____

_____

BLM Authorized Officer

Date_____

Appendix B

Participating Cooperator Options for the Certificate of Participation

In addition to the suite of conservation measures identified in Section VII of the CCA, Participating Cooperators will either implement in-kind conservation or contribute funds for conservation as part of the Certificate of Participation (CP). Conservation measures fall into general categories of habitat enhancement or avoidance of negative habitat impacts, mortality mitigation, research, and providing facilities for propagation or translocation of the species (specifically only for the LPC).

Funding requirements for Participating Cooperators who are oil and gas leaseholders are based on:

- reclamation costs for the amount of surface disturbance within the lease area,
- the habitat category where the disturbance will occur, and
- reclamation goals for each habitat category.

Reductions were applied to some options based on the amount of benefit to the lesser prairie-chicken (LPC) and sand dune lizard (SDL) conservation.

The current cost to reclaim one acre, including the removal of caliche and reseeding operations, is approximately $2,500. On average, a location (location types include anything that requires surface disturbance for production facilities, *e.g.*, oil, gas, injection, monitoring wells, and compressor stations) consists of 4 acres of caliche which includes the actual pad and the road. Therefore, the current total for reclamation of one average location is approximately $10,000. The habitat categories for LPC in New Mexico are defined in the Special Status Species Resource Management Plan Amendment (RMPA) of 2008 as:

- PPA = Primary Population Area
- CMA = Core Management Area
- HEA = Habitat Evaluation Area
- SSPA = Sparse and Scattered Population Area
- IPA = Isolated Population Area

Reclamation goals by habitat categories based on the importance to the species stability are:

- PPA/CMA = 2 acres reclaimed : 1 new acre disturbed
- HEA = 1.5 acres reclaimed : 1 new acre disturbed
- SSPA = 1.25 acres reclaimed : 1 new acre disturbed
- IPA =1 acres reclaimed : 1 new acre disturbed

Options for an Oil and Gas Leaseholder/Operator under a Certificate of Participation

The goal for an oil and gas CP is for leaseholders to voluntarily contribute funding or in-kind actions to benefit the LPC or SDL. The intent is to provide options that would insure measurable benefits to each species' conservation. The following scenarios include:

- the new locations option at full field development (most expensive option);
- the lease option which has a 25 percent reduction in contributions compared to the new location option at full field development;

- the co-location option which has a 70 percent reduction in contributions compared to building a new location; and

For actual contribution scenarios, refer to the tables located in Appendix C.

The Lease Option
A leaseholder/operator signs a CP that allows for a total number of locations based on one location per 40-acre spacing in the lease. This option is most advantageous to the leaseholder (most cost-effective with a 25 percent reduction over the per well option) if full field development is anticipated. For example, a 640-acre lease may allow up to 16 locations to be included in the CP. This option is also more time efficient for the Center for Excellence of Hazardous Materials Management (CEHMM) to administer and track. This option has the ability to generate contributed funding in a timely manner for the implementation of conservation measures in SDL and LPC habitat. Under this scenario, lessees would still be required to avoid dune complexes and connecting corridors as required by the RMPA (2008). If there are numerous dunes in the lease area, this may not be the most appropriate option.

The Per Location Option
A leaseholder/operator signs a CP that includes only a planned number of locations: either new, co-located, or a combination of both. Disadvantages of this option include: for the leaseholder, it could cost more in the long run should they decide to develop more locations than originally planned; and for CEHMM , there could be multiple CPs to administer and track for a single lease. There could be an advantage to leaseholder who knows they will only develop a small number of locations on the lease. Under this scenario, lessees would still be required to avoid dune complexes and connecting corridors as required by the RMPA (2008).

- A. New Locations:

A leaseholder/operator signs a CP for one or more new locations they plan to develop on their lease. This option is the most expensive for the leaseholder because it provides the least conservation benefit to the SDL or LPC since every location creates new surface disturbance and increases habitat fragmentation. It does however potentially allow for more wells than the Lease Option (e.g., oil spacing at 40 acres/well plus gas spacing at 160 acres/well). Under this scenario, lessees still have to stay out of dune complexes as required by the RMPA (2008).

- B. Co-Locations:

A leaseholder/operator signs a CP for the number of co-located wells they plan to develop from a single location. It is the least costly option for leaseholders (with a 70 percent reduction over the New Location Option) because it provides the greatest conservation of habitat by reducing surface disturbance and habitat fragmentation.

The Contributions Table (Appendix C) provides a basis for comparing each of the options and combinations. Contributions are based on the number of 40-acre spaces within a mineral lease for two options and less-than-40-acre spacing for another option, the proposed number of new locations and planned co-locations on the lease, the habitat category for LPC, and the current cost of reclamation. When a Participating Cooperator opts for contributing funds (rather than doing conservation practices themselves) it would require a transfer of funds to CEHMM prior to

the CP becoming effective. Leaseholders/Operators who opt to complete in-kind conservation measures as assigned by the FWS and BLM would have a deadline and a measurable standard for completion of those actions written into the CP by CEHMM. Their CP would not become effective until the work was completed and approved by the FWS, BLM, and CEHMM. Regardless of the types of contributions provided, there will be no direct cash-value refunds to the Participating Cooperator. However, if a Participating Cooperator decides to relinquish coverage for wells not drilled, they may receive a credit for application to other parcels, new or existing, under the control of the Participating Cooperator. A transfer of credits can only be completed while the species are in candidate status, and have not been listed as threatened or endangered under the Endangered Species Act. Credits shall not be sold outright and may only be transferred to other Participating Cooperators via a transfer of applicable operating or lease right.

Options for a Livestock Grazing Certificate of Participation

The level of commitment for a CP for a livestock operator would be appraised on an individual basis since ranching operators vary widely in the type and size of operation authorized on public lands. Consideration will be given to the type of conservation measures most needed on their specific allotment (i.e., deferment of grazing, rest rotation grazing management, and fence marking). Other measures could include brush treatments, fence or power line removal, or providing a location or facility for releases of captive-bred or translocated LPCs.

A CP containing in-kind implementation of conservation measures will have a deadline and measurable standards for completion of each specific action written into the CP by CEHMM. These CPs would not become effective until the work was completed and approved by CEHMM.

Appendix C

Contributions Table

"By the Lease" Option (A 25% reduction compared to full field development by the well)						
Lease Size		40 Acres	80 Acres	160 Acres	320 Acres	640 Acres
Well paces		1	2	4	8	16
Habitat Category	PPA	$20,000	$30,000	$60,000	$120,000	$240,000
	CMA	$20,000	$30,000	$60,000	$120,000	$240,000
	HEA	$15,000	$22,500	$45,000	$90,000	$180,000
	SSPA	$12,500	$18,750	$37,500	$75,000	$150,000
	IPA	$10,000	$15,000	$30,000	$60,000	$120,000

"By the Well" Option (All new construction for locations at full field development)							
Lease Size		40 Acres	80 Acres	160 Acres	320 Acres	640 Acres	Ratio Of Reclamation
Total Wells		1	2	4	8	16	
Habitat Category	PPA	$20,000	$40,000	$80,000	$160,000	$320,000	**2:01**
	CMA	$20,000	$40,000	$80,000	$160,000	$320,000	**2:01**
	HEA	$15,000	$30,000	$60,000	$120,000	$240,000	**1.5 : 1**
	SSPA	$12,500	$25,000	$50,000	$10,000	$200,000	**1.25 : 1**
	IPA	$10,000	$20,000	$40,000	$80,000	$160,000	**1:01**

* : One well on 40 acre spacing is full field development “by the well”

By the Well" Option in IPA (Scenarios including co-located wells)								
40 Acres	80 Acres: 2 well spaces		160 Acres: 4 well spaces		320 Acres: 8 well spaces		640 Acres: 16 well spaces	
N/A	$13,000.00	1 N 1 C	$33,000.00	3N 1 C	$73,000.00	7 N 1 C	$153,000.00	15N 1C
			$26,000.00	2N 2 C	$66,000.00	6N 2C	$146,000.00	14N 2C
			$19,000.00	1 N 3 C	$59,000.00	5N 3C	$139,000.00	13N 3C
					$52,000.00	4N 4C	$132,000.00	12N 4C
					$45,000.00	3N 5C	$125,000.00	11N 5C
					$38,000.00	2N 6C	$118,000.00	10N 6C
					$31,000.00	1N 7C	$111,000.00	9N 7C
							$104,000.00	8N 8C
							$97,000.00	7N 9C
							$90,000.00	6N 10C
							$83,000.00	5N 11C
							$76,000.00	4N 12C
							$69,000.00	3N 13C
							$62,000.00	2N 14C
							$55,000.00	1N 15C

N = Well requiring a new location

C = Well co-located with an existing location

By the Well" Option in SSPA (Scenarios including co-located wells)								
40 Acres	80 Acres: 2 well spaces		160 Acres: 4 well spaces		320 Acres: 8 well spaces		640 Acres: 16 well spaces	
N/A	$16,250.00	1 N 1 C	$41,250.00	3N 1 C	$91,250.00	7 N 1 C	$191,250.00	15N 1C
			$32,500.00	2N 2 C	$82,500.00	6N 2C	$182,500.00	14N 2C
			$23,750.00	1 N 3 C	$73,750.00	5N 3C	$173,750.00	13N 3C
					$65,000.00	4N 4C	$165,000.00	12N 4C
					$56,250.00	3N 5C	$156,250.00	11N 5C
					$47,500.00	2N 6C	$147,500.00	10N 6C
					$38,750.00	1N 7C	$138,750.00	9N 7C
							$130,000.00	8N 8C
							$121,250.00	7N 9C
							$112,500.00	6N 10C
							$103,750.00	5N 11C
							$95,000.00	4N 12C
							$86,250.00	3N 13C
							$77,500.00	2N 14C
							$68,750.00	1N 15C

By the Well Option in HEA (Scenarios including co-located wells)								
40 Acres	80 Acres: 2 well spaces		160 Acres: 4 well spaces		320 Acres: 8 well spaces		640 Acres: 16 well spaces	
N/A	$19,500.00	1 N 1 C	$49,500.00	3N 1 C	$109,500.00	7 N 1 C	$229,500.00	15N 1C
			$39,000.00	2N 2 C	$99,000.00	6N 2C	$219,000.00	14N 2C
			$28,500.00	1 N 3 C	$88,500.00	5N 3C	$208,500.00	13N 3C
					$78,000.00	4N 4C	$198,000.00	12N 4C
					$67,500.00	3N 5C	$187,500.00	11N 5C
					$57,000.00	2N 6C	$177,000.00	10N 6C
					$46,500.00	1N 7C	$166,500.00	9N 7C
							$156,000.00	8N 8C
							$145,500.00	7N 9C
							$135,000.00	6N 10C
							$124,500.00	5N 11C
							$114,000.00	4N 12C
							$103,500.00	3N 13C
							$93,000.00	2N 14C
							$82,500.00	1N 15C

By the Well Option in CMA/PPA (Scenarios including co-located wells)								
40 Acres	80 Acres: 2 well spaces		160 Acres: 4 well spaces		320 Acres: 8 well spaces		640 Acres: 16 well spaces	
N/A	$26,000.00	1 N 1 C	$66,000.00	3N 1 C	$146,000.00	7 N 1 C	$306,000.00	15N 1C
			$52,000.00	2N 2 C	$132,000.00	6N 2C	$292,000.00	14N 2C
			$38,000.00	1 N 3 C	$118,000.00	5N 3C	$278,000.00	13N 3C
					$104,000.00	4N 4C	$264,000.00	12N 4C
					$90,000.00	3N 5C	$250,000.00	11N 5C
					$76,000.00	2N 6C	$236,000.00	10N 6C
					$62,000.00	1N 7C	$222,000.00	9N 7C
							$208,000.00	8N 8C
							$194,000.00	7N 9C
							$180,000.00	6N 10C
							$166,000.00	5N 11C
							$152,000.00	4N 12C
							$138,000.00	3N 13C
							$124,000.00	2N 14C
							$110,000.00	1N 15C

Formula used is: ((n)+(c*0.3))*h(10000)=Benefit
n= Number of new well locations
c=Number of co-located wells
0.3 = 70% reduction compared to a new location
h= Habitat coefficient based on reclamation goal
10000 = $10,000 (cost to reclaim 4 acres of caliche)

Appendix D – **Bureau of Land Management**
Special Status Species Resource Management Plan Amendment (RMPA) Management Decisions for Lesser Prairie-chicken (LPC) and Sand Dune Lizard (SDL)
Approved April 2008

The RMPA established baseline requirements to be applied to all future activities for Federal surface and Federal minerals (including private surface used for Federal mineral development). Regardless of whether a permittee or lessee participates in this Candidate Conservation Agreement (CCA), these RMPA baseline requirements will be applied to all activities requiring Federal authorization within the RMPA area.

The following areas are closed to new oil & gas leasing:

- The Core Management Area (CMA), including Mathers RNA, Mescalero SandsAreas of Critical Environmental Concern (ACEC) and Sand Ranch ACEC.
- Occupied and suitable LPC habitat within the Primary Population Area (PPA).
- Potentially suitable LPC habitat within the PPA may be closed depending on its location relative to occupied and suitable habitat.
- Occupied LPC habitat within the Sparse and Scattered Population Area (SSPA) and the Isolated Population Area (IPA).
- The 17 Habitat Evaluation Areas (HEAs) within the IPA may be closed, depending on the results of the evaluation.
- Areas "closed to new oil and gas leasing" amount to 220,000 acres (previous RMP had only 11,000 acres closed).

Occupied LPC habitat. All areas within 1.5 miles of an active LPC site, regardless of vegetation that has been active for one out of the last 5 years. Upon discovery of a previously unknown active site, the surrounding 1.5-mile radius is considered occupied habitat.

Suitable LPC habitat. Unoccupied areas of appropriate vegetation type, in patches of 320 acres or more, falling entirely outside of Robel impact/avoidance distances around infrastructure.

Areas where No Surface Occupancy requirements will be applied to new oil & gas leasing:

- Tracts along the edge of the CMA needed for proration or drainage purposes.
- Tracts within the PPA needed for proration or drainage purposes that do not impact suitable habitat.
- In the 17 HEAs, depending on the results of the evaluations.
- Amounts to 24,000 acres. (The previous RMP had only 7,000 acres of NSO).

Areas open to new oil and gas leasing with Timing and Noise requirements to protect LPC activity:

- Timing requirement expanded to March 1 through June 15 (no noise from 3 am until 9 am). The timing requirement use to be 3/15 to 6/15.
- Exceptions to timing requirement considered up to March 15. No exceptions after that date.
- Noise not to exceed 75 db measured 30 feet from the source.

- Amounts to 80,000 acres (previous RMP had only 287,000 acres with Timing/Noise requirements, which decreased because these acres have moved to either "Closed to New Leasing" or the "No Surface Occupancy" categories above).

Plans of Development

A plan of development (POD) is required on all new and existing oil and gas leases when requested by the authorized officer.

When developing existing oil and gas leases, no disturbance will be allowed within 200 meters of known LPC leks (see timing and noise requirements) plus a POD is required before the well location will be approved when requested by the authorized officer.

Sand Dune Lizard habitat protections applied to oil and gas development:

- New oil and gas leases.
- No Surface Occupancy will be applied to dune complexes within tracts proposed for leasing.
- POD required before the first well location can be approved when requested by the authorized officer.
- Existing oil and gas leases.
- POD required when requested by the authorized officer.
- Lessee conducts a habitat survey prior to approval of activities.
- No surface disturbance within up to 200 meters of SDL habitat.

Utility Corridors

In accordance with the Energy Policy Act of 2005, BLM designated interstate utility corridors, which go around the Planning Area.

Within SDL habitat, new surface disturbance (rights-of-way) in dune complexes will not be authorized unless the action could be beneficial to the species, as determined by the authorized officer.

Powerline Removal Program

In order to reduce the number of overhead electric power lines, the power liner removal credit (PLRC) program has been established. The PLRC program features:

- Allows 1.0 mile of new overhead power line to be constructed for every 1.5 miles of idle line, including poles, removed.
- Participants in the program can bank the credits.
- Credits can be earned regardless of surface ownership.

Guidelines for chemical treatment of shinnery oak.

Adherence to these guidelines should be emphasized as part of the overall rangeland management strategy for lesser prairie-chicken and sand dune lizard habitat.

- Treatment with herbicides is recommended only when habitat goals cannot be achieved by other means, such as grazing system management.
- Given the condition stated above, treatment of shinnery oak is recommended when necessary to achieve vegetative standards for plant composition and canopy cover; for

example, when shinnery oak cover still exceeds guidelines after grazing management has been applied.

- In conducting such treatments, the goal should be to temporarily reduce shinnery oak competition with grasses, allowing grass cover to increase naturally. Herbicides should be used at dosages that would set back (defoliate) shinnery oak, not kill it.
- Large block and linear application should be avoided. Instead, application should follow natural patterns on the landscape such that only patches needing treatment are treated.
- Herbicide treatment should not be applied in dune areas and corridors between dune complexes.
- Post-treatment grazing management is essential to success. Grazing would be deferred for at least two growing seasons after treatment.
- Tebuthiuron treatments for shinnery oak control within 500 meters of occupied or suitable habitat for sand dune lizard would not be allowed.
- Proposals for shinnery oak treatments with non-tebuthiuron herbicides or defoliants within 500 meters of occupied or suitable habitat would be reviewed by the sand dune lizard research team (biologists from NMDGF, BLM, or other relevant agencies).
- Sand dune lizard dispersal corridors of untreated shinnery oak flats at least 500 meters wide should be retained between suitable habitats, both occupied and unoccupied, that are separated by less than 2000 meters.

Vegetation & Livestock Grazing decisions include:

- An allottee may voluntarily relinquish grazing on an allotment. Relinquishment will be reviewed during the next revision of the management plan.
- Requirements for spikes on posts and reflectors on wire on new fences in the LPC habitat incorporated into best management practices in order to reduce LPC mortality associated with fences.
- Vegetation treatment areas will be rested from grazing for 2 growing seasons unless a different time period, longer or shorter, is necessary to achieve habitat requirements.
- Occupied and suitable SDL habitat would not be chemically treated unless the SDL is removed from State or Federal lists; or a chemical application rate is developed that would not impair habitat.

Solar & Wind Energy

BLM would only consider solar or wind energy generating applications that produce no negative impacts to LPC or SDL habitat.

Recreation decisions include:

- If visitation begins to negatively impact LPC, a permit system would be instituted.
- If determined to be necessary, generators associated with recreation uses would not be allowed in or near LPC leks from March 1 to June 15 between the hours of 3 am and 9 am.

Sand Ranch Area of Critical Environmental Concern

- Established through the RMPA.
- The management goal of the ACEC is to protect and enhance LPC/SDL habitat:
  37,000 acres Public land

11,000 acres State land
10,000 acres private land
58,000 acres total

- Provides for the following management:
  - Allows for voluntary relinquishment of grazing in allotments.
  - Closes the area to future oil and gas leasing.
  - Closes the area to locatable, leasable and saleable mineral entry.
  - Emphasizes land exchanges with State Land Office to block up land management.
  - Sets in place mechanism for acquiring private land from willing sellers.

Appendix E – **Table Showing How Conservation Measures Can Reduce and/or Eliminate Threats to the Lesser Prairie-Chicken and Sand Dune Lizard**

Threat		Overall Threat Level	Conservation Measures Used to Address Threat
Sand dune lizard	Habitat Loss, Fragmentation, Degradation	High	No surface occupancy within 200 meters of dune complexes.
			Prohibit tebuthiuron spraying within 500 meters of dune complexes or within corridors connecting dune complexes.
			Route and construct new roads, pipelines, and powerlines outside of dune complexes.
			Establish Plans of Development for all new enrolled properties.
			Limit seismic exploration in dune complexes.
			Prevent encroachment of invasive nonnatives in dune complexes.
			Prevent entry into areas closed to OHV use.
			Prohibit OHV use in occupied and suitable dunes.
	Exposure to Toxic Chemicals and Hydrogen Sulfide Emissions	Moderate	Submit a predetermined schedule for pipeline and facility maintenance.
			Schedule facility maintenance.
Lesser Prairie-Chicken	Habitat Loss, Fragmentation, Degradation	High	Establish Plans of Development for all new enrolled properties.
			Construct all infrastructures (i.e., roads, powerlines, and pipelines) for well development within the same corridor.
			Construct new infrastructures in locations which avoid occupied and suitable LPC habitat.
			Bury new distribution power lines that are planned within 2 miles of occupied LPC habitat (measured from the lek).
			Minimize total new surface disturbance by co-locating wells, directional drilling, and interim reclamation of drill pads.
			Prohibit tebuthiuron spraying within 500 m of suitable and occupied habitat.
			Design grazing management plans to meet habitat specific goals for individual ranches.
			Remove mesquite vegetation that invades into the soils preferred by LPC.
	Fence Collisions	Moderate	Install fence markers along fences that cross through occupied habitat within 2 miles of an active lek.
	Predation	Moderate	Bury new distribution power lines that are planned within 2 miles of occupied LPC habitat (measured from the lek).

Appendix F – **Implementation Schedule**

The following Implementation Schedule outlines actions and costs for the conservation of the lesser prairie-chicken (LPC) and sand dune lizard (SDL). It is a guide for meeting the goals and objectives elaborated throughout this Candidate Conservation Agreement (CCA). This schedule identifies a strategy description based on threats to the species, responsible parties, conservation measure duration, and potential funding sources.

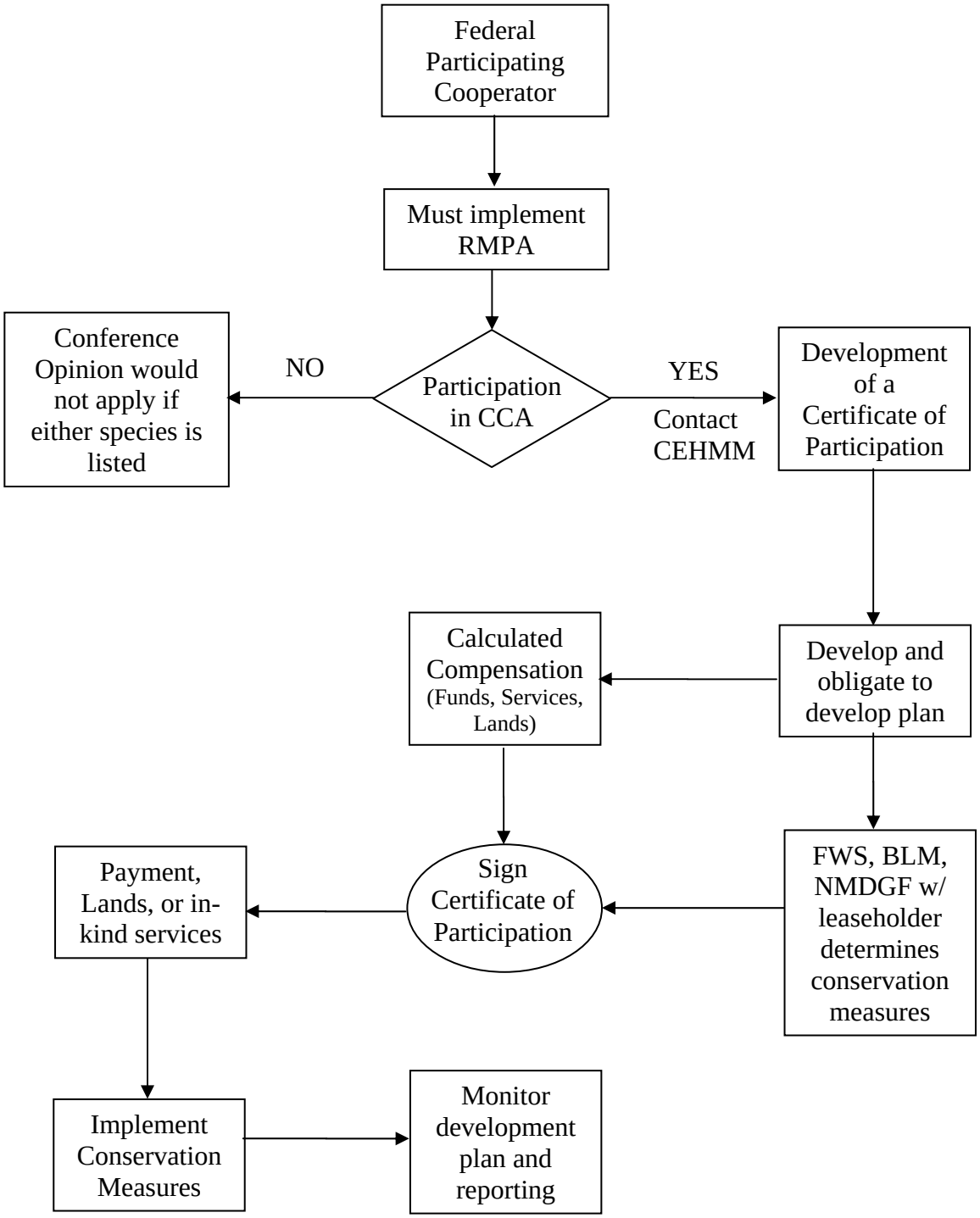
Strategy Description	Responsible Parties	Conservation Measure Duration	*Funding Source
1. Habitat Loss, Fragmentation, Degradation			
a. Establish Plans of Development for all new enrolled properties (LPC, SDL).	BLM, Participating Cooperators	Continuous	Participating Cooperators
b. Remove caliche pads and roads on legacy wells (LPC, SDL).	BLM, Participating Cooperators	Continuous	Participating Cooperators, CCA monies, PFW
c. Construct all infrastructure for well development within the same corridor (LPC).	BLM, Participating Cooperators	Continuous	Participating Cooperators
d. Construct all infrastructure for well development outside of dune complexes (SDL).	BLM, Participating Cooperators	Continuous	Participating Cooperators
e. Prohibit tebuthiuron spraying within 500 m of suitable and occupied habitat (LPC); dune complexes or within corridors connecting dune complexes (SDL).	BLM, Participating Cooperators	Continuous	No cost
f. Remove mesquite that invades into soils (LPC); prevent encroachment of invasive nonnatives in dune complexes (SDL)	BLM, Participating Cooperators	Continuous	BLM, NMDGF, CCA monies, PFW, Participating Cooperators
g. Prevent entry into areas closed by OHV use; prohibit OHV use in occupied and suitable dunes (SDL).	BLM, Participating Cooperators	Continuous	BLM, NMDGF, CCA monies, PFW, Participating Cooperators
h. Bury new distribution power lines planned within 2 mi of occupied habitat, measured from the lek (LPC).	BLM, Participating Cooperators	Continuous	Participating Cooperators

Strategy Description	Responsible Parties	Conservation Measure Duration	*Funding Source
i. Minimize total new surface disturbance by co-locating wells, directional drilling, and interim reclamation of drill pads (LPC).	BLM, Participating Cooperators	Continuous	Participating Cooperators
j. Design grazing management plans to meet habitat specific goals for individuals ranches (LPC).	BLM, Participating Cooperators	Continuous	NRCS, NMDGF, Participating Cooperators
2. Predation			
a. Bury power lines planned within 2 mi of occupied habitat, measured from the lek (LPC).	BLM, Participating Cooperators	Continuous	Participating Cooperators
3. Other natural or manmade factors			
a. Submit a predetermined schedule for pipeline and maintenance facility (SDL).	BLM, Participating Cooperators	Continuous	Participating Cooperators
b. Schedule facility maintenance (SDL).	BLM, Participating Cooperators	Continuous	Participating Cooperators
c. Install fence markers (LPC).	BLM, Participating Cooperators	Continuous	CCA monies, NRCS, LIP, NMDGF, PFW
4. Other – PVA for LPC and SDL in NM and contiguous areas of western TX	BLM, FWS, Participating Cooperators, CEHMM, others	early 2009	CCA monies

*Note – The funding sources identified in the implementation schedule are only suggestions, and do not constitute a commitment of resources from any of the above listed agencies.

FWS = U.S. Fish and Wildlife Service, BLM = Bureau of Land Management, CEHMM = Center of Excellence for Hazardous Materials Management, PFW = Partners for Fish and Wildlife, NRCS = Natural Resource Conservation Service, NMDGF = New Mexico Department of Game and Fish, LIP = Landowner Incentive Program

Appendix G – Flow Chart to Participate in Lesser prairie-chicken and Sand dune lizard CCA



XV. ATTACHMENTS

Attachment # 1 – CCAA

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Candidate Conservation Agreement with Assurances

for the

Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) and Sand Dune Lizard *(Sceloporus arenicolus*)

Developed cooperatively by:
U.S. Fish and Wildlife Service - Southwest Region
Center of Excellence for Hazardous Materials Management

December 8, 2008

Table of Contents

This Candidate Conservation Agreement with Assurances (CCAA), is an attachment to the Candidate Conservation Agreement for Lesser Prairie-Chicken and Sand Dune Lizard in New Mexico (December 2008) between the U.S. Fish and Wildlife Service (FWS), the Bureau of Land Management (BLM), and the Center of Excellence for Hazardous Materials Management (CEHMM). This CCAA becomes effective and binding on the date of the last signature below. Participating property owners may also be included under the CCAA by signing a Certification of Inclusion (Appendix A). Administrators of this CCAA are:

CEHMM: Doug Lynn
505 N. Main St.
Carlsbad, New Mexico 88220
505/885-3700 (Phone)
505/ 885-6422 (Fax)

FWS: Wally "J" Murphy, Field Supervisor
New Mexico Ecological Services Field Office
2105 Osuna Road NE
Albuquerque, New Mexico 87113
505/761-4525 (Phone)
505/761-2545 (Fax)

I. Authorities and Purpose

Sections 2, 7, and 10 of the Endangered Species Act of 1973, as amended (ESA), and the Fish and Wildlife Coordination Act, allow the FWS to enter into this CCAA . Section 2 of the ESA states that encouraging parties, through Federal financial assistance and a system of incentives, to develop and maintain conservation programs is key to safeguarding the Nation's heritage in fish, wildlife, and plants. Section 7 of the ESA requires the FWS to review programs that they administer and to utilize such programs in furtherance of the purposes of the ESA. By entering into this Agreement, the FWS is utilizing its Candidate Conservation Programs to further the conservation of the Nation's fish, wildlife, and plants. Lastly, Section 10(a) of the ESA authorizes the issuance of permits to "enhance the survival" of a listed species. However, Enhancement of Survival permits are not issued for candidate or other non-listed species unless and until those species are listed as threatened or endangered.

The purpose of this CCAA is for CEHMM and the FWS to work with Participating Landowners to implement conservation measures for the Lesser Prairie Chicken (*Tympanuchus pallidicintus*) (LPC) and Dunes Sagebrush Lizard, commonly known as Sand Dune Lizard *(Sceloporus arenicolus*) (SDL) in Lea and Eddy counties, New Mexico. The conservation measures would be implemented by CEHMM and Participating Landowners and would focus on those measures found in the *Collaborative Conservation Strategies for the Lesser Prairie-Chicken and Sand Dune Lizard in New Mexico* created by the New Mexico Lesser Prairie Chicken/Sand Dune Lizard Working Group (LPC/SDL Working Group 2005), the *Lesser Prairie Chicken*

Conservation Initiative (May 2008) created by the Lesser Prairie Chicken Interstate Working Group, and the *Special Status Species Record of Decision and Approved Resource Management Plan Amendment* (RMPA) for the BLMs Pecos District Office in Roswell, New Mexico. The conservation goal of this CCAA is to encourage development, improvement, and protection of suitable LPC and/or SDL (LPC/SDL) habitat on non-Federal lands in Lea and Eddy counties, New Mexico. This goal will be met by giving private landowners incentives to implement conservation measures and by providing landowners with regulatory certainty concerning land use restrictions that might otherwise apply should LPC/SDL become listed under the ESA.

II. Background

For a complete description of the natural history, status and distribution, and threats for LPC/SDL within the covered area, see the Candidate Conservation Agreement for the Lesser Prairie-Chicken and Sand Dune Lizard in New Mexico (December 2008).

In 2003, the Wildlife Management Institute invited representatives from land management and wildlife agencies, oil and gas industry, livestock producers, and conservation groups to address recovery of the LPC/SDL in southeastern New Mexico. Representatives from the FWS stated to this group that reestablishing viable LPC populations south of Highway 82 was essential in preventing the listing of this species.

Innovative strategies crafted by the group included:

- Grazing management to promote high quality LPC nesting habitat with financial compensation for ranchers;
- Restoration and management of potential LPC habitat south of U.S. Highway 82;
- Conservative shinnery-oak control, including discontinuing control within 500 m of SDL habitat;
- Well-planned oil and gas development to minimize disturbance and fragmentation of habitat, including 3 specific strategies to conserve suitable or occupied SDL habitat:
  - Placing well pads >100m from occupied or suitable habitat
  - Limiting well pad densities to <13 pads/mi^2
  - Allowing seismic testing no more than once every 5 years
- Captive propagation of LPCs to expedite establishment of viable populations south of U. S. Highway 82; and
- Candidate Conservation Agreements with Assurances to promote habitat conservation on private lands.

Need for this Agreement

Agricultural interests are concerned about restrictions that may be imposed on them if the LPC and/or SDL become listed as a federally endangered or threatened species. The ESA authorizes the FWS to prohibit activities on private lands that may harm listed species. Activities likely to be affected are duration or intensity of livestock grazing or stocking rates on rangeland, brush control to enhance livestock carrying capacity, and conversion of native rangeland.

The oil and gas industry is concerned because they could experience increased regulatory burdens as well. For example, the BLM estimated that the listing of the LPC could add an additional 100 days to the process of approving development of a new well. Oil and gas development occurs throughout much of the range of the LPC/SDL in southeastern New Mexico.

In Lea and Eddy counties, it is unlikely that LPCs from the single remaining lek south of U.S. Highway 82 could expand into much of the available habitat. Oil and gas industry representatives in the working group proposed captive breeding and release as one means of maintaining or increasing the number of birds in the wild. The BLM is dedicating resources towards habitat recovery and maintenance, but with increasing oil and gas development, it is questionable whether they will be able to provide enough habitat to support viable LPC/SDL populations. Thus, participation from private landowners in LPC/SDL conservation will be critical.

This CCAA and its associated Enhancement of Survival permit, issued pursuant to section 10(a)(1)(A) of the ESA, would provide Participating Landowners regulatory assurances that should they cooperate and provide suitable LPC and/or SDL habitat on their land, they will not incur additional land-use restrictions on their property should either species become listed. Participating Landowners would be included under this CCAA and the associated permit by agreeing to the appropriate terms of this CCAA and the permit by signing a Certification of Inclusion (CI) (Appendix A).

Applicant

CEHMM is a non-profit, 501(c)(3), organization originally founded to reduce the impact of hazardous materials on the environment. Since CEHMM's establishment in May 2004, they have been innovative in their approach to identifying and pursuing meaningful applied research that has resulted in practical solutions in the environment. CEHMM has developed technology for creating biofuels from algae, biomonitoring of the H5N1 strain of avian influenza and West Nile viruses, and cooperative conservation of imperiled species. CEHMM has a broad capacity in these areas due to the combined experience of their directors and staff members. CEHMM has also been able to develop strong partnerships with universities, agencies, research institutions, and private industry to bring together additional expertise as needed to meet challenges of various endeavors. CEHMM has already developed a conservation fund which in part will be used to further the effort of the CCAA in conserving the LPC and SDL.

Participants

Any non-Federal landowner may enroll their lands under the CCAA. This may include any private, State, or Tribal entity. Individuals who have a "controlling" interest in non-Federal lands, such as a lease, may enroll the lands within their lease if they have a controlling interest in the management of the lands. In this case, the lease holder may not make commitments for the landowner and any improvements or conservation activities must be on the condition that the landowner's permission is again, in writing. This is particularly true of State trust lands. The New Mexico State Land Office (NMSLO) manages state trust lands to generate revenue for state schools and other recipients of the state trust. Therefore, a grazing lease holder may enroll his

lease to gain the assurances under the CCAA, but cannot make active conservation commitments for the NMSLO. Therefore, before any legacy wells are removed off of or LPC are reestablished on New Mexico State Trust Lands, the appropriate approval process must be followed with the NMSLO. The NMSLO may become a co-signer to a CI or may enroll their properties out right and place the conservation commitments on the leaseholder. This situation provides flexibility for the leaseholder to seek regulatory assurance and still recognizes the NMSLO's rights to manage state trust lands and generate revenue for the trust.

Process of Enrolling

An interested landowner would initially contact CEHMM, but may work through any of the cooperating agencies to enroll. Once the initial contact is made, CEHMM and the interested landowner would look at a map of the property and determine where the conservation lands are likely to be and what other activities are occurring on the property. Then CEHMM, the interested landowner, would meet with the FWS, BLM, NMDGF, other interested cooperators, or their designees to determine what the conservation role the property may provide. A draft CI is written that documents the conservation measures the interested landowner may commit to implementing. If the interested landowner agrees to participate, he or she can sign the CI, or he or she can continue to discuss options with the oversight group until he or she is ready to sign the CI. Once the landowner signs the CI, CEHMM will counter sign and send to the FWS for their concurrence. Once the FWS concurs the landowner becomes a participant. Conservation measures should be implemented as soon after enrollment as possible. Some conservation measures may require funding and should be implemented as funding becomes available. A Participating Landowner must implement the agreed upon conservation measures to qualify for the assurances and incidental take coverage of the permit if listing occurs. If the landowner, in good faith, is working to gain funding for conservation measures; this should suffice. Landowners will also have the responsibility to report any observations of these species and progress they are making on their conservation commitment to CEHMM. This will assist in evaluating the success of the CCAA and the individual conservation measures. This process is illustrated in Appendix C.

III. Planning Area, Covered Area, Enrolled Lands, and Conservation Lands

The Planning Area includes all lands currently occupied or potentially occupied by the LPC or SDL in New Mexico. This includes approximately 2,200 mi^2 in the southeastern section of the state within portions of the counties of Lea, Eddy, De Baca, Curry, Roosevelt, Quay, and Chaves. However, the initial focal area of the CCAA will be in Lea, Eddy, and Roosevelt counties. Expansion of the CCAA into the remainder of the LPCs/SDLs currently occupied and suitable habitat throughout New Mexico may be occur, contingent upon available funding to provide for CEHMM's increased workload due to an expanded scope and range. The Covered Areas include private and State trust lands that currently provide or could potentially provide suitable habitat for the LPC and/or SDL within the Planning Area. Enrolled lands are the lands identified on all signed CIs of all Participating Landowners included under this CCAA and its permit, if issued. Conservation lands are those enrolled lands identified in the CI that provide conservation benefits for the LPC and/or SDL under this CCAA.

IV. Duration of the Agreement and Permit

This CCAA will have a duration of 20 years from the date the CCAA is signed by CEHMM and FWS; and may be renewed before it expires. The CCAA will cover Participating Landowners from the date their lands are enrolled until the end of their participation in this CCAA, either through expiration or termination. Should one or both covered species be listed as threatened or endangered, and all other requirements are met, the permit will be issued and all Participating Landowners will be covered from that date until the end of their participation in this CCAA, either through expiration or termination. The duration of participation will be at least 5 years, but can be the full duration of the CCAA. Participation is also renewable with the original conservation commitment, as identified by CEHMM in the CI. Conservation lands will be maintained as suitable LPC and/or SDL habitat for the duration of participation and for as long as the landowner wishes coverage by the section 10(a)(1)(A) enhancement of survival permit.

Coverage under the permit will only apply to those Participating Landowners who enroll lands under this CCAA prior to any future effective ESA listing date of the LPC and/or SDL. The permit coverage is for incidental take associated with the landowner's ongoing land uses that occurred during participation and implementation of conservation on enrolled properties, as long as the conservation agreed upon is being implemented. Any incidental take of LPC and/or SDL resulting from a change in land use that diminishes that conservation lands suitability for will not be covered by the section 10(a)(1)(A) enhancement of survival permit. Future non-enrolled landowners wishing incidental take authorization for the LPC and/or SDL after any future effective ESA listing date, could apply for authorization through the FWS's Habitat Conservation Plan or Safe Harbor Agreement permitting programs.

V. Conservation Measures and Obligations of the Parties

CEHMM will implement and administer the CCAA. Participating Landowners can sign up under the CCAA and be covered under the associated permit through a CI.

1) Participating Landowners:

Common to all Participating Landowners:

a) Cooperate with CEHMM in completion of the CI (Appendix A). Enrollment under this CCAA and coverage of the enrolled lands will begin on the date the Participating Landowner agrees to implement conservation measures agreed upon by the BLM, FWS, New Mexico Department of Game and Fish (NMDGF), and/or designee and signs the CI. The CCAA is valid until the end of the agreement term, or until the end of their participation in this CCAA as documented in the CI, either through expiration or termination.

b) Improve or maintain conservation lands as suitable LPC and/or SDL habitat for the Duration of Conservation" in the CI. Lands can be enrolled under the CCAA and

the permit whether or not the Participating Landowner receives funding from CEHMM or other sources. Technical assistance is available from the NRCS and FWS to develop plans to improve and maintain habitat for the LPC and/or SDL. Financial assistance for the implementation of these plans may be available through conservation programs of the U.S. Department of Agriculture's National Food Security Act of 1985, as amended (Farm Bill) and/or the FWS's Partners for Fish and Wildlife Program (PFW) depending on annual funding. The CI will identify, among other things, suitable LPC/SDL habitat to be maintained on the conservation lands and the duration that this habitat will be maintained.

c) Adhere to stipulations on surface activities required by the BLM RMPA (May 2008) on oil and gas lease developments on enrolled lands at a minimum.

d) Adhere to rangeland and grazing stipulations required by the BLM RMPA (May 2008) at a minimum for ranch operations.

e) Allow CEHMM, FWS, and/or NMDGF personnel, with prior notification, to survey enrolled lands for the presence of LPCs and/or SDLs and for habitat suitability for these species.

f) Allow CEHMM personnel or their designees access to the enrolled lands for purposes of monitoring LPC and/or SDL populations and habitat.

g) Allow CEHMM personnel or their designees access to the enrolled lands for purposes of compliance monitoring of conservation commitment.

h) Use herbicides for shinnery oak management only when habitat goals cannot be achieved by other means, including grazing system management.

   i. No herbicide treatments will be applied in dune complexes (NRCS sand hills ecological sites) and corridors between dune complexes. Maintain a no-application buffer around dune complexes of 100 m to ensure dunal stability.

   ii. Prohibit tebuthiuron spraying within 500 m of SDL habitat. In addition, for SDL, prohibit spraying in dune complexes or within corridors, which connect dune complexes that are within 2000 m of each other. All application of tebuthiuron will be by a licensed applicator and in accordance with the New Mexico supplemental label for wildlife habitat.

   iii. In conducting such treatments, the goal will be to temporarily reduce shinnery oak competition with grasses, allowing grass cover to increase naturally. Herbicides should be used at dosages that would set back (defoliate) shinnery oak, not kill it.

   iv. Large block and linear application of herbicides will be avoided. Application should follow the natural patterns on the landscape such that only patches needing treatment are treated.

   v. For LPC, herbicide treatment should not be applied around large oak motts, and within 1.5 miles of active lek sites.

   vi. Post-treatment grazing management is essential to success. Grazing will be deferred year round through at least two growing seasons after treatment. If vegetation response to treatment has been hindered due to drought or other factors additional deferments to ensure success of the treatment may be required.

vii. Experimental treatments outside these guidelines may occur with the approval by FWS. Experimental treatments must be part of a quantitative research design to study vegetation response, viability of shinnery oak, drift, sub-surface spread, the interaction of herbicide treatment and/or grazing management and the response of LPC and SDL to various treatments.

i) For livestock ranches, implement grazing management plans intended to move towards meeting specific habitat goals for the LPC and/or SDL as defined in the Collaborative Conservation Strategies for the Lesser Prairie-Chicken and Sand Dune Lizard in New Mexico (LPC/SDL Working Group 2005) on individual ranches. This may include adjustment of stocking rates, rest-rotation patterns, grazing intensity and duration, avoidance of nesting areas during nesting season, and contingency plans for varying prolonged weather patterns including drought.

j) No leasing of lands within the Conservation Lands to wind power development (including any appurtenant turbine towers, roads, fences, or power lines).

k) No leasing any lands within the Conservation Lands to oil and gas development (including roads, fences, or power lines), where the private land holder has discretion.

l) No conversion of Conservation Lands to crop production (sodbusting) or development as part of maintaining existing LPC and/or SDL habitat.

m) Avoid construction of new roads. If unavoidable, route and construct new roads, pipelines and power lines outside of occupied and suitable, unoccupied shinnery dune complexes as delineated by the FWS, BLM, NMDGF, and/or designees.

n) Provide escape ramps in all open water sources and trenches for LPC and/or SDL.

o) Install fence makers along fences that cross through occupied habitat within 2 miles of an active lek.

p) Avoid well pad construction within 1.5 miles of an active lek, (as defined in the Strategy and/or RMPA), unless reviewed and approved by CEHMM and FWS.

q) Initiate control of shinnery oak only after coordinating with and gaining approval from CEHMM and FWS concerning control procedures so they will not be detrimental to LPC and/or SDL.

r) Any trenches dug on enrolled property will have escape ramps placed at the ends and approximately every 500 feet to allow for LPC/SDL escape. Trenches may alternatively be covered to avoid entrapment and should be inspected three times a day.

s) Provide information on annual basis to CEHMM on implementation of conservation commitment, observations of LPC/SDL on enrolled property, and any mortality of either species observed.

Optional Conservation enhancements:

A landowner may choose to implement as many of these as desired and this list is not inclusive. Conservation measures from the companion Candidate Conservation Agreement (CCA) or the Collaborative Conservation Strategies for the Lesser Prairie-Chicken and Sand Dune Lizard in New Mexico (LPC/SDL Working Group 2005) may be implemented in accordance with stipulations a-r above. All conservation measures must

be included on the CI and agreed upon by the FWS, CEHMM, and Participating Landowner.

t) Allow release of captive-reared or translocated LPCs on enrolled lands if deemed appropriate by CEHMM, FWS, and NMDGF personnel.
u) Participate in annual meetings with CEHMM, FWS, and other Participating Landowners to discuss progress in recovery of LPCs/SDLs on participating lands. In addition, contribute information to an annual progress report as deemed appropriate by Participating Landowners about range conditions, land management activities, LPC/SDL abundance and distribution, and factors that may be having positive and negative effects on LPC/SDL populations.
v) Control mesquite invasion especially in sandy soils where shinnery oak-bunch grass is the dominant plant association preferred by LPCs or SDLs. If mesquite control involves the use of herbicides in must be a site greater than 500 m from suitable and occupied habitat for SDL. All application of herbicides will be by a licensed applicator and in accordance with the manufactures and Environmental Protection Agency labeling.
w) Maintain enrollment in the Conservation Reserve Program.
x) Allow removal of legacy oil and gas wells and infrastructure, and restoration of LPC/SDL habitat.
y) Provide access for academic and agency researcher to study LPC/SDL on their lands.

2) CEHMM:

a) Implement and administer this CCAA including monitoring of LPC/SDL distribution and status on Enrolled Lands within the Planning Area.
b) Enroll Participating Landowners in accordance with this CCAA via CIs.
c) Complete the CIs (Appendix B), to document that the Participating Landowner's proposed habitat enhancement or protection measures (conservation measures) will provide net conservation benefits to the LPC and/or SDL. CEHMM will provide the completed Certificate of Inclusion Form to the FWS (and BLM, where enrolled lands are adjacent to allotments (agriculture) or lands leased (oil/gas) from BLM) for concurrence at least 30 days prior to enrolling Participating Landowners under this CCAA using a CI.
d) Meet regularly and work cooperatively with Participating Landowners to plan and find funding for projects that improve and maintain LPC and/or SDL habitat.
e) Release captive-reared or translocated LPCs, in cooperation with NMDGF, FWS, if necessary for the conservation of viable populations.
f) Annually lead a meeting with the FWS and all Participating Landowners enrolled under this CCAA to review progress from the previous year, seek potential solutions for factors that are retarding recovery of LPC/SDL populations, and discuss initiating actions that would benefit the LPCs and/or SDLs in the upcoming year.
g) Prepare annual reports on implementation of the CCAA in accordance with Part IX of this CCAA.

3) FWS:

a) Issue an enhancement of survival permit to the CEHMM under section 10(a)(1)(A) of the ESA in accordance with 50 CFR 17.32 (d) should the species be listed at some time in the future, to commence upon the listing of the LPC and/or SDL and continuing through the remainder of the term of this Agreement, that would provide CEHMM and Participating Landowners with authorization for incidental take of LPCs and/or SDLs and provide regulatory assurances. The permit, if issued, would authorize take of LPCs and/or SDLs resulting from otherwise lawful activities on enrolled lands that is consistent to the incidental take anticipated under the CCAA.

b) Within 30 days of receipt of a completed Certificate of Inclusion from CEHMM, notify CEHMM of the FWS's determination of whether or not the lands should be enrolled, by concurrence or non-concurrence on the Certificate of Inclusion, concerning the enrollment of the Participating Landowner. After 30 days, concurrence with the CI is granted.

c) If available, provide funding through PFW and assist in securing funding from other sources, as applicable, to improve LPC and/or SDL habitat on private lands within the Planning Area.

4) All Parties:

a) In the event the Participating Landowner needs to sell the conservation lands prior to the end of the "Duration of Conservation" for these lands under this CCAA, they will notify the FWS at least 60 days in advance of the potential sale, and notify the prospective landowner of the existence of this CCAA (and/or have previously recorded the CCAA) in order for the potential new owner to decide whether to become party to this CCAA. If funding was provided by through CEHMM under the CCA/CCAA to the Participating Landowner under this CCAA and the new landowner does not want to become party to this CCAA and requests transfer of the permit pursuant to 50 CFR 13.25(b), if issued; the Participating Landowner terminates his/her enrollment under this CCAA for other reasons; or the FWS suspends or revokes the permit, the current Participating Landowner shall reimburse the FWS a pro-rated amount, calculated as: **(total funding received ÷ the "duration of conservation" period from the CI, related to the funding) × (the number of years remaining to be completed in the "duration of conservation" period)**. If the Participating Landowner has received funding from other sources, such as PFW or NRCS, they may need to repay other funding sources in accordance to agreements the Participating Landowner makes with these funding sources. If the new landowner does not become a party to this CCAA and the permit is not transferred, or a new permit is not issued, he/she will not receive the benefits of the permit authorizing incidental take of LPC and/or SDL.

b) The FWS provides the CEHMM and Participating Landowners the ESA regulatory assurances found at 50 CFR 17.32(d)(5). Consistent with the FWS's Candidate Conservation Agreement with Assurances Final Policy (USFWS and NMFS 1999), conservation measures and land, water, or resource use restrictions, in addition to the measures and restrictions described in this CCAA, will not be imposed with respect to legal activities on Enrolled Lands should the LPC and/or SDL become listed under the ESA in the future. These assurances are authorized by the enhancement of survival permit issued under section 10(a)(1)(A) of the ESA for the Enrolled Lands identified in the CI. In the event of unforeseen circumstances, the FWS will not require the commitment of additional land, water, or other natural resources beyond the level otherwise agreed to for the species in this CCAA. The FWS may request additional conservation, but since it is voluntary on the part of CEHMM and Participating Landowners, consent of CEHMM and any affected Participating Landowners must be in writing. The permit, if issued, will authorize the incidental take of LPCs and/or SDL by Participating Landowners as long as such "take" is consistent with this CCAA.

c) Any proposed amendment to or modification of this CCAA shall require written notification to all parties. The notification shall describe the proposed amendment or modification. Modifications may include but not be limited to compliance with the ESA, the National Environmental Policy Act, or the FWS's permit regulations. Upon issuance of a proposed amendment or modification, the party proposing the modification or amendment will coordinate a meeting or conference call between the affected parties to discuss and explain their proposal. Amendments or modifications will become final when signed by CEHMM and FWS. Approved amendments shall be attached to the original CCAA. Participating Landowners enrolled prior to an amendment will not be required to implement additional conservation, but they may voluntarily choose to per section V.4.b. above. Participating Landowners enrolling after an amendment will be required to implement the CCAA as amended at the time of enrollment.

d) The FWS may suspend or revoke the permit for cause in accordance with the laws and regulations in force at the time of such suspension or revocation.

e) Each party shall have all remedies otherwise available to enforce the terms of this CCAA and the permit, except that no party shall be liable in damages for any breach of this CCAA, any performance or failure to perform an obligation under this CCAA or any other cause of action arising from this CCAA.

f) The FWS, CEHMM, and Participating Landowners agree to work together in good faith to resolve any disputes, using dispute resolution procedures agreed upon by all parties.

g) Implementation of this CCAA is subject to the requirements of the Anti-Deficiency Act and the availability of appropriated funds. Nothing in this CCAA

will be construed by the parties to require the obligation, appropriation, or expenditure of any money from the U.S. Treasury. The parties acknowledge that neither the FWS will be required under this CCAA to expend any Federal agency's appropriated funds unless and until an authorized official of that agency affirmatively acts to commit to such expenditures in writing.

h) This CCAA does not create any new right or interest in any member of the public as a third-party beneficiary, nor shall it authorize anyone not a party to this CCAA to maintain a suit for personal injuries or damages pursuant to the provisions of this CCAA. The duties, obligations, and responsibilities of the parties to this CCAA with respect to third parties shall remain as imposed under existing law.

i) The terms of this CCAA shall be governed by and construed in accordance with applicable Federal law. Nothing in this CCAA is intended to limit the authority of the FWS to fulfill its responsibilities under Federal laws. All activities undertaken pursuant to this CCAA or its associated permit must be in compliance with all applicable local, state, and Federal laws and regulations.

j) This CCAA shall be binding on and shall inure to the benefit of the parties and their respective successors and transferees, in accordance with applicable regulations (currently codified at 50 CFR 13.24 and 13.25) for the duration of the CCAA.

k) Any notices or reports required by this CCAA shall be delivered in writing to the Administrators listed on page 1 of this CCAA.

5) Cooperating Agencies and Parties:

Many agencies, institutions, and individuals are interested in participating in this effort. Many of these potential cooperators have expertise in these species, such as NMDGF, or in applying conservation practices, such as NRCS. Their participation, along with the participants in the Collaborative Conservation Strategies for the Lesser Prairie-Chicken and Sand Dune Lizard in New Mexico (LPC/SDL Working Group 2005) would be a benefit for developing conservation priorities and commitments on enrolled properties and evaluating the success of such practices. Therefore, their participation will go far towards ensuring the success of this CCAA.

VI. Expected Conservation Benefits

As identified in the FWS's Candidate Conservation Agreement with Assurances Final Policy (USFWS and NMFS 1999), the FWS "must determine that the benefits of the conservation measures to be implemented, when combined with those benefits that would be achieved if it is assumed that conservation measures were also implemented on other necessary properties, would preclude or remove any need to list" the LPC and/or the SDL (64 FR 32726).

Conservation benefits for the LPC and/or SDL from implementation of the CCAA are expected in the form of avoidance of negative impacts, enhancement, and restoration of habitat intended to contribute to establishing or augmenting, and maintaining viable populations of LPCs and/or SDLs in Lea, Eddy, De Baca, Curry, Roosevelt, Quay, and Chaves counties. In addition, conservation of LPCs and/or SDLs would be enhanced by improving and encouraging cooperative management efforts between the CEHMM, FWS, and Participating Landowners who own and control LPC and/or SDL habitat. Also, this CCAA may be used as a model for CCAAs in other parts of the LPC's range to encourage cooperative management and conservation.

Under this CCAA, LPC and/or SDL conservation will be enhanced by providing ESA regulatory assurances such that, should Participating Landowners have or attract LPCs and/or SDLs to their property, the Participating Landowner will not incur additional land use restrictions. Without regulatory assurances, landowners may be unwilling to initiate conservation measures for these species.

In addition to habitat conservation, release of captive-reared LPC that leads to establishment of viable populations in the Planning Area, or augmentation of existing LPC numbers by translocation and release of LPCs from other areas, will contribute to recovery and reduce the need for listing under the ESA.

VII. Funding

Funding for recruiting willing landowners, identifying appropriate lands for enrollment, surveying for LPC and/or SDL, preparation of CIs, and planning for habitat conservation and management is not included in this CCAA. However, nothing in this CCAA would prevent CEHMM or FWS from amending or modifying this CCAA in the future to obligate additional funding for one or more of these activities.

VIII. Level of Incidental Take

Should the LPC and/or SDL be listed under the ESA, authorization for incidental take under the Section 10 Enhancement of Survival permit is limited to agricultural-related (livestock grazing and ranch equipment operation) or oil and gas development on Participating Landowners' Enrolled Lands.

The actual level of take of LPCs and/or SDLs is largely unquantifiable. Incidental take could occur as a result of many activities under both agricultural use of the land and oil and gas development. The implementation of the CCAA is intended to avoid and minimize the sources of incidental take from these activities and reduce the threats to these species.

Incidental take could occur as a result of grazing or brush management practices that modify suitable habitat to an extent that impairs or eliminates successful reproductive and recruitment activities by LPCs and/or SDLs (e.g., grazing intensity to a degree that reduces of eliminates adequate residual nesting cover for LPCs, removal or significant reduction of shinnery oak on dunes or dune complexes that reduces brood-rearing habitat for LPCs and destabilizes dunes

suitable or occupied by SDLs), or is a source of LPC and/or SDL mortality (e.g., stock tanks with no wildlife escape ramps, open ditches in SDL habitat, LPC collisions with barbed-wire fences, vehicles, and power lines). Some direct impacts or take could occur from agricultural operations (e.g., machinery operations (haying, baling, herding livestock) or conversion of native rangeland to other agricultural practices (e.g., crop production or dairy operations). Most of these impacts are expected to be limited and sporadic in nature. Conservation benefits for LPCs and/or SDLs under the CCAA will likely accrue well beyond the duration of the conservation period especially from habitat enhancement and protection measures. This should result in reduced impacts and incidental take of these species. Overall, although impacts and incidental take are expected to occur, impacts are not expected to be great enough to compromise the establishment and viability of LPC and/or SDL populations in the Planning Area.

No requirement is made in this CCAA for Participating Landowners to notify CEHMM or FWS prior to any expected incidental take of LPCs and/or SDLs. For purposes of this CCAA, the FWS does not believe that such a notification requirement is practicable or appropriate.

IX. Monitoring and Reporting

Annual Meeting

CEHMM will be responsible for annual monitoring and reporting related to the CCAA. Information in annual reports will include, but not limited to, statements concerning:

1) Participating Landowners enrolled under the CCAA over the past year, including copies of the completed CI;
2) habitat management and habitat conditions in the covered area and on all enrolled lands over the past year, including the status of lands where the duration of conservation has expired;
3) effectiveness of habitat management activities implemented in previous years at meeting the intended conservation benefits;
4) population surveys and studies over the past year;
5) any mortality or injury that are observed of either species over the previous year;
6) funds used for habitat conservation on private lands in the Planning Area; and captive-reared or translocated LPCs that were released on Enrolled Lands.

Reports will be due January 1 of each year to the Administrators of this CCAA and any Participating Landowners.

XII. Signatures

IN WITNESS WHEREOF, THE PARTIES HERETO have, as of the last signature below, executed this CCAA to be in effect as of the date of the last signature.

_____ Date: 12-08-08

Director
Center of Excellence for Hazardous Materials Management

_____ Date: 12-8-08

Regional Director
U.S. Fish and Wildlife Service
Albuquerque, New Mexico

X. Literature Cited

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_____, C. A. Davis, and R.A. Smith. 1993. Autumn-winter foods of the lesser prairie-chickens (Tympanuchus pallidinctus). Great Basin Naturalist 53:186-189.

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XI. Appendices

Appendix A

CERTIFICATION OF INCLUSION

In The
Candidate Conservation Agreement with Assurances for the Lesser Prairie-Chicken (*Tympanuchus pallidicintus*) or Sand Dune Lizard (*Sceloporus arenicolus*) Between the Center of Excellence for Hazardous Materials Management and the United States Fish and Wildlife Service

This certifies that the Participating Landowner of the property, through the implementation of the conservation measures described below is included within the scope of Permit No. TE032692-0, issued on **[insert date of permit]** to the Center of Excellence for Hazardous Materials Management (CEHMM) under the authority of Section 10(a)(1)(A) of the Endangered Species Act of 1973, as amended, 16 U.S.C. 1539(a)(1)(B). Such permit authorizes incidental take of Lesser Prairie-Chickens or Sand Dune Lizards by Participating Landowners, as part of a Candidate Conservation Agreement with Assurances (Agreement), to support CEHMM's efforts to establish and maintain Lesser Prairie-Chicken and Sand Dune Lizard populations in their historic range. Pursuant to that permit and this certificate, the Participating Landowner is authorized for incidental take of Lesser Prairie-Chickens or Sand Dune Lizards as a result of activities identified in section 3.c. of the Agreement and the associated Permit on the enrolled lands identified below.

Participating Landowner's Name:_____

Address:_____

A. Legal Description of Enrolled Lands (Attach Detailed Map):
_____
_____

B. Total Acres of Enrolled Lands (all lands covered by permit): _____

C. Legal Description of Conservation Lands or Detailed Map with Conservation Lands Identified:
_____
_____

D. Duration of Conservation (years): _____
(Assurances/permit coverage is only valid for term of enrollment – may be renewed)

E. From:_____ To:_____

F. Lesser Prairie Chicken Conservation Initiatives Applicable? ____Yes ____No

Management Actions and Benefits for Lesser Prairie Chicken Conservation

For each applicable category of conservation lands, indicate the amount of habitat (acres), specific conservation/management actions the Participating Landowner will take to benefit LPC and the conservation benefits expected from these management actions.

Management Actions	Benefits

G. Sand Dune Lizard Initiatives Applicable? ___Yes ___No

Management Actions and Benefits for Sand Dune Lizard Conservation

For each applicable category of conservation lands, indicate the amount of habitat (acres), specific conservation/management actions the Participating Landowner will take to benefit SDL and the conservation benefits expected from these management actions.

Management Actions	Benefits

The permit authorization is subject to carrying out conservation measures identified above, the terms and conditions of the permit, and the terms and conditions of the Agreement, entered into pursuant thereto by the CEHMM and the U.S. Fish and Wildlife Service. By signing this Certification of Inclusion, the Participating Landowner agrees to carry out all of the conservation measures agreed to above.

Participating Landowner	Date
CEHMM Representative	Date

Concur

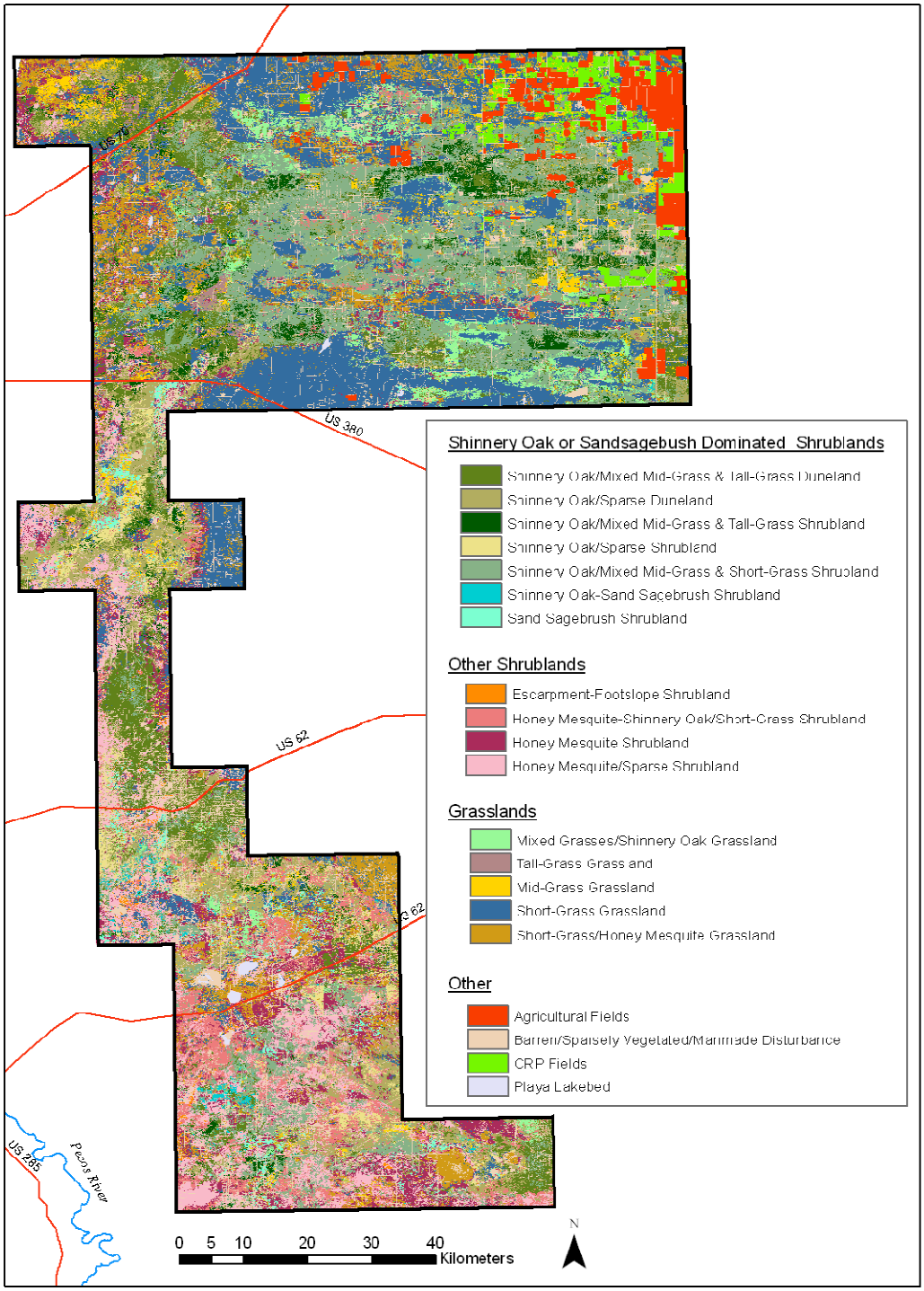
FWS Representative	Date

Do Not Concur

FWS Representative	Date

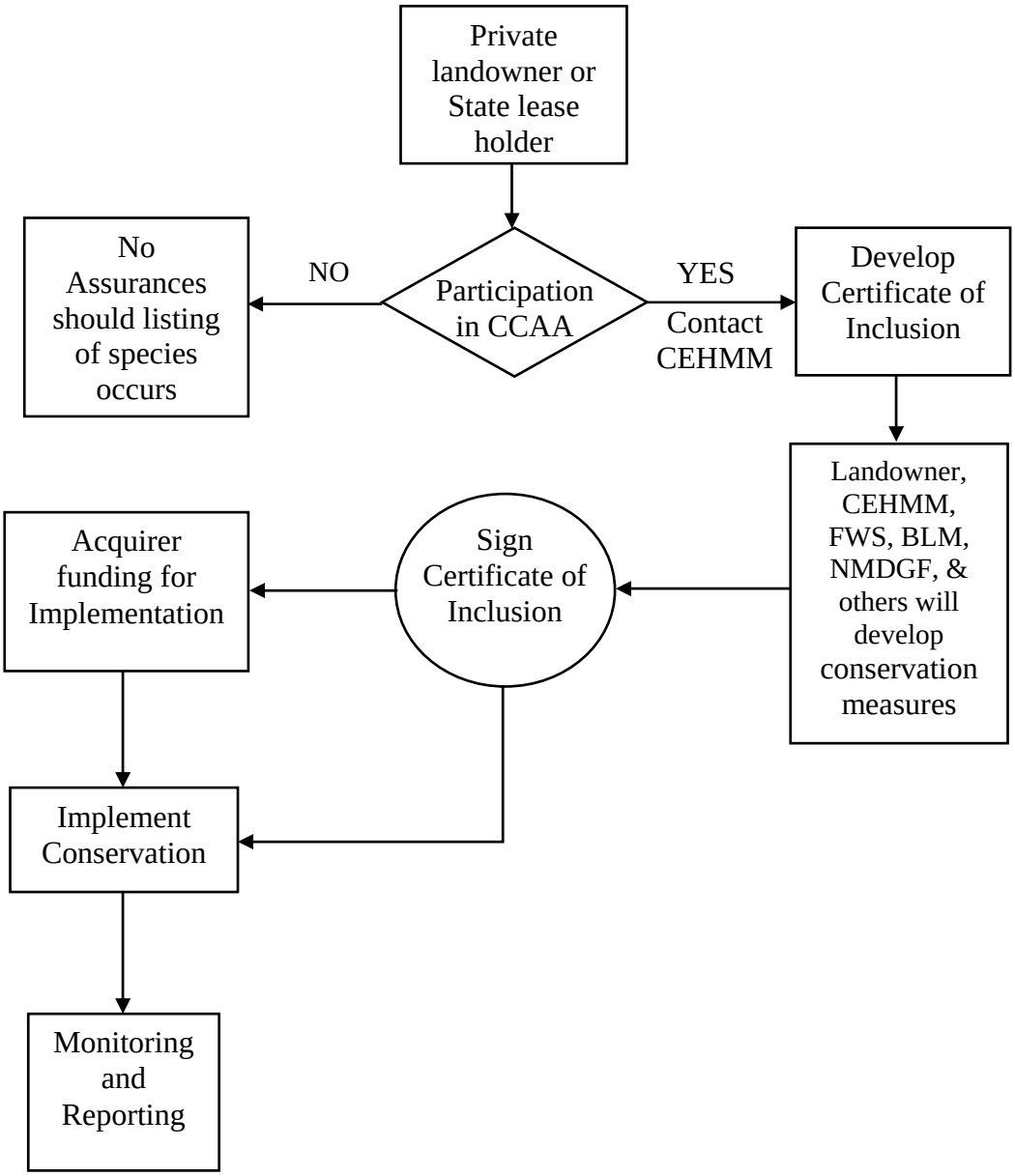
Appendix B

Appendix B. Vegetation Map of Shinnery Oak or Sand Sagebrush Dominated Shrublands in Eastern New Mexico (Natural Heritage 2005).



Appendix C

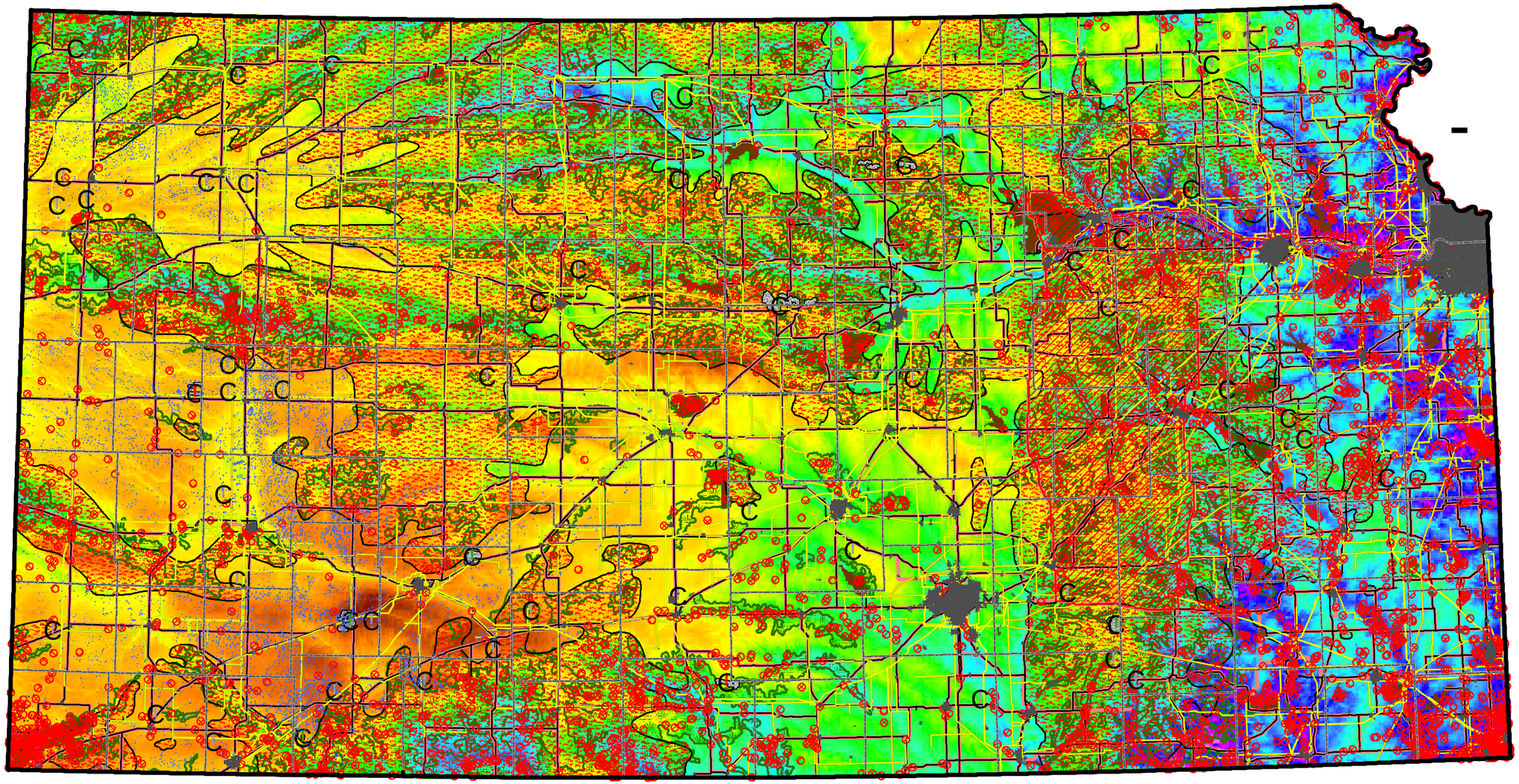
Appendix C. A diagram showing how an interested landowner would enroll in the CCAA .



ATTACHMENT 3

Figure: Using GIS for Wind Resource Planning in Kansas. Kansas Wildlife and Parks, Kansas Biological Survey, and Kansas Applied Remote Sensing Program

Using GIS for Wind Resource Planning in Kansas



Objective:

The Kansas Wind Resource Planner (WRP) was designed to serve as a guide for the siting of wind farms, transmission lines and other landscape altering structures by showing potential wind resource data and general areas of conservation sensitivity. Research has shown that the actual footprint of wind farms is small compared to the large area of avoidance around these facilities by sensitive grassland birds (like the prairie chicken). As a result, the siting of wind power facilities on intact native prairie appears likely to cause avoidance or complete abandonment of otherwise suitable habitats by some grassland birds and is therefore generally discouraged where possible. The data in the WRP is an accumulation of data available from different organizations and agencies across the state and is presented as a free on-line resource for organized, assessable, and unbiased data to help people make informed decisions.

Avg. wind speed meters/sec
High : 9.4
Low : 6.2

Electric lines Voltage
0 - 100
101 - 161
230
345

Kansas wind farms Project status
Existing (7)
Proposed (42)
Under Construction (2)
Wind farm buffer (0.5 mile)
Wind turbines

Prairie chicken range
Heart of the Flinthills
Sensitive species
Intact grasslands
Managed lands
Playa lakes
Highways (+ 0.5 mile buffer)

0 10 20 40 60 80 100 Miles

www.kars.ku.edu/maps/windresourceplanner

Data used includes:

Potential wind power - Estimated wind resources at 100-meters as modeled by AWS Truewind

Kansas wind farms - Status and location from SPP and KS Energy Information Network Last updated Oct, 2008

Transmission lines - From DASC, as compiled from KCC based on permit applications

Prairie chicken range - Current range as delineated by expert opinion. Last updated Sept, 2008

Heart of the Flinthills - Region defined by Gov. Sebelius as an area where wind development is discouraged in an effort to protect these large tracts of tallgrass prairie

Sensitive species - From the Kansas Natural Heritage Inventory

Intact grasslands - large parcels of intact (untilled) grasslands, from The Nature Conservancy

Managed lands - Kansas stewardship data includes lands managed by federal and state agencies, military, local governments, universities, and NGO's

Playa lakes - Probable playas were identified through from three data sources: SSURGO soils data, National Wetlands Invenotry (NWI) data, and imaged-based analysis by Playa Lakes Joint Venture (PLJV)

KANSAS WILDLIFE & PARKS

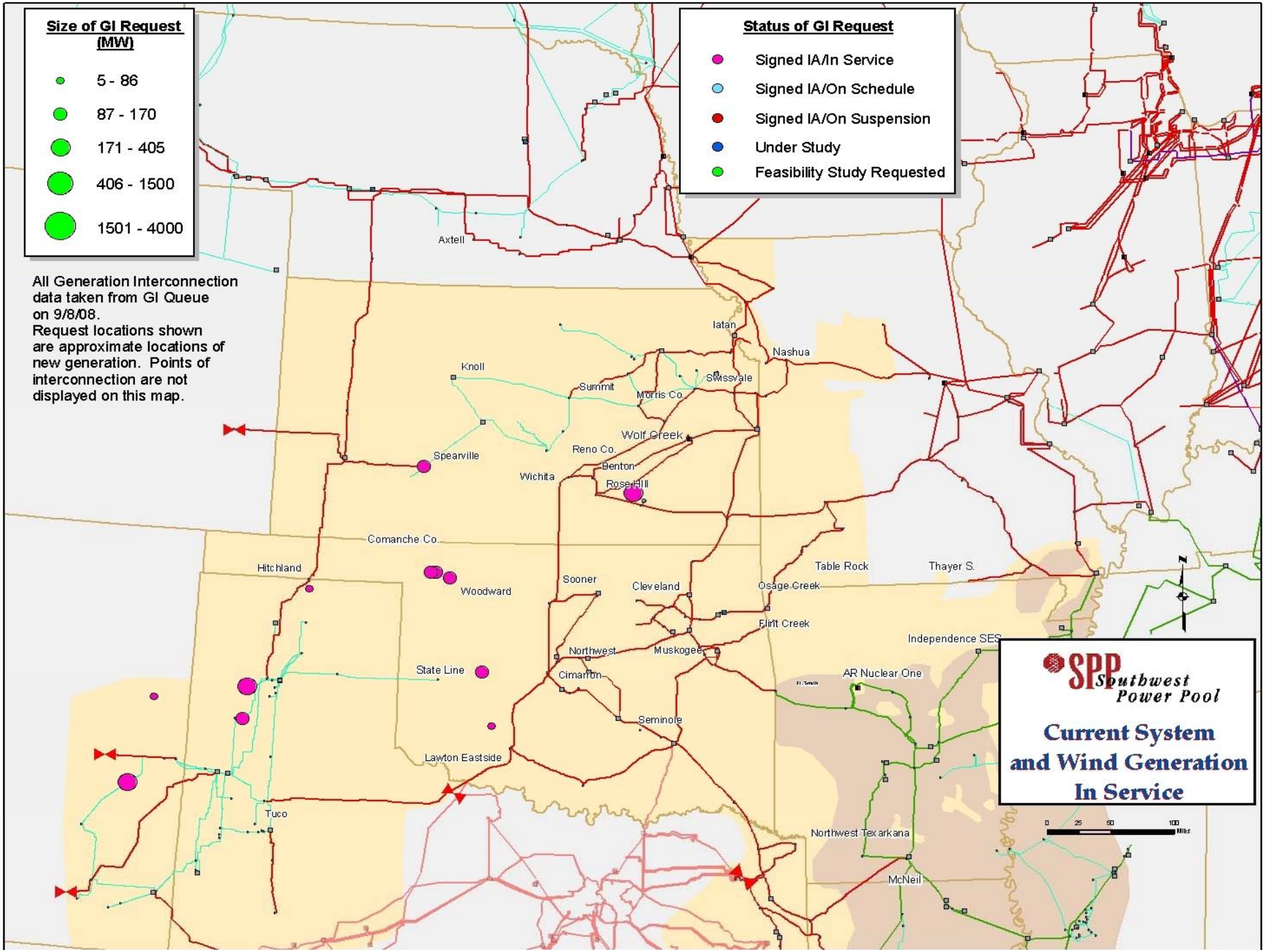
KANSAS BIOLOGICAL SURVEY

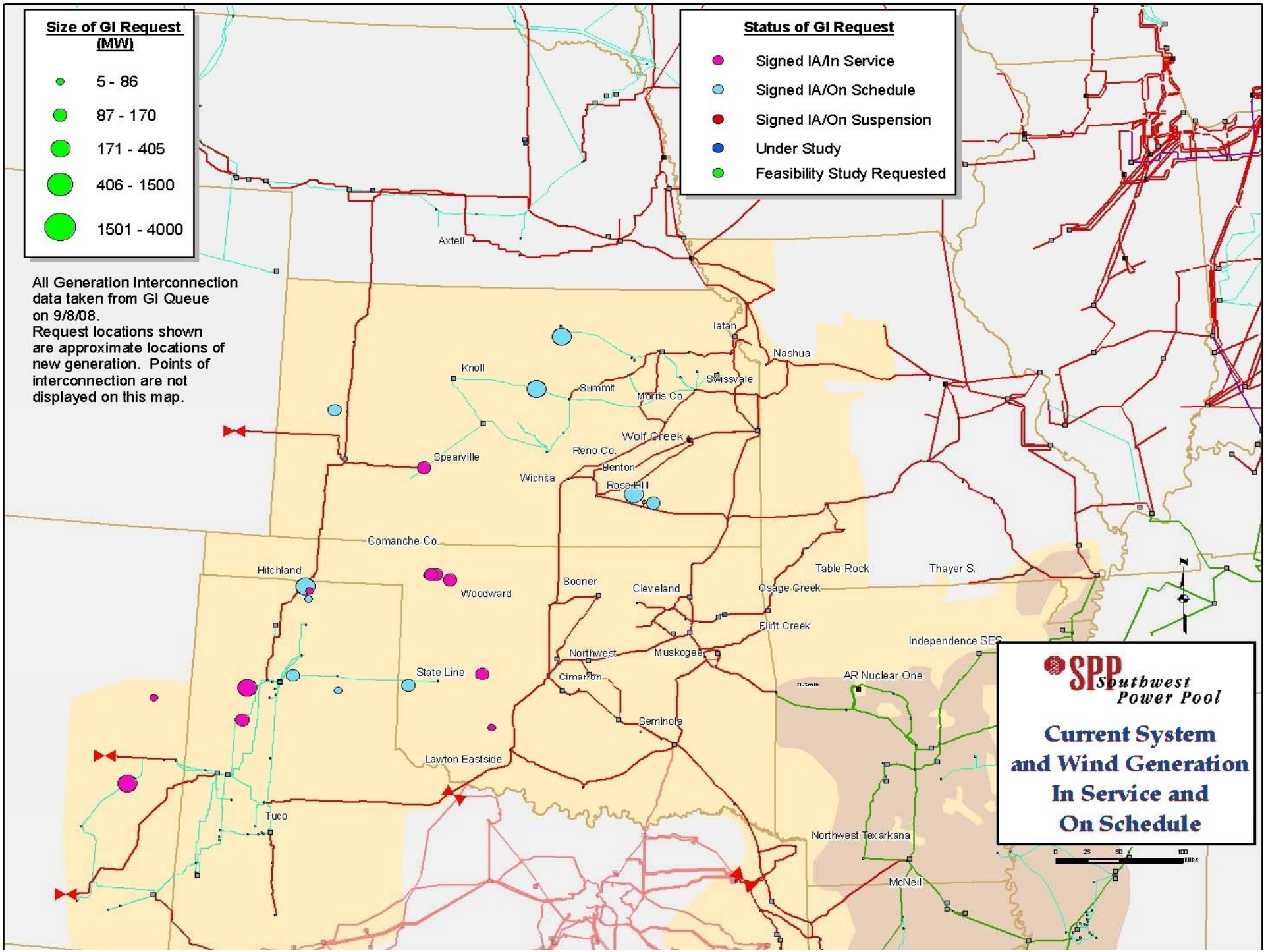
KARS
Kansas Applied Remote Sensing Program

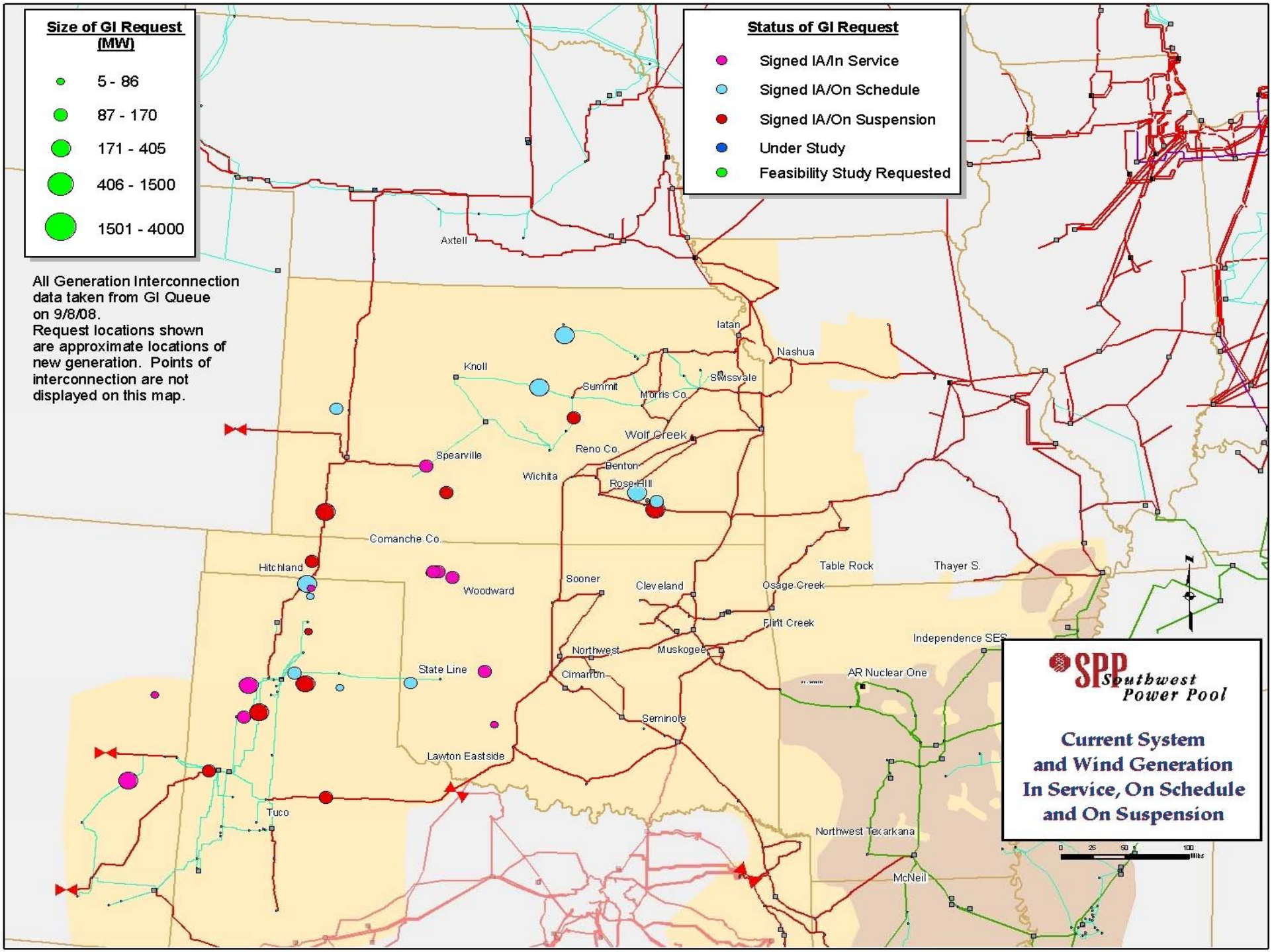
ATTACHMENT 4

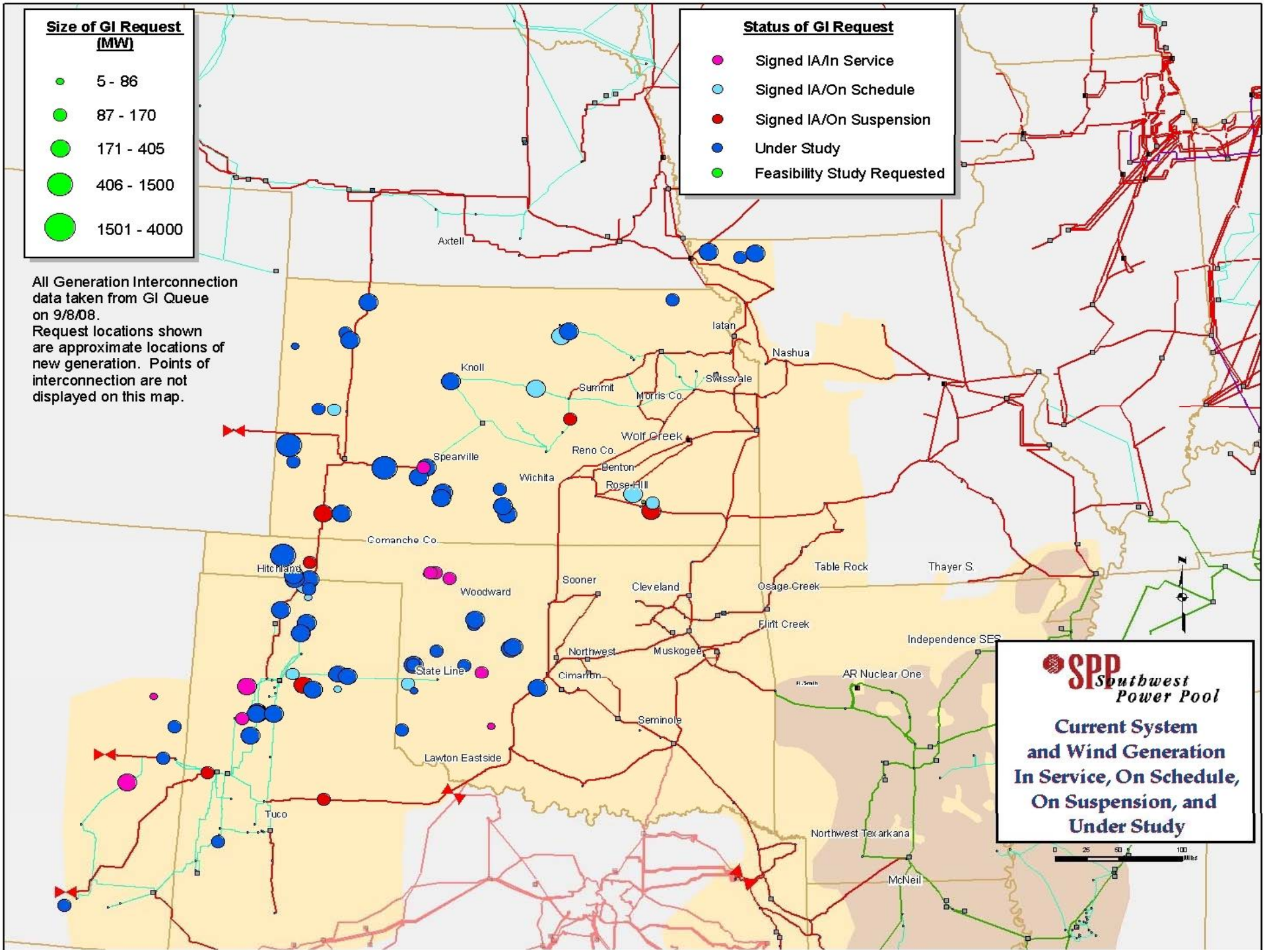
Figures: Southwest Power Pool Transmission Expansion

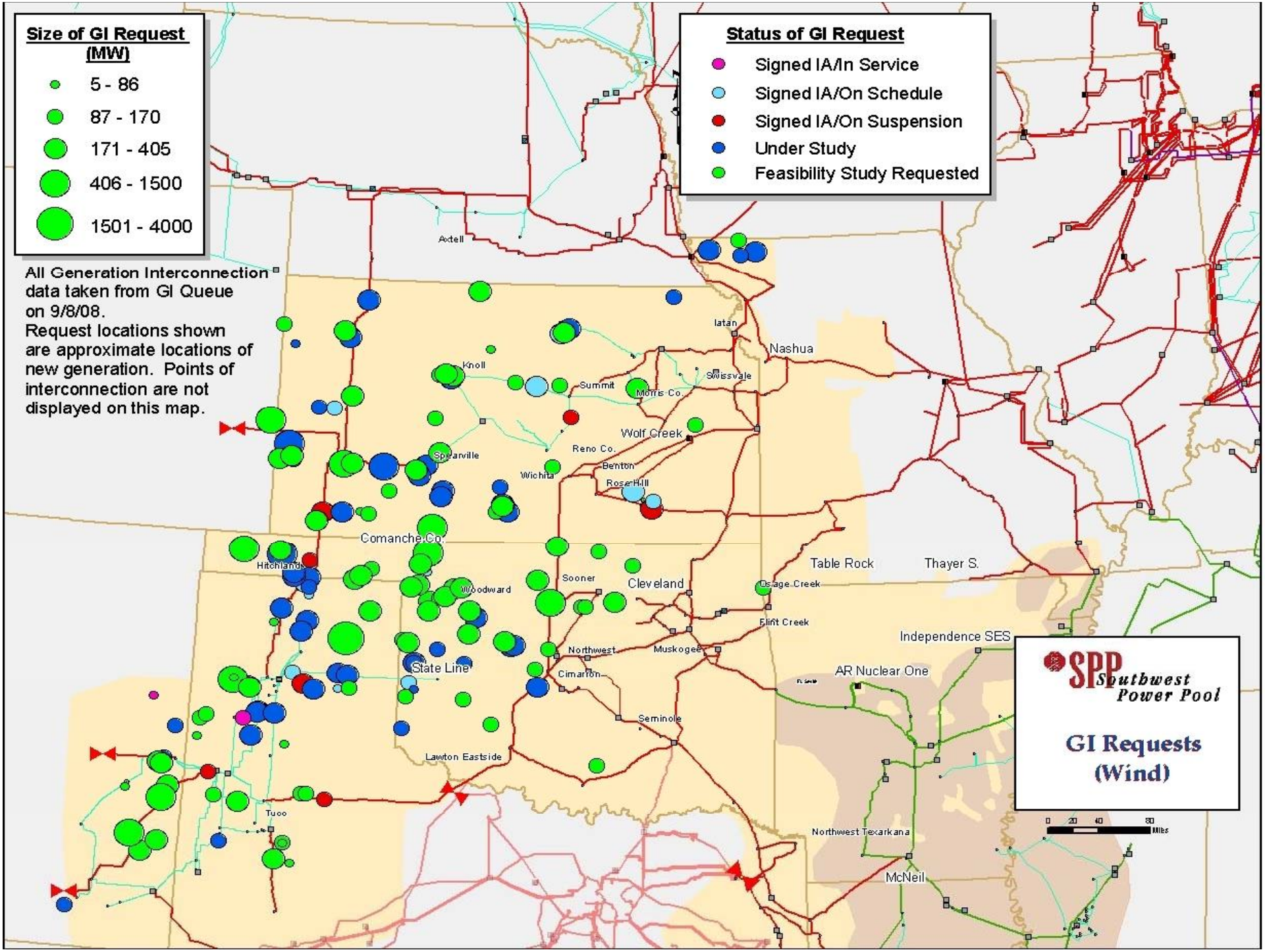
Caspary, J. 2008. Southwest Power Pool Transmission Expansion. REVOLUTION: Oklahoma Wind Energy Conference, Oklahoma City, OK, 3 December 2008.

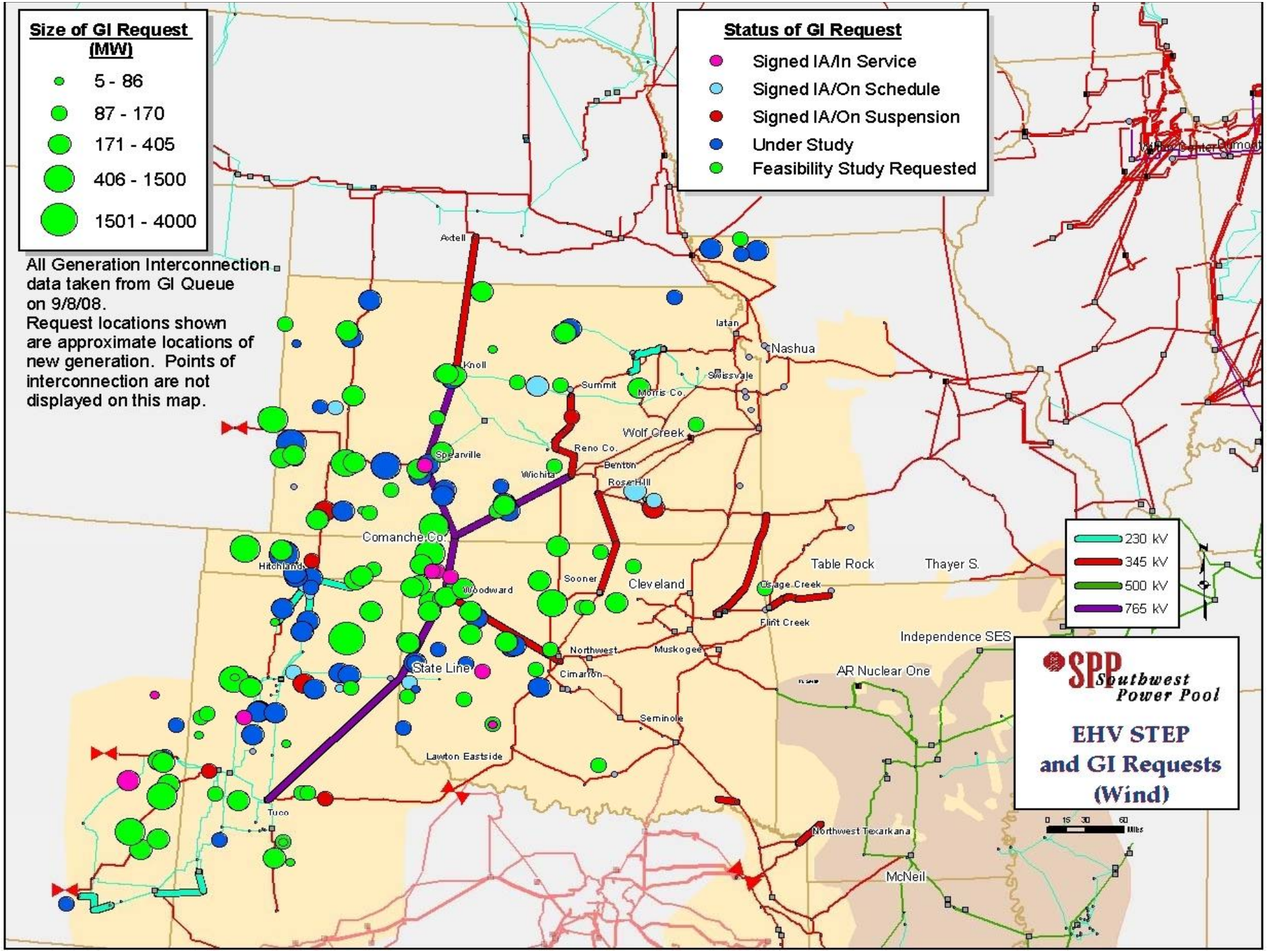

Size of GI Request (MW)
5 - 86
87 - 170
171 - 405
406 - 1500
1501 - 4000
Status of GI Request
Signed IA/In Service
Signed IA/On Schedule
Signed IA/On Suspension
Under Study
Feasibility Study Requested
All Generation Interconnection data taken from GI Queue on 9/8/08.
Request locations shown are approximate locations of new generation. Points of interconnection are not displayed on this map.
Axtell
Iatan
Nashua
Knoll
Swissvale
Summit
Morris Co.
Wolf Creek
Reno Co.
Spearville
Benton
Wichita
Rose Hill
Comanche Co.
Hitchland
Woodward
Sooner
Cleveland
Table Rock
Thayer S.
Osage Creek
Flint Creek
Independence SES
Northwest
Muskogee
State Line
Cimarron
AR Nuclear One
Seminole
Lawton Eastside
Tuco
Northwest Texarkana
McNeil
SPP Southwest Power Pool
Current System and Wind Generation In Service

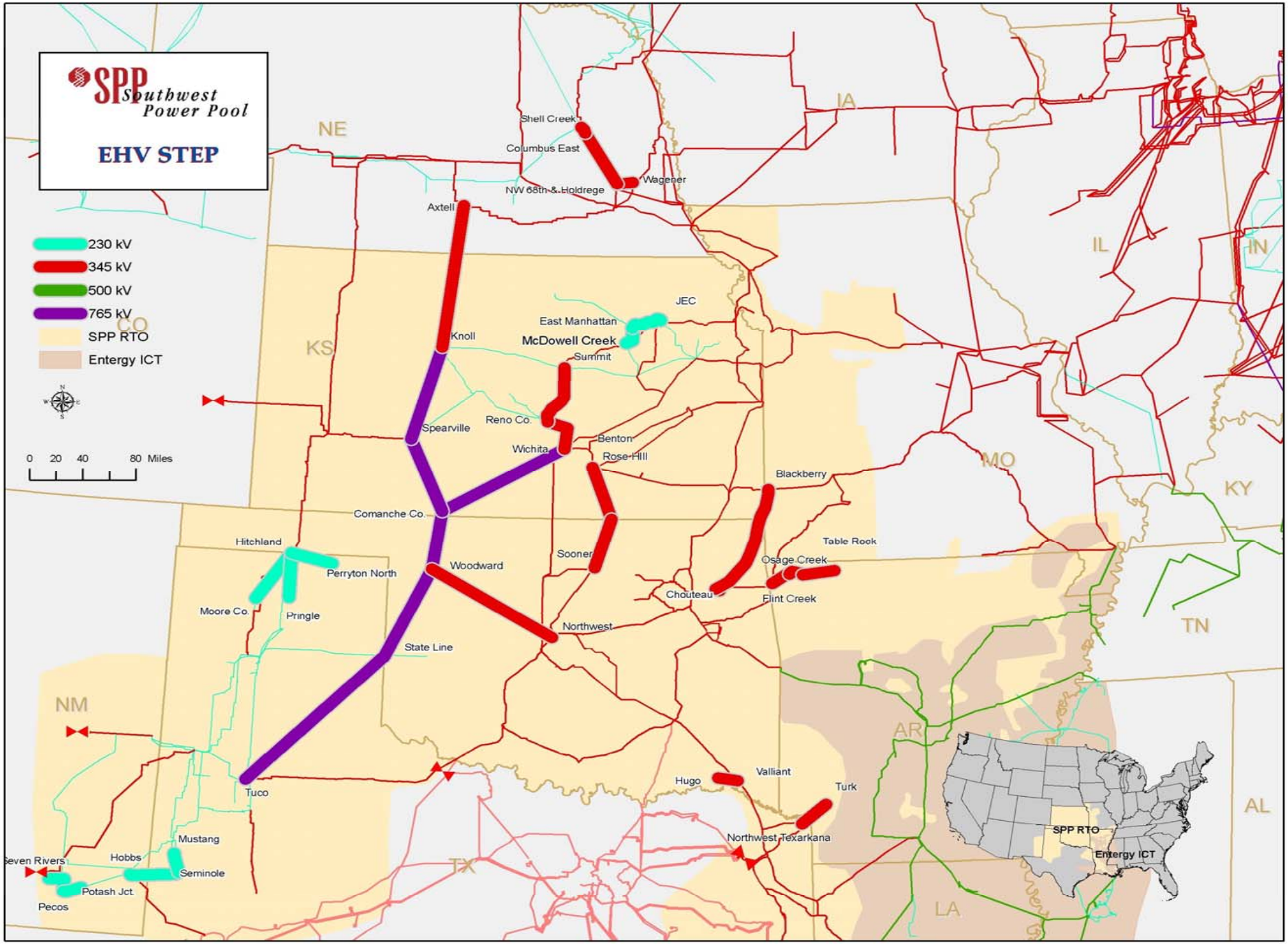

Size of GI Request (MW)
5 - 86
87 - 170
171 - 405
406 - 1500
1501 - 4000
Status of GI Request
Signed IA/In Service
Signed IA/On Schedule
Signed IA/On Suspension
Under Study
Feasibility Study Requested
All Generation Interconnection data taken from GI Queue on 9/8/08.
Request locations shown are approximate locations of new generation. Points of interconnection are not displayed on this map.
Axtell
Iatan
Nashua
Knoll
Summit
Morris Co.
Swissvale
Wolf Creek
Reno Co.
Spearville
Benton
Wichita
Rose Hill
Comanche Co.
Hitchland
Woodward
Sooner
Cleveland
Table Rock
Thayer S.
Osage Creek
Flint Creek
Independence SES
Northwest
Muskogee
Cimarron
State Line
AR Nuclear One
Seminole
Lawton Eastside
Tuco
Northwest Texarkana
McNeil
SPP Southwest Power Pool
Current System and Wind Generation In Service and On Schedule


Size of GI Request (MW)
5 - 86
87 - 170
171 - 405
406 - 1500
1501 - 4000
Status of GI Request
Signed IA/In Service
Signed IA/On Schedule
Signed IA/On Suspension
Under Study
Feasibility Study Requested
All Generation Interconnection data taken from GI Queue on 9/8/08.
Request locations shown are approximate locations of new generation. Points of interconnection are not displayed on this map.
Axtell
Iatan
Nashua
Knoll
Summit
Morris Co.
Swissvale
Wolf Creek
Reno Co.
Spearville
Benton
Wichita
Rose Hill
Comanche Co.
Hitchland
Woodward
Sooner
Cleveland
Table Rock
Thayer S.
Osage Creek
Flint Creek
Independence SES
Northwest
Muskogee
State Line
Cimarron
AR Nuclear One
Seminole
Lawton Eastside
Tuco
Northwest Texarkana
McNeil
SPP Southwest Power Pool
Current System and Wind Generation In Service, On Schedule and On Suspension


Size of GI Request (MW)
5 - 86
87 - 170
171 - 405
406 - 1500
1501 - 4000
Status of GI Request
Signed IA/In Service
Signed IA/On Schedule
Signed IA/On Suspension
Under Study
Feasibility Study Requested
All Generation Interconnection data taken from GI Queue on 9/8/08.
Request locations shown are approximate locations of new generation. Points of interconnection are not displayed on this map.
Axtell
Iatan
Nashua
Knoll
Swissvale
Summit
Morris Co.
Wolf Creek
Reno Co.
Spearville
Benton
Wichita
Rose Hill
Comanche Co.
Hitchland
Woodward
Sooner
Cleveland
Table Rock
Thayer S.
Osage Creek
Flint Creek
Independence SES
Northwest
Muskogee
State Line
Cimarron
AR Nuclear One
Seminole
Lawton Eastside
Tuco
Northwest Texarkana
McNeil
SPP Southwest Power Pool
Current System and Wind Generation In Service, On Schedule, On Suspension, and Under Study


Size of GI Request (MW)
5 - 86
87 - 170
171 - 405
406 - 1500
1501 - 4000
Status of GI Request
Signed IA/In Service
Signed IA/On Schedule
Signed IA/On Suspension
Under Study
Feasibility Study Requested
All Generation Interconnection data taken from GI Queue on 9/8/08.
Request locations shown are approximate locations of new generation. Points of interconnection are not displayed on this map.
Axtell
Iatan
Nashua
Knoll
Summit
Swissvale
Morris Co.
Wolf Creek
Reno Co.
Spearville
Benton
Wichita
Rose Hill
Comanche Co.
Hitchland
Woodward
Sooner
Cleveland
Table Rock
Thayer S.
Osage Creek
Flint Creek
Independence SES
Northwest
Muskogee
State Line
Cimarron
AR Nuclear One
Seminole
Lawton Eastside
Tuco
Northwest Texarkana
McNeil
SPP Southwest Power Pool
GI Requests (Wind)
0 20 40 80 Miles


Size of GI Request (MW)
5 - 86
87 - 170
171 - 405
406 - 1500
1501 - 4000
All Generation Interconnection data taken from GI Queue on 9/8/08.
Request locations shown are approximate locations of new generation. Points of interconnection are not displayed on this map.
Status of GI Request
Signed IA/In Service
Signed IA/On Schedule
Signed IA/On Suspension
Under Study
Feasibility Study Requested
230 kV
345 kV
500 kV
765 kV
SPP Southwest Power Pool
EHV STEP and GI Requests (Wind)
Axtell
Knoll
Iatan
Nashua
Swissvale
Summit
Morris Co.
Wolf Creek
Reno Co.
Benton
Rose Hill
Wichita
Spearville
Comanche Co.
Hitchland
Woodward
Sooner
Cleveland
Table Rock
Thayer S.
Osage Creek
Flint Creek
Independence SES
Northwest
Muskogee
Cimarron
State Line
AR Nuclear One
Seminole
Lawton Eastside
Tuco
Northwest Texarkana
McNeil
0 15 30 60 Miles


SPP Southwest Power Pool
EHV STEP
230 kV
345 kV
500 kV
765 kV
SPP RTO
Entergy ICT
0 20 40 80 Miles
NE
IA
IL
IN
CO
KS
MO
KY
TN
NM
AR
TX
LA
AL
Shell Creek
Columbus East
Wagener
NW 68th & Holdrege
Axtell
Knoll
JEC
East Manhattan
McDowell Creek
Summit
Reno Co.
Spearville
Wichita
Benton
Rose Hill
Blackberry
Comanche Co.
Hitchland
Perryton North
Woodward
Sooner
Table Rock
Osage Creek
Chouteau
Flint Creek
Moore Co.
Pringle
Northwest
State Line
Hugo
Valliant
Turk
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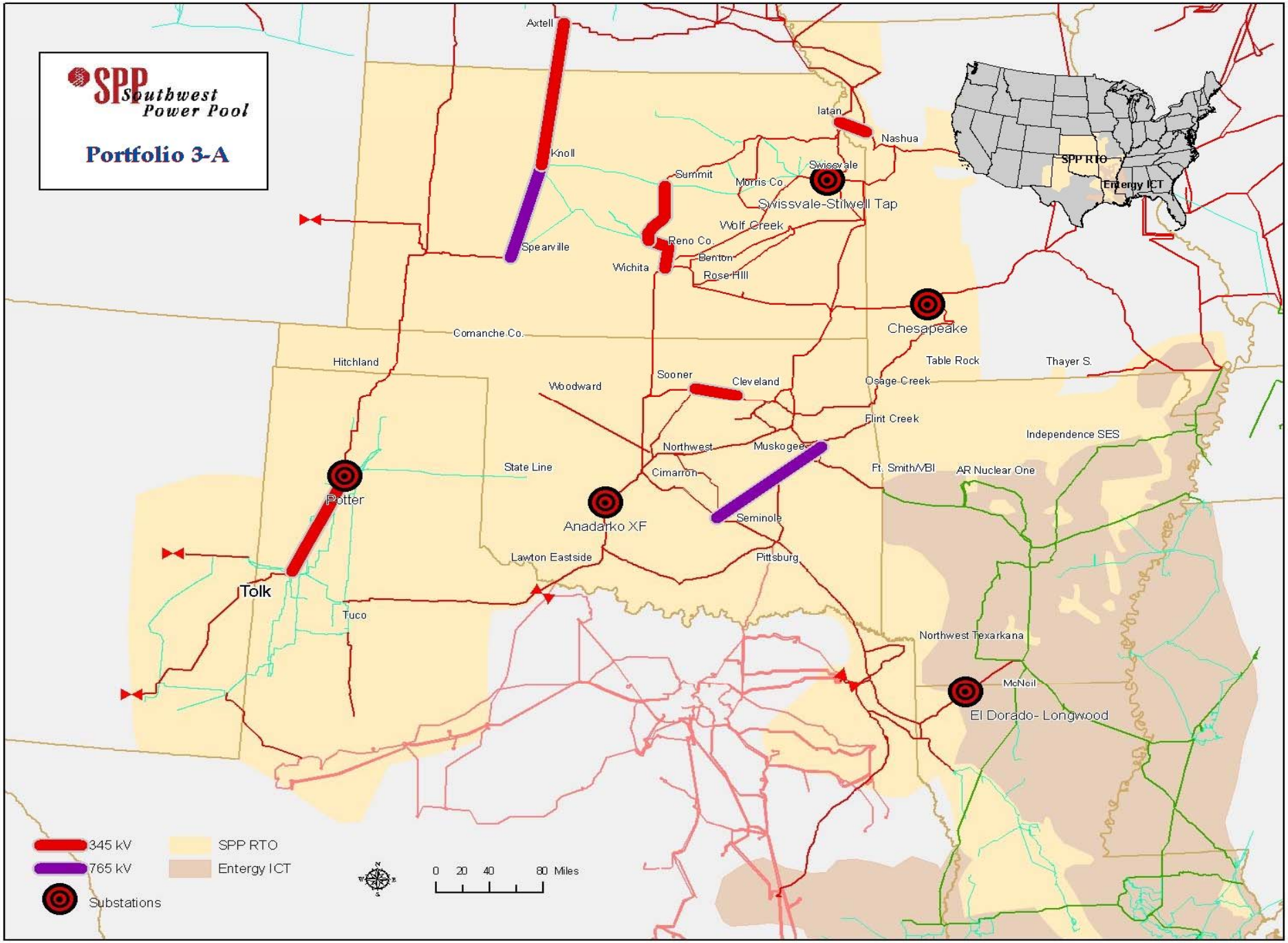
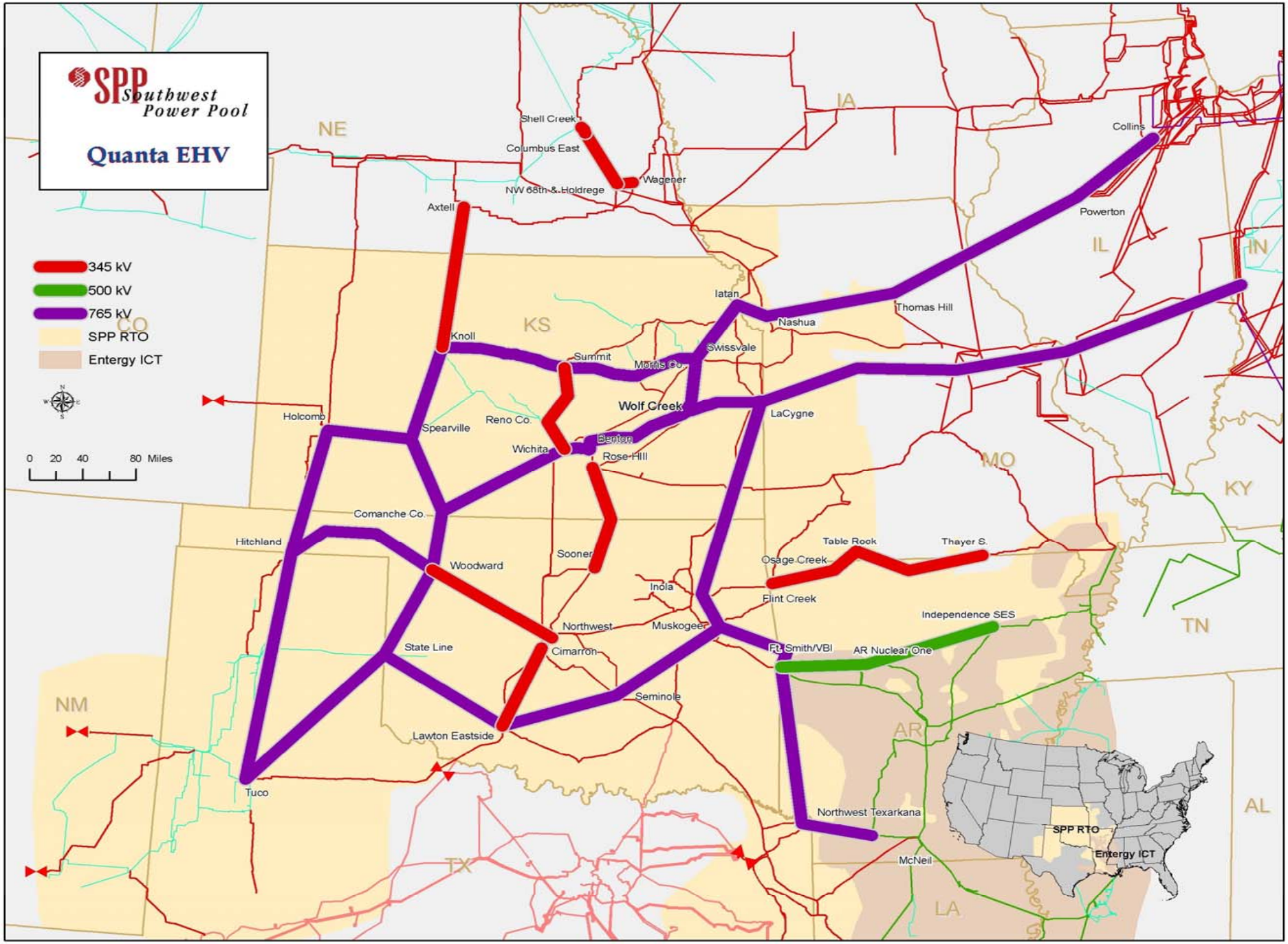
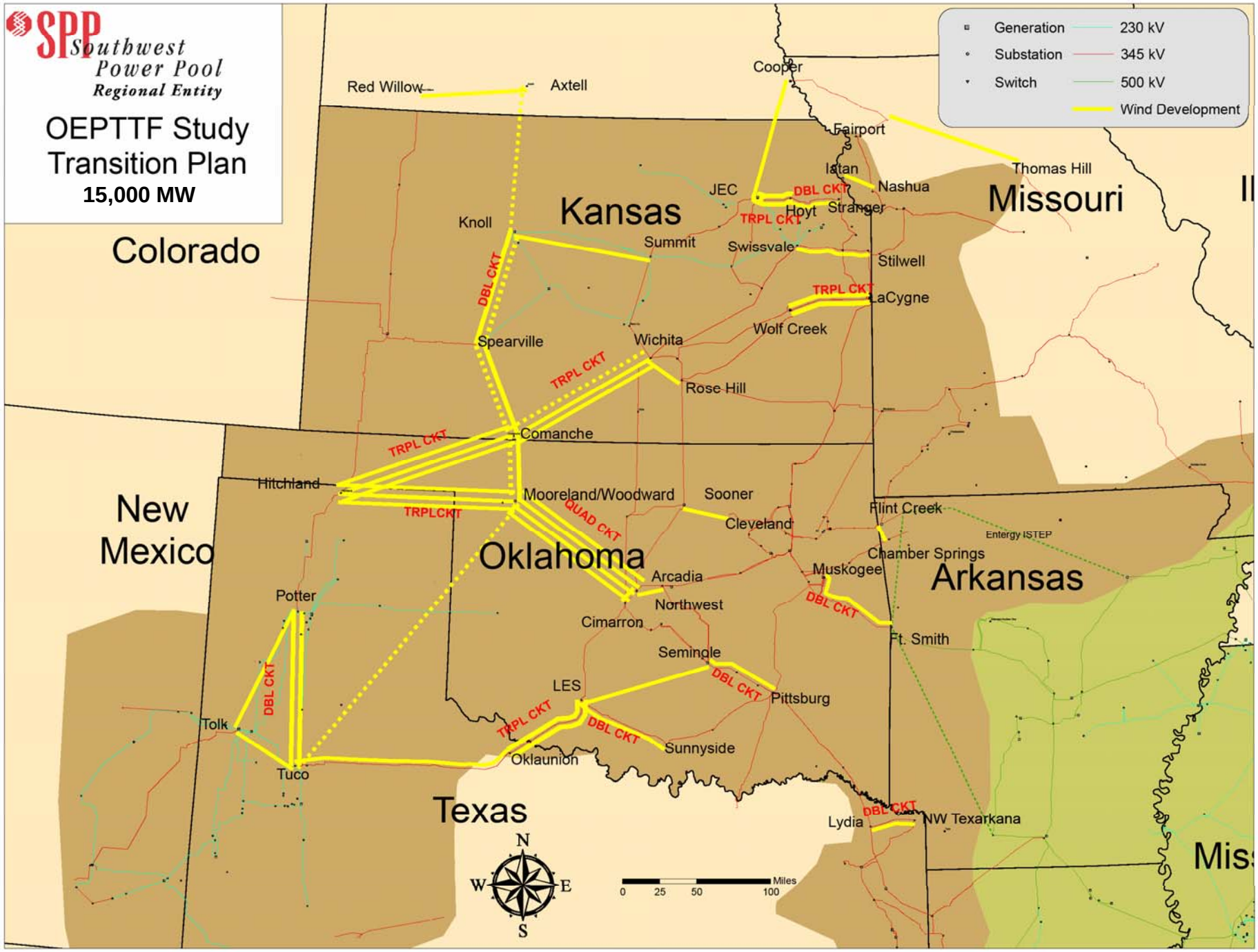
Mustang
Hobbs
Seven Rivers
Seminole
Potash Jct.
Pecos
SPP RTO
Entergy ICT


SPP Southwest Power Pool
Portfolio 3-A
Axtell
Knoll
Spearville
Iatan
Nashua
Swissvale
Summit
Morris Co.
Swissvale-Stilwell Tap
Wolf Creek
Reno Co.
Benton
Wichita
Rose Hill
Chesapeake
Comanche Co.
Hitchland
Table Rock
Thayer S.
Sooner
Cleveland
Osage Creek
Woodward
Flint Creek
Independence SES
Northwest
Muskogee
State Line
Cimarron
Ft. Smith/VBI
AR Nuclear One
Potter
Anadarko XF
Seminole
Lawton Eastside
Pittsburg
Tolk
Tuco
Northwest Texarkana
McNeil
El Dorado- Longwood
SPP RTO
Entergy ICT
345 kV
765 kV
Substations
SPP RTO
Entergy ICT
0 20 40 80 Miles


SPP Southwest Power Pool
Quanta EHV
345 kV
500 kV
765 kV
SPP RTO
Entergy ICT
0 20 40 80 Miles
NE
IA
IL
IN
KS
CO
MO
KY
TN
NM
TX
AR
LA
AL
Shell Creek
Columbus East
NW 68th & Holdrege
Wagener
Axtell
Collins
Powerton
Thomas Hill
Iatan
Nashua
Swissvale
Knoll
Summit
Morris Co.
Wolf Creek
LaCygne
Holcomb
Spearville
Reno Co.
Wichita
Benton
Rose Hill
Comanche Co.
Hitchland
Woodward
Sooner
Table Rock
Thayer S.
Osage Creek
Inola
Flint Creek
Independence SES
Northwest
Muskogee
State Line
Cimarron
Ft. Smith/VBI
AR Nuclear One
Seminole
Lawton Eastside
Tuco
Northwest Texarkana
McNeil
SPP RTO
Entergy ICT


SPP Southwest Power Pool Regional Entity
OEPTTF Study
Transition Plan
15,000 MW
Generation
Substation
Switch
230 kV
345 kV
500 kV
Wind Development
Colorado
Kansas
Missouri
New Mexico
Oklahoma
Arkansas
Texas
Red Willow
Axtell
Cooper
Fairport
Thomas Hill
Istan
Nashua
JEC
Hoyt
Stranger
Knoll
Summit
Swissvale
Stilwell
LaCygne
Wolf Creek
Spearville
Wichita
Rose Hill
Comanche
Hitchland
Mooreland/Woodward
Sooner
Cleveland
Flint Creek
Entergy ISTEP
Chamber Springs
Muskogee
Arcadia
Northwest
Cimarron
Ft. Smith
Seminole
Pittsburg
LES
Potter
Tolk
Tuco
Oklaunion
Sunnyside
Lydia
NW Texarkana
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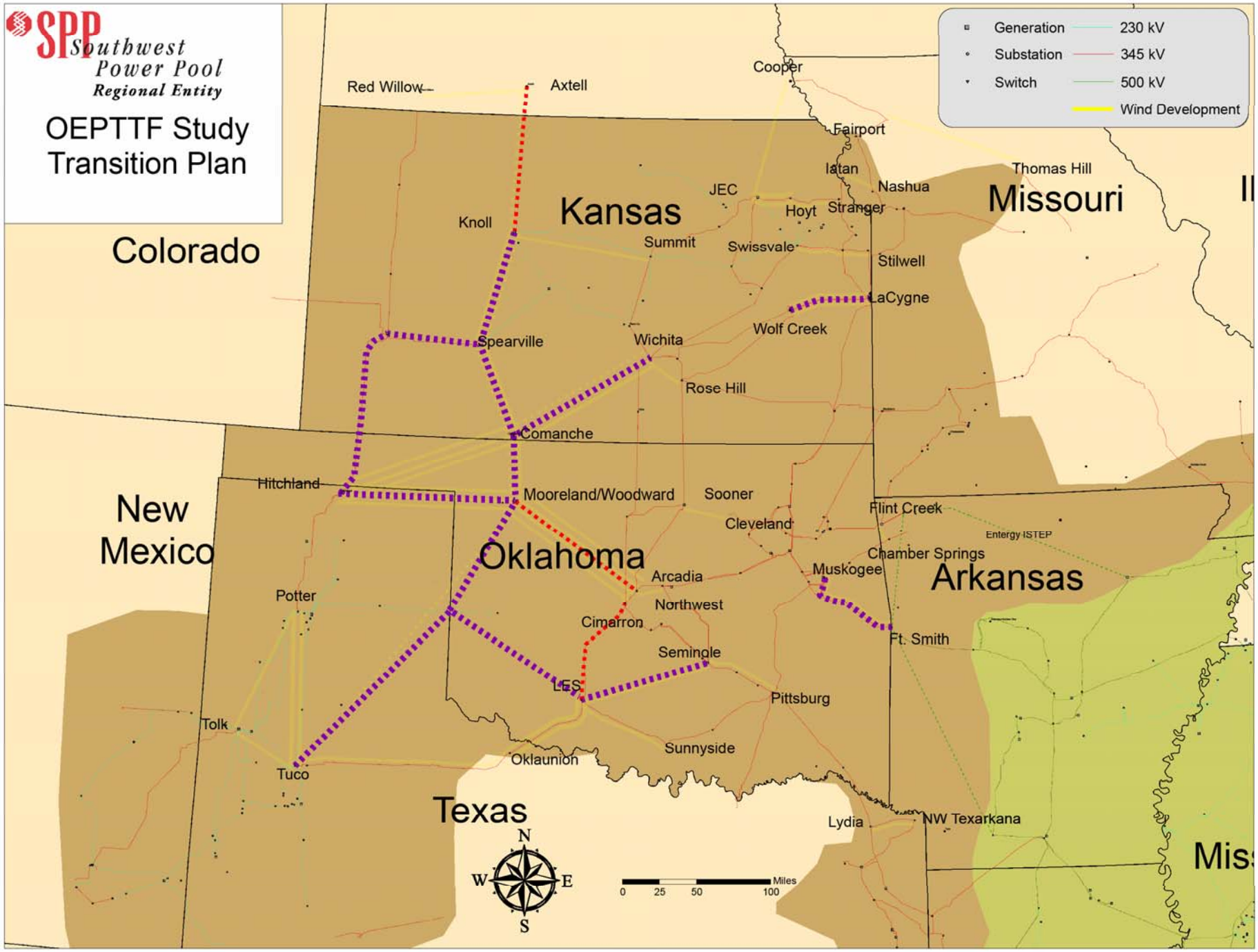
TRPL CKT
QUAD CKT
TRPLCKT
N
S
E
W
Miles
0
25
50
100


SPP Southwest Power Pool Regional Entity
OEPTTF Study Transition Plan
Generation
Substation
Switch
230 kV
345 kV
500 kV
Wind Development
Colorado
Kansas
Missouri
New Mexico
Oklahoma
Arkansas
Texas
Red Willow
Axtell
Cooper
Fairport
Iatan
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JEC
Hoyt
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Mooreland/Woodward
Sooner
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Flint Creek
Entergy ISTEP
Chamber Springs
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Pittsburg
Tolk
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Oklaunion
Tuco
Lydia
NW Texarkana
N
W
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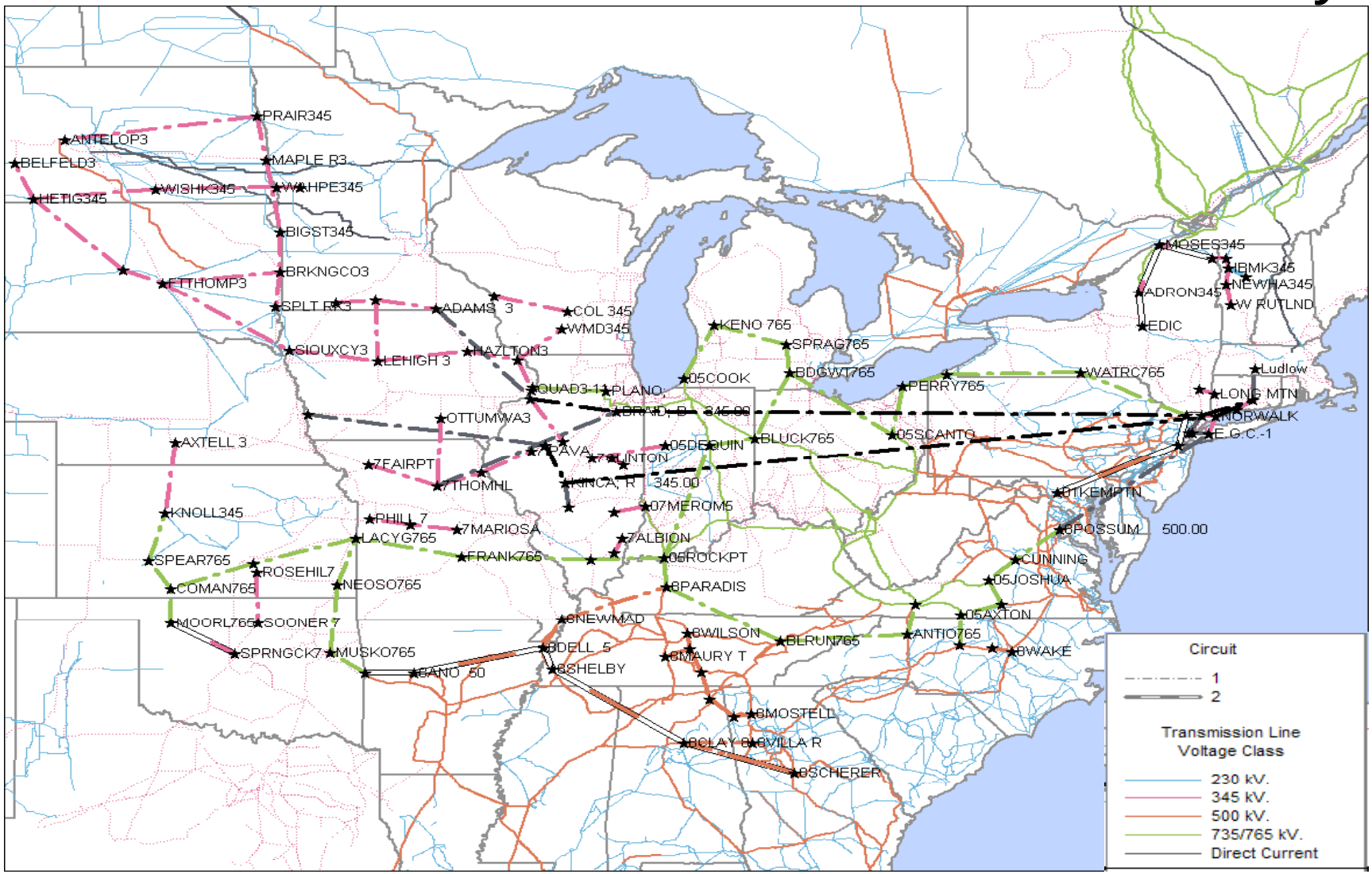
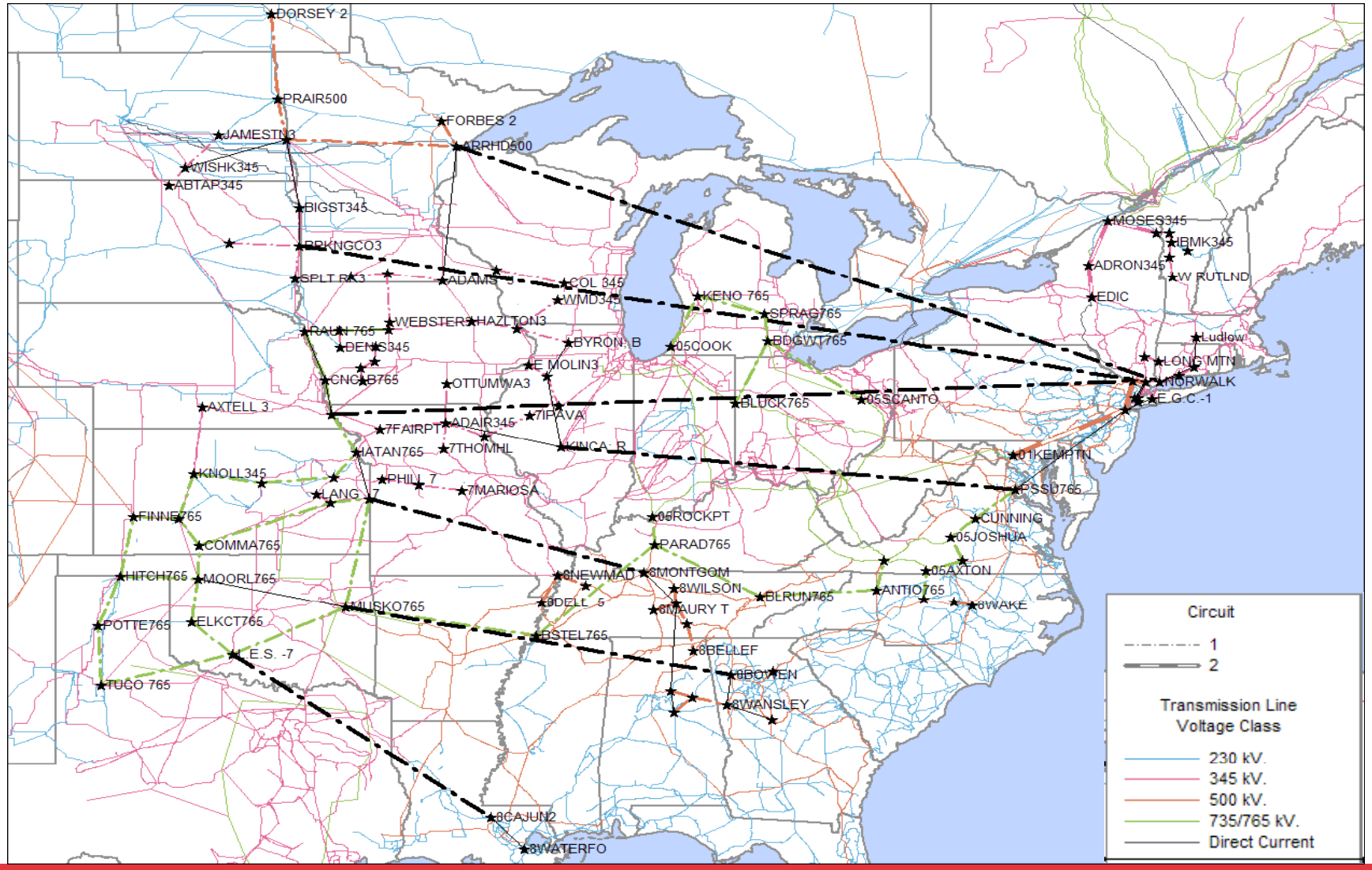
Miles
0
25
50
100

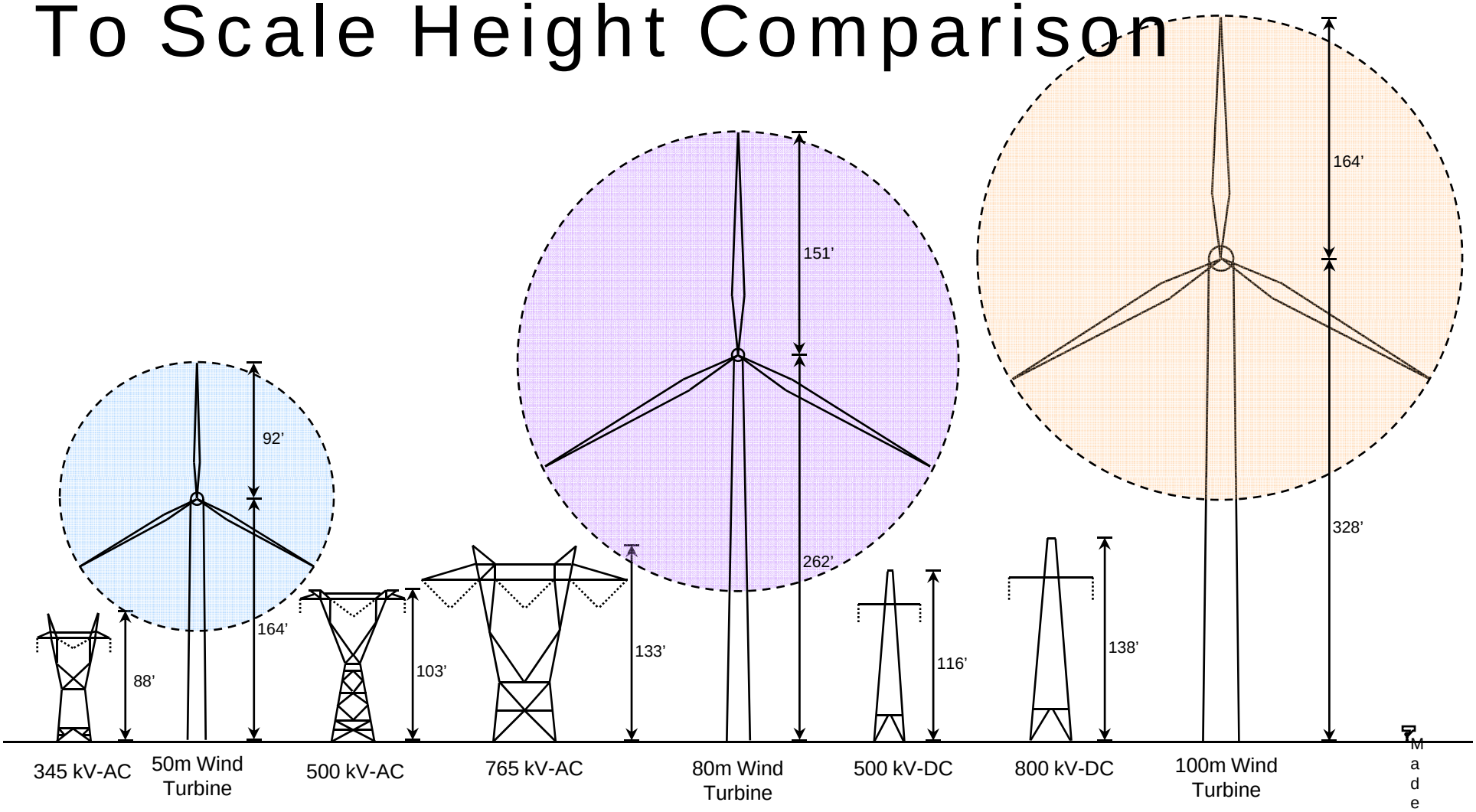
Reference Scenario – Current Overlay



20% Wind Scenario – Current Overlay



To Scale Height Comparison



Produced by Midwest ISO

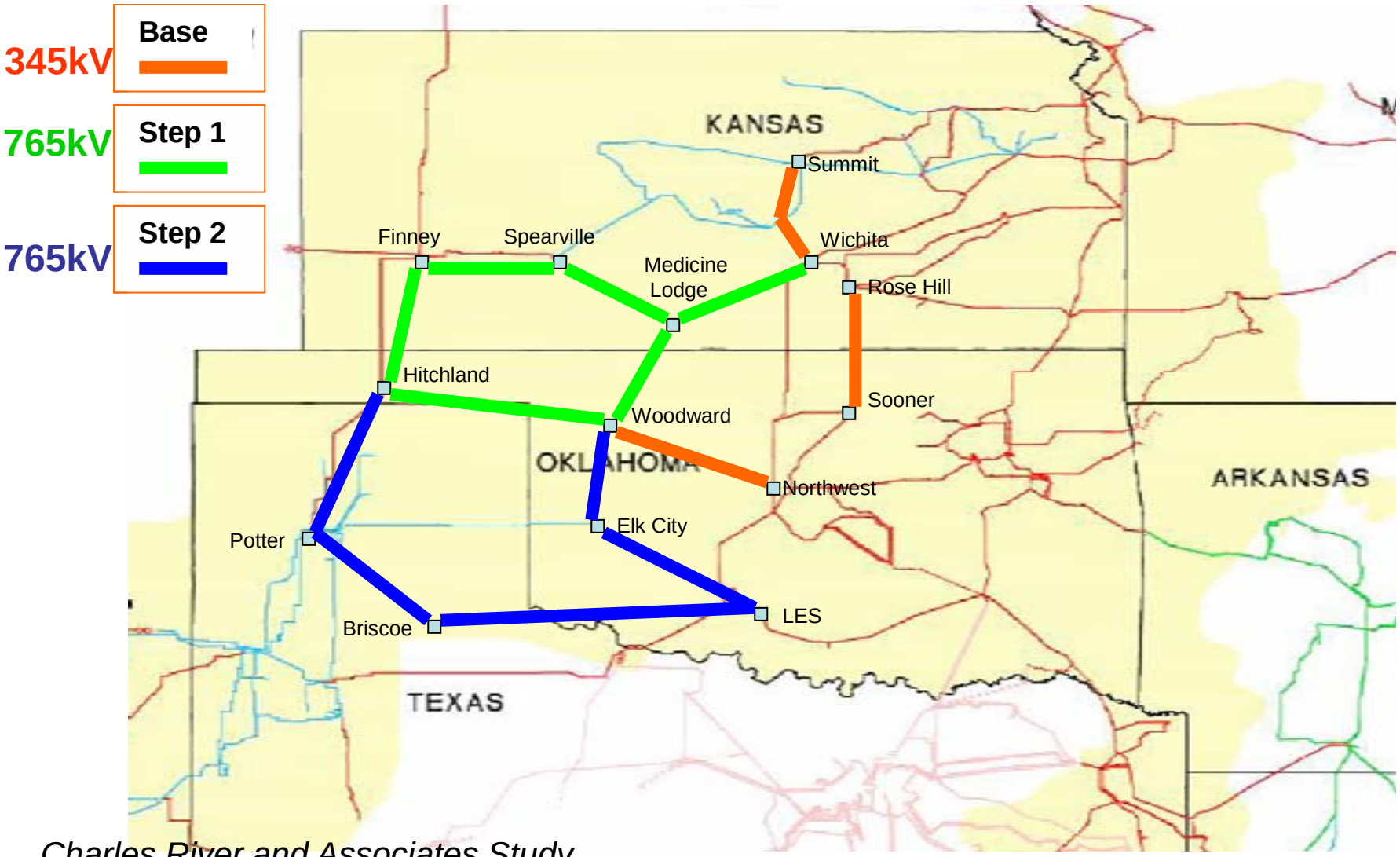
Made by JT

ATTACHMENT 5

Figure: Designing Energy Solutions Without Borders

Barton, L. 2008. Designing Energy Solutions Without Borders. REVOLUTION: Oklahoma Wind Energy Conference, Oklahoma City, OK, 3 December 2008.

Case Study: SPP Western Loop 2016



Charles River and Associates Study