PREPARED BY: David A. Haukos, Kansas Cooperative Fish and Wildlife Research Unit

SUBJECT: Research Overview for Kansas Colorado

ISSUE: The lesser prairie-chicken (*Tympanuchus pallidicinctus*) is an iconic symbol of the southwestern Great Plains, a species of conservation concern, and currently subject to considerable regulatory uncertainty. Recently listed as a threatened species under the Endangered Species Act in May of 2014 due to long-term declines in abundance and occupied range, accompanied by concerns regarding continued loss and degradation of habitat, the listing decision was vacated in September 2015 following judicial review. Conservation planning and implementation of management strategies requires knowledge on lesser prairie-chicken ecology, limiting factors, resource selection, and response to management options. Starting in 2012, in conjunction with researchers and managers across the range of the lesser prairie-chicken, a comprehensive investigation effort in the northern portion of the species range was initiated to inform conservation and management efforts.

METHODS: At Kansas State University, a series of research objectives was established to improve knowledge of lesser prairie-chicken ecology and management. Relative to the U.S. Department of Agriculture, Natural Resource Conservation Service Lesser Prairie-Chicken Initiative, a group of 1 post-doctoral research associate, 6 graduate students, and >40 technicians conducted research of lesser prairie-chickens in Kansas and Colorado on (1) dynamic landcover changes, (2) relative influence of landcover and climate on population fluctuations, (3) population response to Conservation Reserve Program lands, (4) occurrence and prediction of fence collision, (5) influence of grazing duration and intensity, (6) behavior response to the presence of trees in the landscape, and (7) effects of prescribed fire. The overall research effort involves >40 objectives and involves >20 collaborators from across the species range. Our studies were conducted on 7 main sites encompassing nearly 240,000 ha in Kansas and Colorado (Figure 1). Lesser prairie-chickens were captured on leks during spring and fall 2013-2016. All females and some males were fitted with either 15-g VHF or 22-g satellite GPS transmitters. Throughout the year, vegetation measurements of composition, cover, and structure were recorded at patch and point scales. Survival, home range, resource selection, and recruitment were estimated annually for each study site. Responses to anthropogenic structures and predators were measured. Additional data were collected for diet, genetic, soundscape, and behavioral analyses.

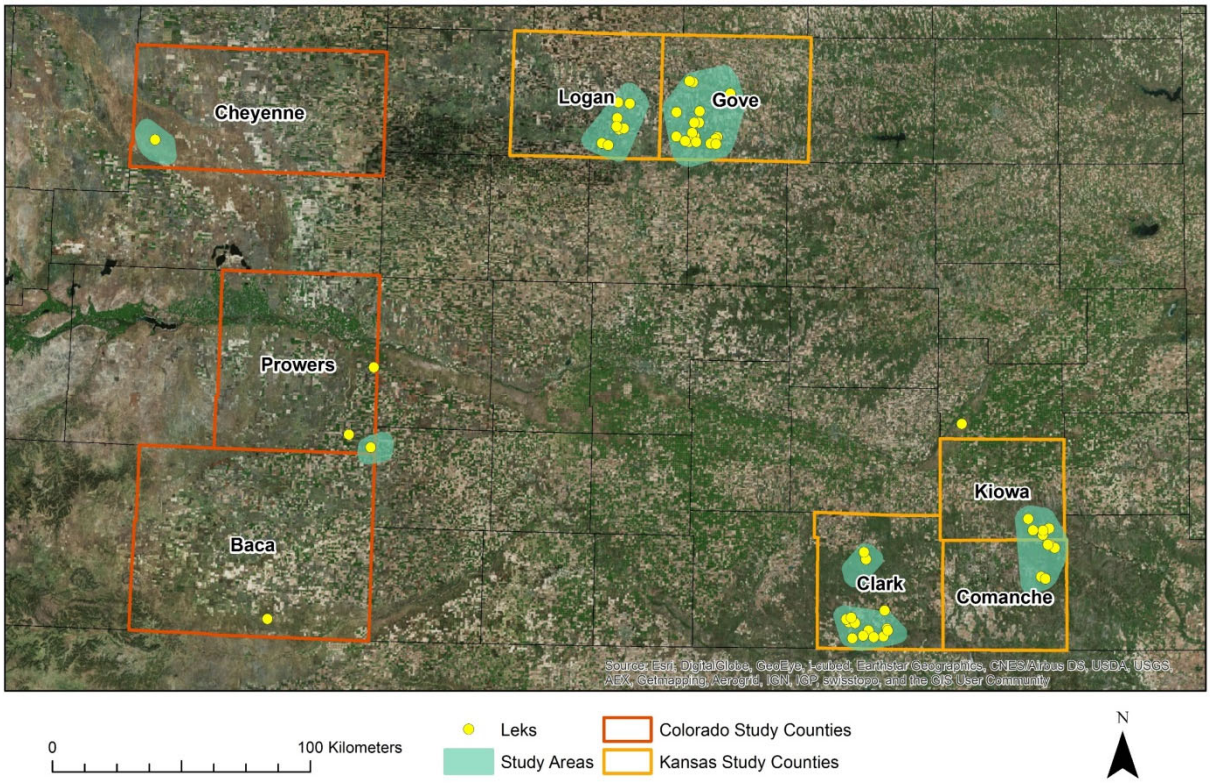


Figure 1. Study site locations for research on lesser prairie-chicken ecology and management in Kansas and Colorado.

RESULTS:

- Captured 724 individual lesser prairie-chickens 2013 – 2015. We deployed 207 satellite transmitters and 130 VHF transmitters.
- Greater than 250,000 locations of lesser prairie-chickens were collected.
- Greater than 40,000 vegetation points and patches were measured.
- Success was estimated for 234 nests.
- Total area of grassland in Kansas has changed little since the 1950s, with CRP offsetting any losses between 1950s and 1980s. The lone exception to this pattern was the sand sagebrush prairie of southwestern Kansas where grassland declined due to increased irrigation in the 1970s and 1980s.
- Lesser prairie-chicken population declines are related to extreme Palmer Drought Severity Index (PDSI) during the previous summer, with severity of decline and ability to respond dependent on cropland:grassland ratio of the landscape. A ratio of >1:10 cropland:grassland had negative effects on the population response to drought.

PREPARED BY: Samantha Robinson and David Haukos, Kansas Cooperative Fish and Wildlife Research Unit

SUBJECT: Effects of Fences in Northern Portion of the Range

ISSUE: Collision with fences by lesser prairie-chickens has been deemed an influential source of mortality range wide. However, the linkage between mortality and fences has only been assessed in one portion of the range with high fence densities. We explicitly tested the influence of fences on lesser prairie-chicken mortality in Kansas and Colorado.

METHODS: Our study was conducted in Logan, Gove, Kiowa, Comanche and Clark counties in Kansas, as well as Prowers, Baca, Stanton and Cheyenne counties in Colorado. We conducted "on-foot" surveys of fences within 3 km of leks over two years in the spring and fall lekking periods to locate evidence that lesser prairie-chickens had collided with fences. Additionally, we compared known lesser prairie-chicken mortality locations with random locations to determine if the mortality distance from fence differed from random. We also determined how many times lesser prairie-chickens had crossed fences within our study areas using satellite GPS transmitter data from marked prairie-chickens in an attempt to link the number of crosses or cross locations to characteristics of the landscape.

RESULTS:

- 3 possible collisions and 12 feathers were detected during 2,805 km of fence survey.
- Known mortalities were further from fences than random locations (Figure 1).
- One collision from 148 transmittered lesser prairie-chicken mortality locations was documented.
- We documented 12,706 fence crosses by GPS marked lesser prairie-chickens (Figure 2).
- We used distance to lek, terrain ruggedness, slope, elevation, and landcover to model predictions of fence-crossing,
    - None of the factors influenced fence-crossing location or frequency

CONCLUSIONS:

- Mortality by fence collision is not an influential source of mortality for lesser prairie-chickens in Kansas and Colorado.
- Fence crossings by lesser prairie-chickens is a random process in Kansas and Colorado and not related to landscape characteristics.

MANAGEMENT IMPLICATIONS:

- Management strategies that maintain low fence densities can assist in assuring that mortality from collisions remains low.

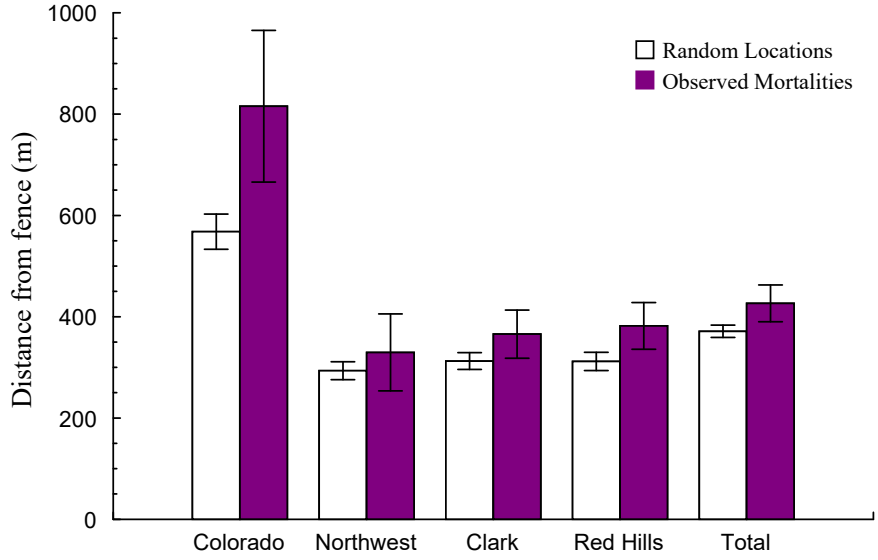


Figure 2: Average distance from fence for observed mortalities of lesser prairie-chickens and random locations on the landscap

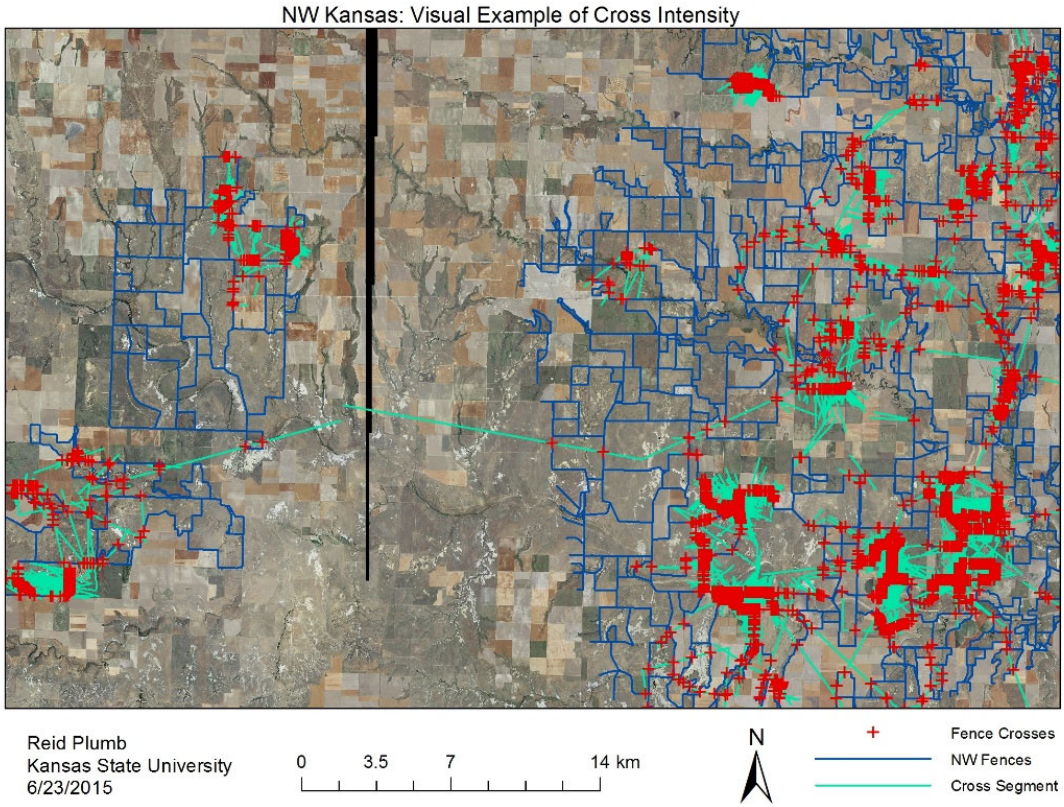


Figure 1: Fence crosses by GPS transmittered lesser prairie-chickens in Kansas and Colorado.

PREPARED BY: Joseph Lautenbach and David Haukos, Kansas Cooperative Fish and Wildlife Research Unit

SUBJECT: Response of Lesser Prairie-Chickens to Trees Encroachment in Grasslands

ISSUE: Since conversion of prairie has remained relatively stable for the past few decades, the leading cause of habitat loss for the lesser prairie-chicken has become woody plant encroachment into grasslands, and is especially problematic in the Southern Great Plains. In the eastern portion of the lesser prairie-chicken range, the eastern redcedar is the primary species expanding into grasslands. While the eastern redcedar is a native species, it was controlled in grasslands by frequent fires. With the removal of fire from grasslands, eastern redcedar and other trees have become established in grasslands.

METHODS: We trapped 58 female lesser prairie-chickens and attached radio and satellite transmitters to assess habitat use across 35,000 acres. We tracked females to their nests and throughout the year. To assess lesser prairie-chicken responses to tree ≥ 3 feet, we compared locations used by female lesser prairie-chickens and what was available across the landscape. We also compared nesting locations to what was available across the study.

RESULTS:

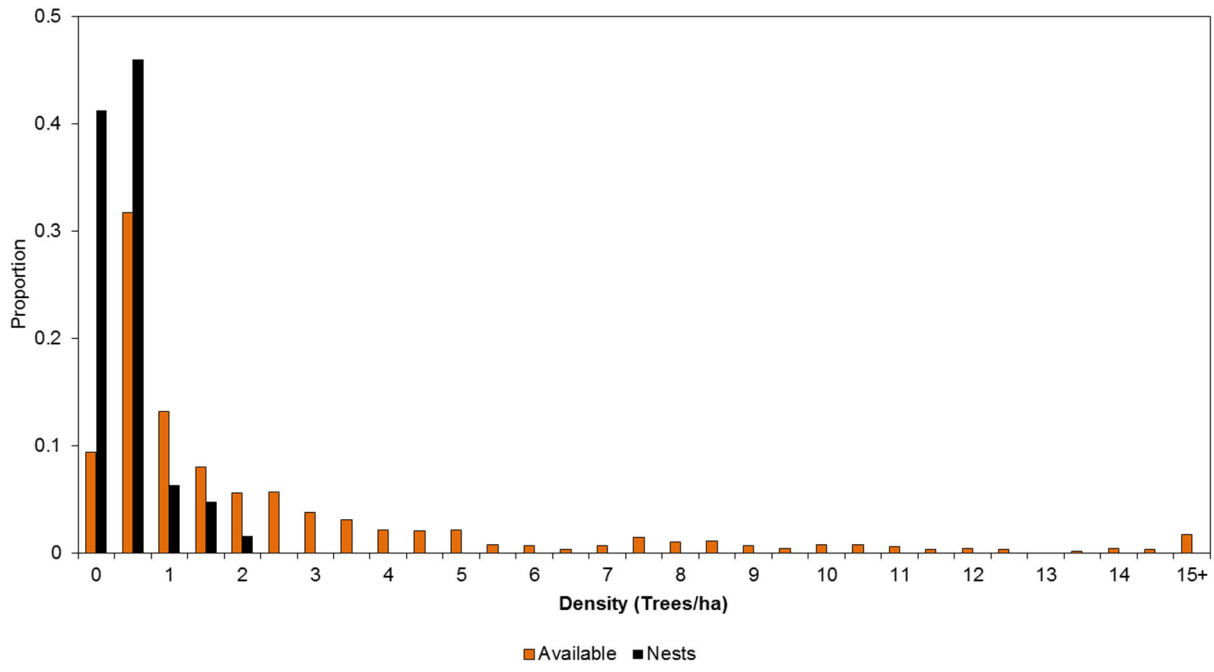
- Nesting decreases with increasing tree density. Nests were not detected in areas with ≥1 tree/acre.
- Female lesser prairie-chickens avoid trees by >300 km (1000 feet) or more on average when using habitat or selecting nest sites.
- Grassland habitat patches with ≥3 trees/acre are not used by female lesser prairie-chickens.

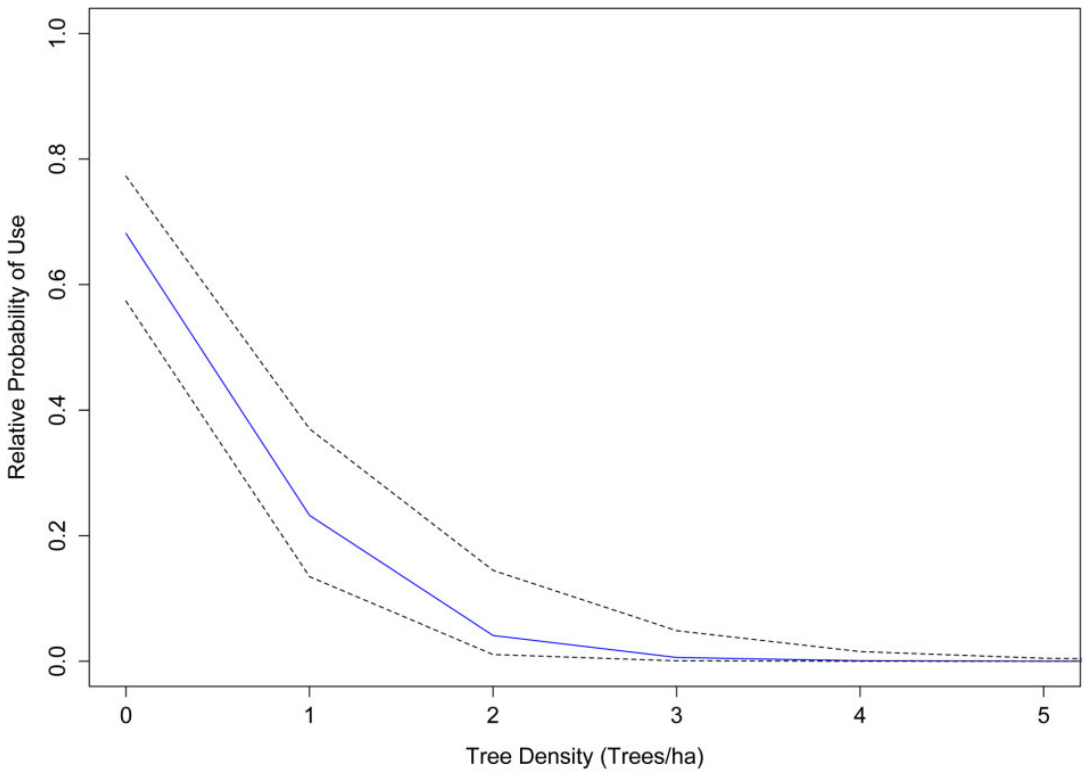
CONCLUSIONS:

- Tree encroachment into grasslands reduces habitat available to lesser prairie-chickens.
- Lesser prairie-chickens may avoid trees due to the perceived presence of predators.

MANAGEMENT IMPLICATIONS:

- Focus initial removal efforts in (or adjacent to) lesser prairie-chicken occupied habitat, and should target low tree densities (2 trees/acre or less) first.
- Mechanical removal or prescribed fire are effective methods for removal.
- Routine prescribed fire will prevent new trees from sprouting in grasslands and in areas where restoration has occurred.


0.5
0.4
0.3
0.2
0.1
0
Proportion
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15+
Density (Trees/ha)
Available
Nests


1.0
0.8
0.6
0.4
0.2
0.0
Relative Probability of Use
0
1
2
3
4
5
Tree Density (Trees/ha)

PREPARED BY: Daniel S. Sullins, John D. Kraft, and David A. Haukos, Kansas Cooperative Fish and Wildlife Research Unit

SUBJECT: Influence of the Conservation Reserve Program

ISSUE: Since 1996, CRP has considered enhancing wildlife habitat as a program objective with the unique ability of this program to benefit ecosystem and producers over large spatial scales has made it a rare landscape conservation success. For a grassland obligate species such as the lesser prairie-chicken, increasing the amount of grassland in a landscape is certainly beneficial. However, CRP may only provide habitat for certain life stages (e.g., nesting and winter) and the relative quality of CRP as habitat may vary annually. Understanding landscape characteristics and demographic mechanisms for which CRP grasslands benefit LEPCs will allow for strategic conservation.

METHODS: We assessed the influence of CRP grasslands on LEPCs in northwest Kansas where populations have increased over the last two decades. The study began in 2013 following the most extensive drought in 50 years. We estimated the effects of landscape composition (proportion of area as a landcover type) and configuration (arrangement of landcover types) on lesser prairie-chicken occurrence. We then examined how change in drought severity influences habitat use at a landscape scale. We estimated demographic rates (n = 105 females, 2013-2015) within occupied landscapes to assess quality of those habitats and identify life stages that most benefit from CRP. We estimated nest density, nest survival (n = 102), and nonbreeding season survival of LEPC using CRP and native prairie.

RESULTS:

Landscape Scale Habitat Selection

- CRP grasslands are most likely to be used when local landscapes (~7,500 acres) are comprised of >65% (~4,900 acres) native working grasslands (Figure 1A).
- CRP use increased in years during and following severe drought (Figure 1 B).

Demographic Comparisons

- Nest and adult survival were similar among birds that used CRP and NonCRP (Figure 2).
- ~40% of nests were in CRP in 2013 and 2014, but only 10% of nests were in CRP in 2015.
- Nest densities were 3 times greater in CRP than in prairie and likely provide reliable habitat during periods of drought.

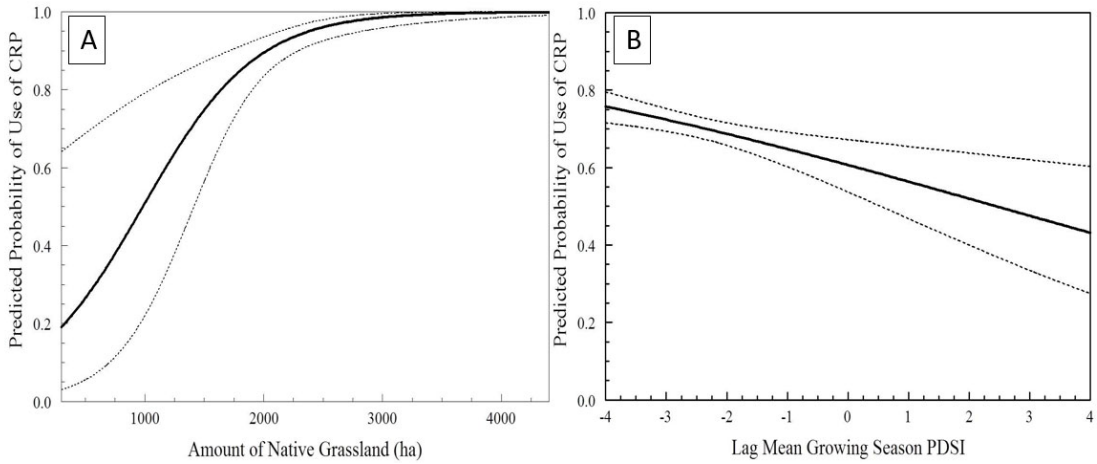


Figure 1. Predicted probability of use of Conservation Reserve Program grasslands by lesser prairie-chickens in northwest Kansas in 2013- 2015 as a function of the amount of native grassland (A) in a ~7,500 acres; 11.7 square miles landscape and (B) as a function of the drought severity (PDSI; Palmer Drought Severity Index) during the previous year (low numbers = greater drought severity).

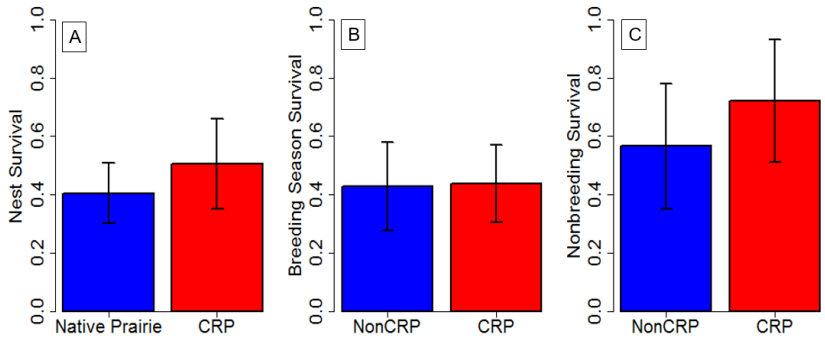


Figure 2. Estimates of nest survival over a 35-day exposure period (A), breeding season survival (B; Mar 15 – Sep 15), and nonbreeding survival (C; Sep 16 – Mar 14) for lesser prairie-chickens using CRP and other cover types in northwest Kansas in 2013- 2015.

CONCLUSIONS:

- CRP is most likely to be used when it occurs in landscapes that are predominantly grassland and when grasslands are clumped together.
- CRP provides nesting habitat comparable to native prairie and nesting microhabitats are more readily and reliably available in CRP than in native prairie.
- CRP benefits vary along a strong precipitation gradient from the eastern to western portions of the range. In northwest Kansas, the planting of tall and mixed-grass species CRP can increase the amount of nesting habitat. In southeastern Colorado, CRP can provide habitat for all life stages when it is clumped in large areas.

PREPARED BY: Jonathan Lautenbach and David Haukos, Kansas State Cooperative Fish and Wildlife Research Unit, Kansas State University

SUBJECT: Response to Prescribed Fire in Mixed Grass Prairie

ISSUE: Since the settlement of the Great Plains, humans have altered both fire and grazing regimes on the landscape. This has led to the numerous problems for lesser prairie-chickens, including monotypic vegetation structure and tree encroachment. Tree encroachment (especially eastern redcedar) has been shown to decrease the amount of habitat available on the landscape. Prescribed fire has been shown to kill eastern redcedar and provide heterogeneity in vegetation structure. Therefore, one of tool that has been proposed to control the future spread of trees and increase structural heterogeneity necessary for lesser prairie-chicken recovery is through the use of prescribed fire. The goals of this project were to determine the effects of prescribed fire on lesser prairie-chicken habitat and space use to determine if there is an optimal way to implement fire to benefit lesser prairie-chickens.

METHODS:

This study is occurring on private lands is Kiowa and Comanche counties in Kansas. The landowner applies prescribed fire to the ranch in a patch-burn style, where he burns only a portion (about 1/3) of each pasture every year. Pastures are grazed by cattle and in this style of management (patch-burn grazing) cattle will focus their grazing efforts on the recently burned areas leaving the rest of the pasture relatively un-grazed.

We measured vegetation characteristics at used locations (nests, broods, and non-breeding) and available locations. Measured available locations were based on time-since-fire so that we would be able to quantify the effect of patch-burn grazing on lesser prairie-chicken habitat. We also delineated the landscape based on time-since-fire to assess the use of these areas during the nesting and brooding periods

RESULTS:

- Lesser prairie-chickens did not nest in year-of-fire patches
- Majority of nests were located in greater-than 3 years post-fire patches
- Lesser prairie-chickens used year of fire patches for brooding
- Nesting vegetation structure was most similar to greater-than 3 year post-fire patches while brooding habitat was similar to year of fire and 1 year post-fire patches (Figure 1.)

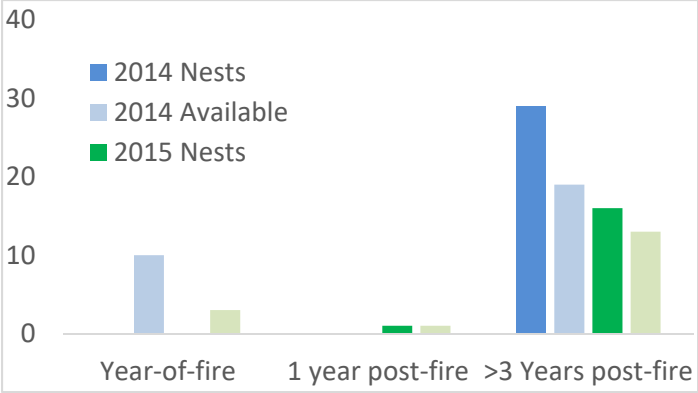


Figure 1: Actual number of lesser prairie-chicken nests (bright colors) compared to the number of nests expected at random (pale colors), based on time-since-fire patches. In 2014, all lesser prairie-chicken nests were located in >3 years post-fire patches while in 2015 all but one nest were located in >3 years post-fire patches.

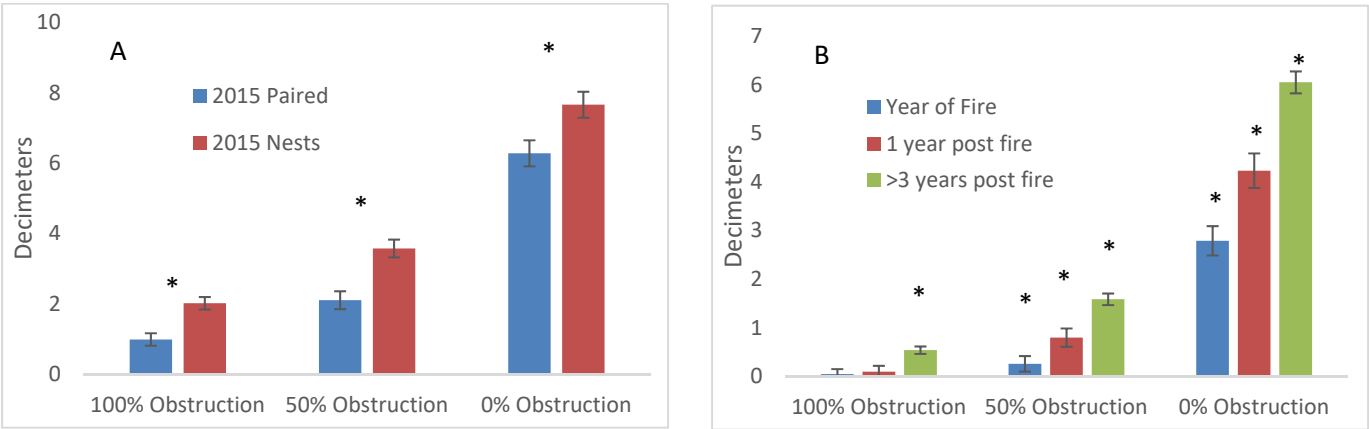


Figure 2: Selected visual obstruction at nesting locations compared to paired random locations (A) depicting that lesser prairie-chickens select for taller vegetation than available on the landscape and the available visual obstruction on the landscape based on time-since-fire (B) depicting that >3 years post-fire patches offer the most similar vegetation to that used at nesting location

CONCLUSIONS:

- Lesser prairie-chickens require multiple habitats throughout their life history
- Lesser prairie-chickens use various time-since-fire patches throughout their life history
- Patch-burn grazing generated a heterogeneous environment, with short-, medium-, and tall-grass patches required by lesser prairie-chickens throughout their life history
- Annual or whole pasture burning will likely negatively impact lesser prairie-chicken populations as no nests were observed in year-of-fire patches

MANAGEMENT IMPLICATIONS:

- Prescribed fire has the ability to maintain lesser prairie-chicken habitat when used in a patch-burn grazing system
- Prescribed fire is a potential tool that can be used to help prevent the spread of eastern redcedars into uninfested areas when applied in a patch-burn grazing system

PREPARED BY: John D. Kraft and David A. Haukos, Kansas Cooperative Fish and Wildlife Research Unit,

SUBJECT: Grazing Practices in Northern Portion of the Range

ISSUE: Management of livestock grazing on these private lands has the ability to influence small- and large-scale vegetation structure important to various seasonal needs of the lesser prairie chickens. Moving forward, it may be beneficial to identify grazing management strategies that benefit both lesser prairie-chicken populations and beef cattle production in grasslands.

METHODS: We evaluated the influence of grazing practices on lesser prairie-chicken habitat selection in grazed lands throughout the year. The primary question of interest is - what grazing strategies are positively related with intensity of use by lesser prairie chickens? These efforts were focused in several locations in western Kansas in 2014 and 2015. We gathered pasture scale grazing practice data for grazing pressure (AUM/ha), stocking density (AUM/ha), growing season deferment (percent of 6-month growing season a pasture was absent of cattle), biomass production potential (kg/ha), and pasture size (ha). Next, we analyzed the similarities and differences among bird locations and a set of randomly distributed locations. This allowed us to identify the grazing practice characteristics associated with increased levels of lesser prairie-chicken use.

RESULTS:

- Increasing grazing pressure (> 1.5 AUM/ha) decreased probability of use, light to moderate grazing pressures (0.5 – 1.0 AUM/ha) increased the probability of use (Figure 1).
- As levels of biomass production potential (kg/ha) increased, the effect of grazing pressure on probability of use was reduced and then reversed for pastures with large biomass (Figure2).
- The percentage of growing season deferment increases, the probability of use decreases (Deferment is negatively correlated with pasture size and stocking density) (Figure 3).
- Investigations into relationships between pasture size and lesser prairie-chicken use reveal that probability of use increases rapidly at pasture sizes that are >~400 hectares (Figure 4).

CONCLUSIONS:

- Lesser prairie-chicken selected for habitats with light to moderate levels of grazing pressure during years of ≥average rainfall during the growing season. However, as grazing pressure increases and rainfall decreases use will likely decrease.
- Growing season deferment was negatively associated with probability of use due to underlying processes among pasture size, stocking density, and cattle foraging behavior. Thus, disturbance by grazing livestock was needed to create adequate microhabitat. This conclusion also supports the tendency for probability of use to increase in highly productive pastures as grazing pressure increased to levels detrimental in other pastures.

- The negative effects of increased grazing pressure can be combated by considering the biomass production potential and size of pastures.
    - Increased biomass production potential increases the resiliency of vegetation structure values to increased grazing pressure. Thus, quality habitat can be obtained at increased values of grazing pressure in certain circumstances.
    - Larger pastures exhibit greater use due to interactions between stocking density and amount/quality of forage available at larger pasture sizes. At low stocking densities (e.g., larger pastures) and longer grazing periods (e.g., less deferment) the ability of cattle to select highly palatable forage increases and frequently use the same foraging areas throughout the grazing period. This process creates heterogeneous habitat for lesser prairie-chickens habitat selection.

Prepared by: Scott A. Carleton, New Mexico Cooperative Fish and Wildlife Research Unit

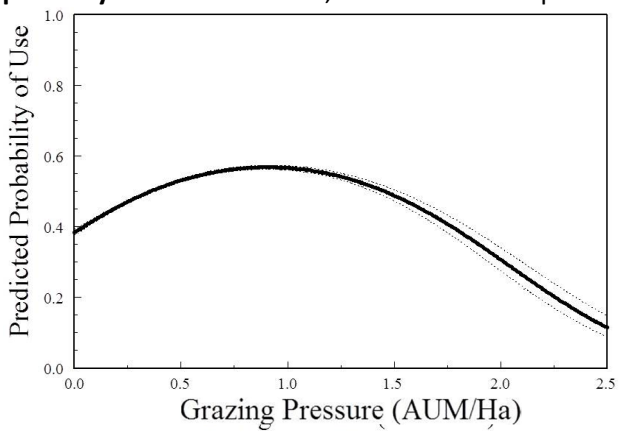


Figure 1. Predicted probability of use of grazed lands by female lesser prairie-chickens as a function of grazing pressure (AUM/ha) during 2014 and 2015.

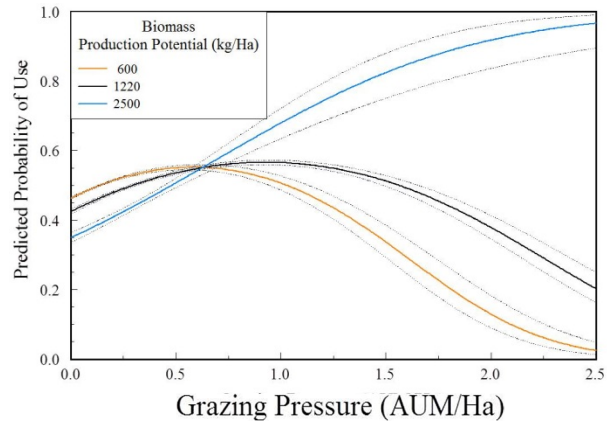


Figure 2. Predicted probability of use of grazed lands by female lesser prairie-chickens as a function of grazing pressure (AUM/ha) and varying levels of biomass production potential (kg/ha).

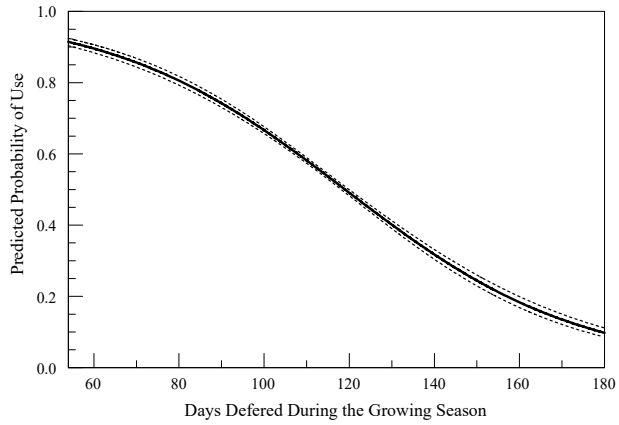


Figure 3. Predicted probability of use of grazed lands by female lesser prairie chickens as a function of growing season deferment.

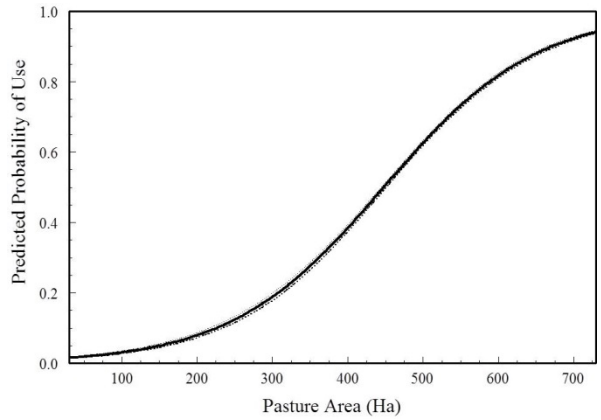


Figure 4. Predicted probability of use of grazed lands by female lesser prairie chickens as a function of Pasture Area (ha).

Prepared by: Scott A. Carleton, New Mexico Cooperative Fish and Wildlife Research Unit

SUBJECT: Mesquite encroachment and avoidance

ISSUE: The encroachment of mesquite has been identified as degrading or potentially limiting habitat availability for lesser prairie-chickens across their contemporary range. Few studies, however, have attempted to quantify these effects, even though the impact of mesquite is of special importance to the management and conservation of lesser prairie-chickens in New Mexico. There are two primary negative effects of woody encroachment by mesquite on lesser prairie-chickens. First, in the early phase of encroachment, it has been hypothesized that the vertical obstruction these plants create may provide predator perches and second conversion to a mesquite dominated environment is ultimately unsuitable for lesser prairie-chickens. Despite these widely held beliefs, the relationship between mesquite presence and patterns of seasonal use of habitat by lesser prairie-chickens is unknown.

METHODS: To determine the magnitude of impacts of distribution of mesquite and how lesser prairie-chickens respond to mesquite presence on the landscape in southeastern New Mexico, we evaluated seasonal space use of radio-marked lesser prairie-chickens (n = 51) in the breeding and non-breeding season. Our goals were to use resource utilization functions to evaluate the relationship between distribution of mesquite and seasonal use of habitat of lesser prairie-chickens. We derived several remotely sensed spatial metrics to characterize the distribution of mesquite and used these data to create population-level resource utilization functions and predict the intensity of use of lesser prairie-chickens across our study area.

RESULTS:

- In the breeding and nonbreeding seasons, lesser prairie-chickens used areas closer to leks and largely avoided areas with mesquite present (Figure 1).
- In the non-breeding season, patterns of use suggested a marginal increase in the incorporation of mesquite within areas of low intensity of use, however, avoidance of mesquite was still exhibited (not shown, pattern nearly identical to Fig 1).
- Predictive maps of habitat use on study demonstrate the negative of effect of individual and low canopy cover mesquite invasions (Figure 2).

CONCLUSIONS:

Understanding the relationship between distribution of mesquite and habitat for lesser prairie-chickens is important for the development of conservation strategies that identify the negative effects of mesquite presence and minimize further loss of habitat.

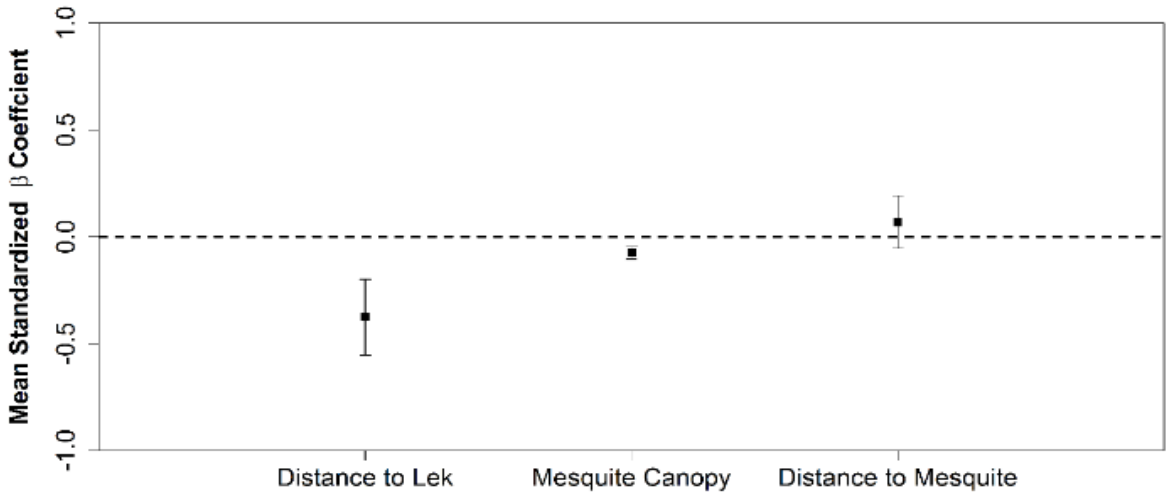


Figure 1. Mean Standardized coefficients from Resource Use Function analysis were used to understand space use relationships for lesser prairie-chickens. Values above 0 indicate avoidance of that feature, whereas values below 0 indicate a spatial association with that feature. Across both seasons, lesser prairie-chickens were associated with leks, avoided areas of mesquite presence, and showed a slight tolerance for areas of low canopy density.

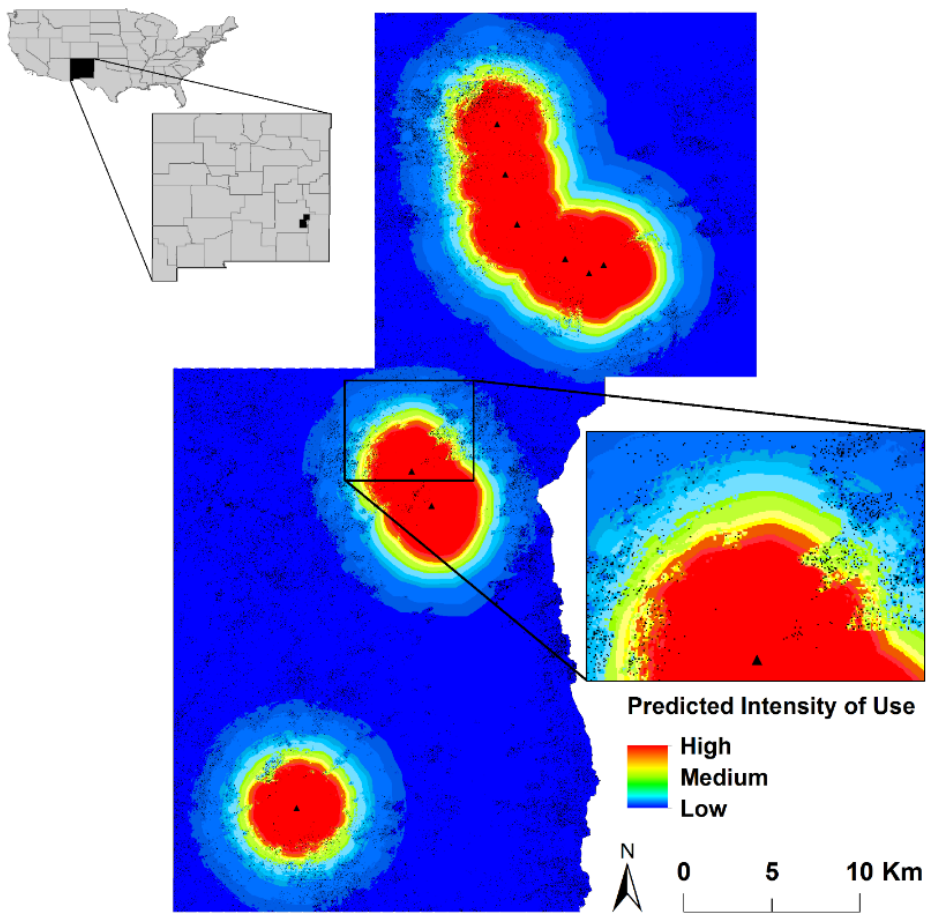


Figure 2. Predicted probability of use shows space use patterns are strongly associated with distance to lek and mesquite densities reduce available habitat in high use areas.

Prepared by: Scott A. Carleton, New Mexico Cooperative Fish and Wildlife Research Unit

SUBJECT: Use of CRP grasslands in New Mexico

ISSUE: In Kansas, CRP habitat has provided preferable nesting habitat for lesser prairie-chickens and recent range and population expansions in areas of west-central Kansas were possibly attributed to CRP plantings of native grasses intermixed with forbs. CRP habitat in New Mexico differs in several ways from CRP habitat in Kansas. The vegetation composition and structure within CRP fields in New Mexico, as well as the arrangement of those fields in relation to other native habitats is quite different (Figure 1). Another important difference in lesser prairie-chicken habitat in New Mexico and west Texas is that it contains a significant shrub component comprised primarily of shinnery oak (*Quercus havardii*). Thus, there is considerable uncertainty what role CRP plays in the demography and space use of lesser prairie-chickens in the southern portion of their range.

In light of the emphasis on CRP for the recovery of the lesser prairie-chicken and CRP's unknown benefit in the southern portion of the bird's range, we set out to evaluate seasonal space use patterns in eastern New Mexico.

METHODS: We radiomarked 82 lesser prairie-chickens over 2 years and monitored movement and habitat use. We used resource selection indices to determine if use of various landcover was disproportional to availability on the landscape.

RESULTS:

- Shinnery oak prairie is a key component of lesser prairie-chicken habitat in New Mexico and is used in much higher proportion to its availability on the landscape (Figure 2).
- CRP grasslands, on the other hand, were used rarely and much lower than their availability (Figure 2).

CONCLUSIONS: The policy of emphasizing CRP in this region as a tool for lesser prairie-chicken recovery should perhaps be targeted to areas where large expanses of agriculture dominate the landscape and native rangeland no longer exists. If CRP contracts are acquired in New Mexico, plantings need to be managed for structure and species composition that promote lesser prairie-chicken occupancy. New CRP contracts should consist of multiple native grass species and a proper mix of forbs. Additionally, removal of nonnative grasses and increasing diversity of both forbs and grasses should be a priority for existing CRP contracts.

Figure 1. Native shinnery oak prairire (left) and CRP plantings (right) are two primary habitats available for lesser prairie-chickens in eastern New Mexico.

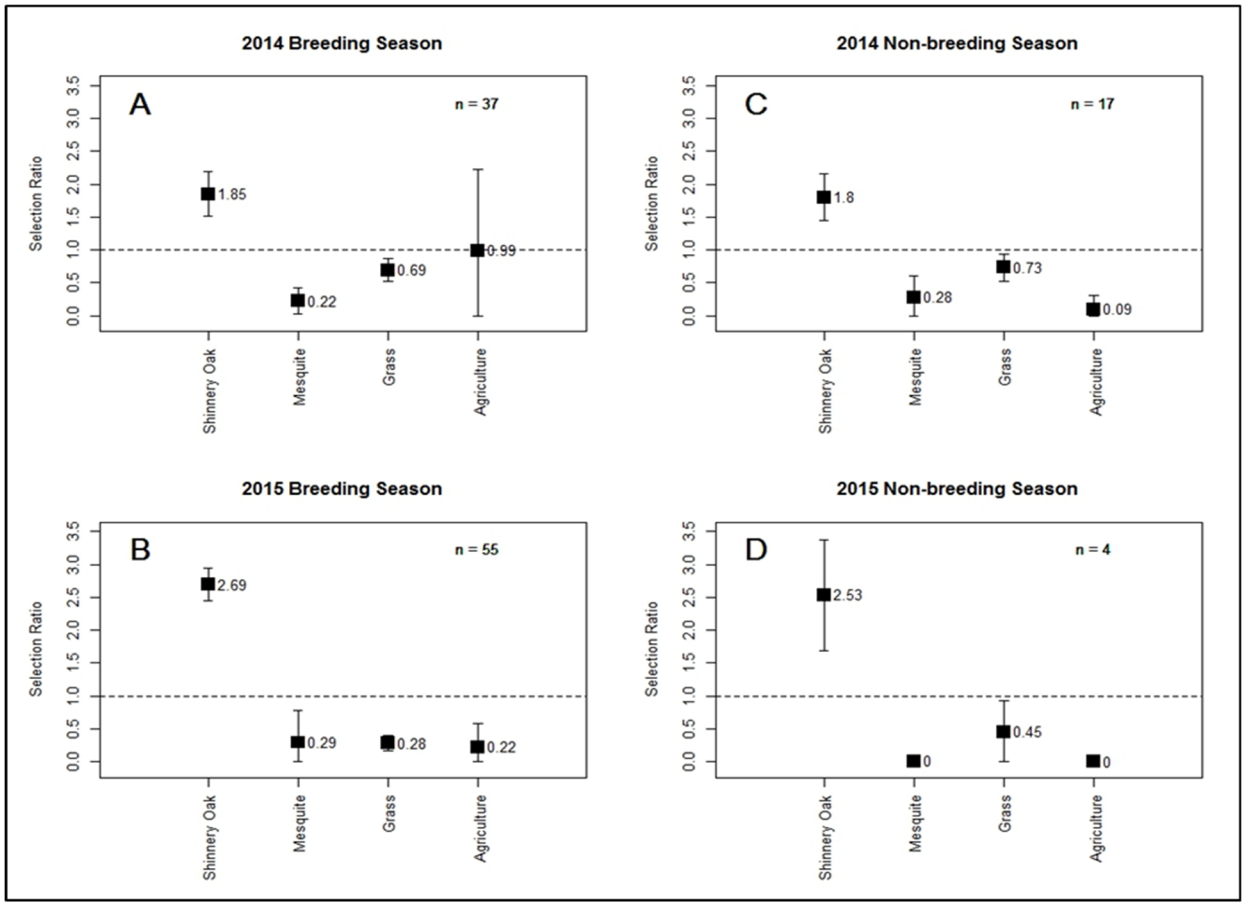


Figure 2. Results of lesser prairie chicken space use during the breeding (A,B) and nonbreeding (C,D) season. Selection ratios greater than one indicate increased use relative to availability, whereas values less than one indicate decreased use relative to availability. In both seasons, lesser prairie-chickens used native shinnery oak habitat much more than their availability on the landscape.

NRCS Lesser Prairie-Chicken Initiative Science Support Briefing Paper November 2016

Prepared by: Scott A. Carleton, New Mexico Cooperative Fish and Wildlife Research Unit

SUBJECT: Response of lesser prairie-chickens to prescribed fire in Shinnery Oak Habitats

ISSUE: Even though little data exists on impacts of prescribed fire, grazing, and woody shrub encroachment on lesser prairie-chickens, and even less is in the peer reviewed literature, one of the top priorities for habitat conservation in the shinnery oak (*Quercus havardii*) ecoregion is removal of honey mesquite (*Prosopis glandulosa*) and development of a prescribed fire program on both public and private lands; prescribed fire is believed to benefit natural creation of different vegetation seral stages needed by lesser prairie-chickens and to prevent woody shrub encroachment. To provide science based data to inform these management decisions, the current project has four primary objectives.

METHODS: This study, using a BACI design, is set to begin fire treatments in the spring of 2016 and will examine the role of prescribed fire and mesquite removal on the seasonal space use patterns of lesser prairie chickens on the Bureau of Land Management owned Sand Ranch Area of Critical Environmental Concern. There are 3 years of pre-treatment data and a spatial control (Figure 1. Eastern portion of the study area). This property has been designated as a "stronghold" for lesser prairie-chickens by the Western Association of Fish and Wildlife Agencies.

Objectives:

1. Investigate seasonal space use of areas with recently treated mesquite, where mesquite has been removed, and where prescribed fire has been applied
2. Compare vegetative characteristics of sites before and after the application of prescribed fire and relate to use/non-use by lesser prairie-chickens across multiple breeding and non-breeding seasons
3. Measure the effects of prescribed fire on fuel reduction pre and post fire
   Determine site selection for lekking, nesting, and brood rearing in relation to mesquite removal and prescribed fire applications

EXPECTED OUTCOMES:

An understanding of the space use and demographic response of lesser prairie-chicken to prescribed fire will enable land managers to implement this conservation practice to maximize the benefits to the species.

Following the completion of this study, we will then look at the interactive effects of grazing management and fire using the same set of objectives.

A B

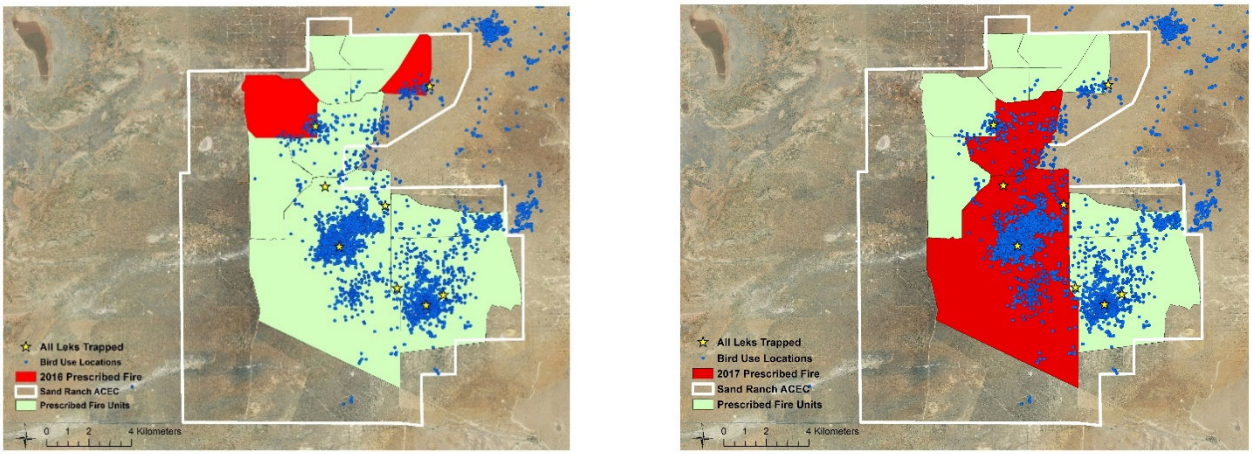


Figure 1. Location of prescribed burns performed in 2016 (A; red polygons) and units scheduled for 2017 (B; red polygons) to study space use patterns of lesser prairie-chickens (blue dots represent pre-burn movement patterns) in response to prescribed fire.

Figure 2. Aerial view of the prescribed burn on Sand Ranch in 2016.

Prepared by: Blake A. Grisham, Texas Tech University

SUBJECT: Evaulation of the Thermal Ecology of Lesser Prairie-Chickens in Relation to Land Management Practices in Eastern New Mexico

ISSUE: Microclimate as a result of vegetation structure is a critical component to lesser prairie-chicken ecology, especially in the shinnery oak ecoregion. Herbicide and grazing practices can improve suitability of landscapes for lesser prairie-chickens if used properly, but the species requires a mosaic of habitat structure and composition at a large spatial scales for various stages of their life cycle. Recognizing this, it is important to manage for a heterogeneous landscape complete with a juxtaposition of shinnery oak dominated (>100 ha) tracts that are interspersed with grassland dominated areas for lekking, nesting, and brood rearing habitat. Visual obstruction and composition of bare ground and shrubs (i.e. shinnery oak) are strongly supported as a critical indicator of nest and brood site selection and adult, nest, and brood survival for the species, yet the relationship between vegetation structure and microclimate, and the resulting thermal profile at nest locations, brood locations, and among the landscape, is not clear. In addition, no study has assessed the large-scale (>20,000 ha), long-term effects (>10 years) of various land management practice on microclimate conditions within the core distribution of the species, despite contemporary evidence that suggests the species is limited by temperature, aridity, and vegetation availability (suitable grass, shrub, and bare ground structure) at the southern distribution of its range. Therefore, an assessment of the thermal ecology of the species in eastern New Mexico is warranted, especially in relation to various land management practices in this ecoregion.

Objectives (In Progress)

1) Assess the relationship among land use practices (combination of herbicide and grazing treatments), vegetation structure, and microclimate for shinnery oak prairies within the core distribution of lesser prairie-chickens in eastern New Mexico (Figure 1).

2) Assess which, if any, land management practice resulted in cooler, wetter microclimates 15–20 years post herbicide and 13–18 years post grazing treatments, respectively (Figure 2).

3) Develop an annual (one for each year; 2015–2017) microclimate mosaic map using the information provided in objective #1.

4) Assess the relationship between microclimate and vegetation structure at fine scales.

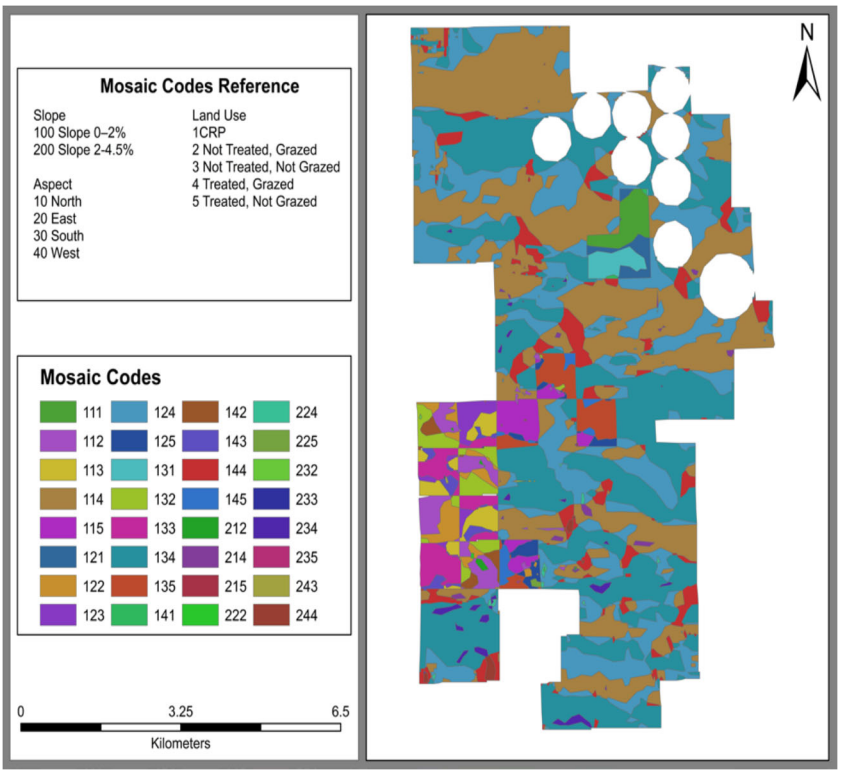


Figure 3. Landscape mosaic for the Weaver Ranch in Roosevelt County, New Mexico. Mosaics are a combination of soil type, land use, aspect, and slope.

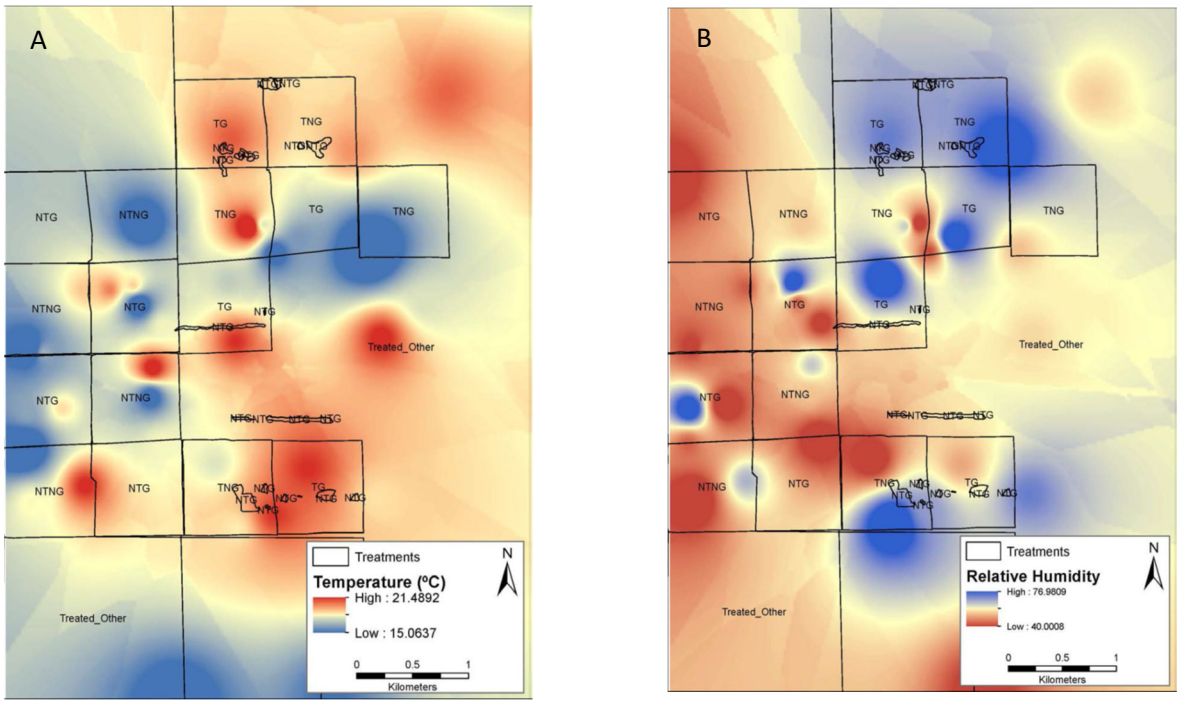


Figure 4. Preliminary landscape map of (A) temperature (°C) and humidity (B) from 69 ibuttons collected across 22 patch types (combination of slope, aspect, and land use) from 18 April–25 May 2015 in Roosevelt County, New Mexico. Gaps among ibutton locations were filled in using the spatial interpolation method of kriging.

SUBJECT: Movements and Habitat Selection of Lesser Prairie-Chickens in Conservation Reserve Program-Dominated Landscapes in the Southern High Plains of Texas

Prepared by: Samuel Harryman, Texas Tech University

ISSUE: Due to the recent listing and delisting of lesser prairie-chickens under the United States Endangered Species Act in March of 2014, new conservation practices must be designed and implemented to stem population declines across the species' range. Conservation Reserve Program lands in Kansas benefit lesser prairie-chickens during the breeding season (Fields 2004). However, little is known about lesser prairie-chicken use of CRP lands in the Southern High Plains of Texas. Leks have been documented within CRP fields, but no studies have examined nest, brood, and adult survival, habitat selection, movements, home range size, and habitat juxtaposition within CRP-dominated landscapes. Our research project will seek to answer these questions. Whether our findings suggest CRP lands are beneficial or detrimental for lesser prairie-chicken populations, they will contribute greatly to lesser prairie-chicken conservation efforts in Texas.

METHODS:

- Assess nest survival of radio-marked LEPCs in CRP dominated landscapes. This includes comparing nest survival between adults and juveniles as well as between nests placed in different types of CRP (CP1, CP2, CP38E)
- Assess habitat use and survival of LEPC broods. This will also include assessing invertebrate abundance and diversity at brood use sites.
- Assess breeding season and annual survival of male and female LEPCs. Breeding season is defined as March 15 – August 31 for females and March 1 – August 31 for males (Grisham et al. 2014).
- Assess the juxtaposition of CRP fields across the landscape and the effects of different land uses on LEPC ecology.

RESULTS: We captured 9 lesser prairie-chickens in 2015 (8 males and 1 female) and recorded 3,347 breeding season locations. Results for habitat selection (compositional analysis) are in Tables 1 and 2. In 2016, we have captured an additional 11 lesser prairie-chickens and have deployed 5 platform terminal transmitters (PTT; 4 hens, 1 male) and 3 very high frequency transmitters (all males).

CONCLUSION:

Our preliminary results suggest CRP in northern Cochran and Bailey counties, Texas, are an important component to lesser prairie-chicken ecology. In fact, CRP field were selected over all other habitat categories and relocation rarely occurred outside of CRP fields. Additionally, most locations were located within 3km of known (or nearest) leks, which is 1.8 km less than the average distance reported in the literature, suggesting CRP is likely the only available habitat for lesser prairie-chickens on the study area. Additional investigation will continue into nesting and brood rearing ecology in 2016 and 2017.

Table 1. Results from second-order compositional analysis for 9 lesser prairie-chickens with platform terminal transmitters, Cochran and Bailey Counties, Texas, 2015. Conservation reserve program lands (CRP) were selected for over other land cover types (playas, roads, and mesquite), agriculture, and native rangelands. For the 2nd order analysis, we defined used units as any land cover included in the 95% home range polygon and available units as any land cover located within 4.5 km buffer around each lek of capture.

Second Order	CRP	Range	Agriculture	Other
CRP	0 [a]	+++	+++	+++
Range	---	0	-	---
Agriculture	---	+	0	-
Other	---	+++	+	0

[a] Interpretation; +++ and + = land cover was selected over other land cover types within row, 0 = comparison of same land cover within row, - = land cover was selected less than other land cover types within row.

Table 2. Results from third-order compositional analysis for 9 lesser prairie-chickens with platform terminal transmitters, Cochran and Bailey Counties, Texas, 2015. Conservation reserve program lands (CRP) were selected for over native rangelands, agriculture, and other land cover types (playas, roads, and mesquite). For the 3rd order analysis, we defined used units as GPS relocations from each individual animal whereas we defined available units as any land cover located within the 95% home range.

Third Order	CRP	Range	Agriculture	Other
CRP	0 [a]	+	+++	+++
Range	-	0	+	+++
Agriculture	---	-	0	+
Other	---	---	-	0

[a] Interpretation; +++ and + = land cover was selected over other land cover types within row, 0 = comparison of same land cover within row, - = land cover was selected less than other land cover types within row.

SUBJECT: Historical Trends of the Landscape Structure of Plant Communities of Sand Shinnery Oak Prairie on the Southern High Plains: Establishing a Foundation for the Restoration of Lesser Prairie-Chicken Populations

Prepared by: Carlos Portillo-Quintero, Texas Tech University

ISSUE: The largest extent of the Sand Shinnery Oak Prairie (SSOP) is located at the southwestern edge of the Llano Estacado. Additional ecological forces structuring the community include weather patterns, fire, and herbivore grazing, although not nearly to extent of the associated short-grass prairie. This complex biophysical environment and its plant and animal associations form a unique ecosystem that supports endemic flora and fauna.

Due to the conservation status of the lesser prairie-chicken, recent efforts have been made to restore the historical vegetation composition of the SSOP to reverse population declines of these species. Despite the on-going efforts to restore and manage these habitats, uncertainty regarding historical plant community composition is currently hindering wide-spread implementation of efforts to restore sand shinnery oak – grass communities to historical conditions that would benefit declining species dependent on these habitats.

One of the apparent impacts has been the development of monocultures of sand shinnery oak in many areas. Although sand shinnery oak was a vital component of historical vegetation communities, the proportion and value of sand shinnery oak are subjects of an on-going debate, because of its unknown impact on the ecology of animal communities of the ecoregion. It is recognized that both lesser prairie-chickens extensively use, if not require, sand shinnery oak habitats to persist in the region. However, in response to increasing dominance of sand shinnery oak, which is poisonous during spring for pregnant cattle, the use of herbicides to control Shinnery oak have been extensive and at varying rates since the late 1970s.

Current knowledge on the historical extent and geographical distribution of vegetation types in the SSOP of the SHP is limited, and therefore, the impact of landscape structure (vegetation composition changes, habitat loss, and habitat fragmentation) on lesser prairie-chicken populations is unknown. We propose investigating the historical trends of the extent and geographical distribution of shinnery oak prairies that have occupied the SSOP in eastern New Mexico and west Texas, in order to create the baseline that will allow to answer how changes in habitat heterogeneity have shaped lesser prairie-chicken populations, and what type of landscape composition can be considered similar to historical conditions.

OBJECTIVES: (1) Using historical non-spatial and spatial data sources from the 1830s – 1930s, describe the presettlement composition of vegetation communities of the SSOP in the SHP of eastern New Mexico and west Texas.

(2) Evaluate changes in SSOP extent, composition and connectivity from the 1930s to the present day within the population range of lesser prairie-chicken in the SHP of eastern New Mexico and west Texas.

METHODS: We propose an investigation on the historical trends of extent and geographical distribution of vegetation types that inhabit the SSOP in eastern New Mexico and west Texas. The work will be completed by analyzing historical maps and documentation prior to 1930s and remotely sensed data (aerial photography and satellite imagery) collected from 1930 to the present day. The majority of the work will involve the use of geographic information systems but it will be supported by ground vegetation surveys for image classification and validation.

EXPECTED OUTCOMES: A new understanding of habitat heterogeneity that may be used to target conservation and restoration actions in the shinnery oak ecoregion.

The potential to link ecological site descriptions to empirical data about known historical vegetation in the region.