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Version 7/03

APPLICATION FOR FEDERAL ASSISTANCE

2. DATE SUBMITTED	Applicant Identifier T2-7-R, Ame #0
3. DATE RECEIVED BY STATE	State Application Identifier
4. DATE RECEIVED BY FEDERAL AGENCY AUG 24 2009	Federal Identifier T2-7-R-1, Ame. #0

1. TYPE OF SUBMISSION:

Application	Pre-application
☐ Construction	☐ Construction
☒ Non-Construction	☐ Non-Construction

5. APPLICANT INFORMATION

Legal Name: Kansas Department of Wildlife and Parks	Organizational Unit: Department:
Organizational DUNS: 878072883	Division:
Address: Street: 1020 SW Kansas Avenue, Room 200	**Name and telephone number of person to be contacted on matters involving this application (give area code)** Prefix: Mr. First Name: Carl
City: Topeka	Middle Name Robert
County: Shawnee	Last Name Magnuson
State: Kansas Zip Code 66612	Suffix:
Country: United States of America	Email: carlm@wp.state.ks.us
6. EMPLOYER IDENTIFICATION NUMBER *(EIN)*: 48-6029925	Phone Number (give area code) (785) 296-1618 / Fax Number (give area code) (785) 296-6953
8. TYPE OF APPLICATION: ☒ New ☐ Continuation ☐ Revision If Revision, enter appropriate letter(s) in box(es) (See back of form for description of letters.) ☐ ☐ Other (specify)	**7. TYPE OF APPLICANT:** (See back of form for Application Types) A. State Other (specify)
	9. NAME OF FEDERAL AGENCY: U.S. Department of Interior, Fish and Wildlife Service
10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 15-634 TITLE (Name of Program): State Wildlife Grants	**11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:** Environmental Impacts of Wind Power on Population Biology of Greater Prairie-Chickens
12. AREAS AFFECTED BY PROJECT *(Cities, Counties, States, etc.)*: Cloud, Clay, and Riley Counties	
13. PROPOSED PROJECT Start Date: 10/01/2009 Ending Date: 09/30/2011	**14. CONGRESSIONAL DISTRICTS OF:** a. Applicant 1, 2, 3, 4 b. Project 1, 2

15. ESTIMATED FUNDING: SWG 5621/5721

a. Federal	$ 145,150.00
b. Applicant	$
c. State	$ 145,150.00
d. Local	$
e. Other	$
f. Program Income	$
g. TOTAL	$ 290,300.00

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?

a. Yes. ☐ THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON

DATE:

b. No. ☐ PROGRAM IS NOT COVERED BY E. O. 12372

☒ OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT?

☐ Yes If "Yes" attach an explanation. ☒ No

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AUDITED KW & Sam DATE 8-21-09

18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT. THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.

a. Authorized Representative Prefix Mr.	First Name Terry	Middle Name E.
Last Name Denker		Suffix
b. Title Chief of Planning and Federal Aid		c. Telephone Number (give area code) (785) 296-2281
d. Signature of Authorized Representative Terry E. Denker		e. Date Signed 8/21/09

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Standard Form 424 (Rev.9-2003)
Prescribed by OMB Circular A-102

BUDGET NARRATIVE WORKSHEET

Grantee:	Kansas Department of Widlife and Parks					
Grant No:	T2-7-C			Amendment No.	0	
FAIMS Grant Agreement Segment No:	T2-7-R-1			Amendment No.	0	
Grant Title:	Environmental Impacts of Wind Power on Population Biology of Greater Parie-Chickens					
Grant Agreement Period:	From:	10/1/2009	To:	9/30/2011		
		Grant Cost				
Federal Assistance Program (Click in cell, then click side drop-down)	Fy Subactivity (AutoFill)	Grantee Share	% (AutoFill)	Federal Share	% (AutoFill)	Total Cost
State Wildlife Grants (implementation)	~~5021~~	~~$ 145,150.00~~	~~50.00%~~	~~$ 145,150.00~~	~~50.00%~~	~~$ 290,300.00~~
	5621	130,161.00	50%	130,161.00	50 %	260,322.00
	5721	14,989.00	50 %	14,989.00	50%	29,978.00
Total Cost		$ 145,150.00		$ 145,150.00		$ 290,300.00

In-Kind Match Used	YES/NO>	None	Amount>	
Describe In-Kind Match				
Estimated Program Income		None		
Method of Crediting Program Income: *(check box)*		Deductive>		Additive>

Instructions: Fill in applicable areas shaded in yellow only. Worksheet revised: 05/15/2007

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STATE: Kansas **GRANT#: T2-7-R, Amendment #0**
GRANT PERIOD: 10/1/2009 – 09/30/2011 **FAIMS#: T2-7-R-1, Ame. #0**
TITLE: Environmental Impacts of Wind Power Development on Population Biology of Greater Prairie-Chickens
SUBGRANT RECIPIENT: Kansas State University

PROJECT PURPOSE AND NEED

The United Nations Framework Convention on Climate Change has set goals for the stabilization of greenhouse gases in the atmosphere to mitigate the predicted effects of global climate change (United Nations 2002). New cost effective technologies that minimize carbon emissions will play a key role in achieving international goals (Hoffert et al. 1998). Recent advances in turbine technologies have reduced costs and generated considerable interest in the use of wind energy as an alternative source of energy. Two advantages of wind power as a renewable energy source are that it does not produce greenhouse gases or require use of fossil fuels. Globally, about 34 GW of wind power facilities were in operation at the start of 2005 and industry growth has continued to increase (AWEA 2005; 2008). In the United States, wind area resources have been developed in at least 22 states, particularly Texas (4.3 GW), California (2.4 GW), and midwestern states (Anderson et al. 1999, AWEA 2008). Estimates of wind power potential indicate that >90% of the most promising sites are located within 12 midwestern states, and future development is likely to be concentrated in this region (Weinberg and Williams 1990).

In Kansas, wind power development is planned for the Smoky Hills and Flint Hills regions of the eastern third of the state, where wind power generation can take advantage of access to an existing infrastructure of transmission lines. This region is characterized by shallow soils, limestone bedrock and steep slopes that are unsuitable for rowcrop agriculture, but support an economically important livestock grazing industry. Eastern Kansas is ecologically important because the region contains the largest remaining tracts of intact tallgrass prairie ecosystem and supports valuable biological resources (With et al. 2008, Rahmig et al. 2009).

Wind power in this region could have potential environmental impacts on grassland species including collision mortalities, habitat loss for wildlife, and reduced population viability due to demographic losses and declines in genetic diversity (Arnett et al. 2007, Drewitt and Langston 2008). Studies of the potential impacts of development require field studies using the best possible experimental design and sampling methods, to control for the spatial and temporal variation that are inherent to natural study systems (Anderson et al. 1999, Stewart et al. 2007). If wildlife impacts can be understood, then design of future wind power facilities and mitigation activities can be part of effective management and development plans.

The Greater Prairie-Chicken is an obligate grassland bird and an indicator species for unfragmented grasslands in the tallgrass prairie ecosystem. Greater Prairie-Chickens are an excellent study species for investigations of the potential impacts of wind power development on native wildlife for three major reasons.

i). Greater Prairie-Chickens are a species of conservation concern and the core of their remaining breeding range is in Kansas, Nebraska, and South Dakota (Robbins et al. 2002). Elsewhere, the Great Plains subspecies (*T. c. pinnatus*) is listed or extirpated in at least 15 states and provinces, the Attwater's Prairie-Chicken (*T. c. attwateri*) of southeast Texas is critically endangered, and the Heath Hen (*T. c. cupido*) of the northeastern states is extinct. Long-term surveys conducted by Kansas Department of Wildlife and Parks indicate that prairie-chicken numbers have been declining in Kansas over the past 30 years (Horak 1985, Haukos and Church 1996, Applegate and Horak 1999), possibly in response to changing rangeland management practices (Robbins et al. 2002).

ii). Population declines are a particular concern for Greater Prairie-Chickens because they are one of the few species of wildlife where reductions in population size and loss of genetic diversity are known to have deleterious effects on reproductive potential. Genetic comparisons of historical and modern populations of Greater Prairie-Chickens have documented declines in genetic diversity and fertility after reductions in population size (Bouzat et al. 1998*a*, Bellinger et al. 2003). In Illinois, loss of genetic diversity reduced egg viability, but translocation and release of birds from Kansas and other states successfully restored the genetic health of isolated populations (Westemeier et al. 1998*a*). Range-wide comparisons have often used Greater Prairie-Chickens in Kansas as a baseline for estimating genetic diversity for large, genetically healthy populations (Bouzat et al. 1998*b*, Johnson et al. 2003).

iii). Greater Prairie-Chickens could be a sensitive species that will be negatively impacted by disturbance from wind power development. Like other prairie grouse, prairie chickens have a lek-mating breeding system where males congregate in communal display areas, females visit leks to select mates, and then nest solitarily in grasslands away from the lek sites (Nooker and Sandercock 2008). Radio-marked Greater Prairie-chickens have large home ranges in natural, unfragmented prairie (up to 600 ha, Robel et al. 1970, Horak 1985), and females frequently move considerable distances from lek sites before nesting (up to 30 km, Schroeder 1991, Schroeder and White 1993). Thus, habitat loss may be more likely to impact prairie-chickens than other species of grassland birds. Impacts of industrial development have been documented in other species of prairie grouse. In Lesser Prairie-Chickens (*T. pallidicinctus*), nesting females avoid anthropogenic structures at distances of 1.3 to 1.4 km for transmission lines, 1.5 to 3.1 km for improved roads, and 2.0 to 2.3 km for buildings (Robel et al. 2004, Pitman et al. 2005). Disturbance from the infrastructure associated with oil and gas development impacts Greater Sage-Grouse (*Centrocercus urophasianus*) by lowering lek attendance of males, and by reducint movements and reproductive success of females (Lyon and Anderson 2003, Walker et al. 2007, Aldridge and Boyce 2007, Doherty et al. 2008).

A better understanding of the impacts of wind power on lek-mating prairie grouse such as the Greater Prairie-Chicken will have great value for planning and mitigating the effects of future wind power development. Population responses of prairie grouse to wind power development are currently unknown, but any changes in regulatory status for prairie grouse under the Endangered Species Act would have dramatic impacts on future development. Two species of prairie grouse have been petitioned for listing under the Endangered Species Act: Lesser Prairie-Chickens (listing priority number [LPN] = 2) and Greater Sage-Grouse (LPN = 6, Federal Register 2008). Both species are currently designated as 'warranted but precluded' by the U.S.

Fish and Wildlife Service because other wildlife species have been given higher priority for listing actions.

Greater Prairie-chickens are listed as a Tier I species for the Tallgrass Prairie Habitat in the Kansas State Wildlife Action Strategy. The proposed project will address 2 objectives of the Strategy outlined for Tallgrass Prairie Habitat. First, and most specifically, funds from the State Wildlife Grant will directly address issues of fragmentation and habitat loss due to wind farm development. Second, and more generally, our study is being conducted on private lands with a variety of native habitat management plans. Our study thus addresses the impact of fragmentation and habitat loss due to multiple land uses, including exurbanization and extensive row crop agriculture on the survival and recruitment of Greater Prairie-chickens. We have leks located in a continuum of land fragmentation, from large tracts of tallgrass prairie to a highly fragmented matrix of grassland and agriculture in Cloud County, Kansas.

OBJECTIVES

In this project, we will conduct an intensive population study based on a Before/After-Control/Impact (BACI) design to examine the environmental impacts of wind power on the population viability of the Greater Prairie-Chicken in eastern Kansas.

The major objectives of our field project are threefold:

i) To use post-construction monitoring to determine the environmental impacts of development of a 201 MW wind power facility on the population biology of Greater Prairie-Chickens (*Tympanuchus cupido*) in eastern Kansas;

ii) To use a Before-After/Control-Impact (BACI) study design and an integrated approach based on movement, demographic, and genetic data to test 7 hypotheses for the potential impacts of wind power development on the viability of prairie chicken populations;

iii) To develop specific recommendations for site selection and design of wind power facilities that will minimize the potential impacts of wind power development on sensitive species of prairie chickens and sage grouse throughout their continental range in the United States and Canada.

Development of wind resources could potentially impact Greater Prairie-Chickens in seven ways:

Hypothesis 1: Impacts on lek attendance.–Lek sites of Greater Prairie-Chickens tend to be associated with open areas, often on the tops of hills or ridges where visibility is good. Lek attendance can vary with time of season, lek size and other factors (Schroeder and Braun 1992, Haukos and Smith 1999, Nooker and Sandercock 2008), and prairie grouse are sensitive to disturbance from predators (Sparling and Svedarsky 1978, Boycon et al. 2004). Changes in landscape structure or configuration may lead to lek abandonment by prairie-chickens (Merrill et al. 1999, Woodward et al. 2001, Fuhlendorf et al. 2002). Wind power development could lead to lower lek attendance by prairie-chickens if noise from turbines interferes with male vocal displays, or if tall structures are perceived as a threat because they hamper detection of approaching predators or provide perch sites for raptors.

Hypothesis 2: Impacts on mating behavior.–In wildlife species with polygynous mating systems and overlapping generations, the ratio of effective to census population size (N_e/N) is usually 0.25 to 0.75 (Frankham 1995, Nunney and Elam 1994). In lek-mating grouse, however, the mating success of males is often highly skewed (Wiley 1991). In Greater Prairie-Chickens, less than 20% of males attending lek sites may obtain >80% of all copulations with visiting females (Nooker and Sandercock 2008), increasing genetic stochasticity and the potential for inbreeding (Bouzat and Johnson 2004). If male mating success is highly skewed, then the ratio of effective to actual census population size may be low. This issue is important because if the ratio N_e/N is < 0.1, then random drift can lead to loss of genetic variation, despite a large census population size (Nunney 1995, Anderson et al. 1999). Wind power development could impact population viability if male mating success is more strongly skewed because females avoid leks, visit leks for shorter periods, or change mating preferences.

Hypothesis 3: Impacts on use of breeding habitat.–Greater Prairie-Chickens require large tracts of native prairie for nesting and brood-rearing (>500 ha), and generally have the highest productivity in areas with moderate amounts of grassy cover (Bowman and Robel 1977, McKee et al. 1998, Ryan et al. 1998). Wind power development may have a direct impact on available habitat if the footprint of infrastructure is large, or if turbines and other structures are erected in habitats that are preferred for breeding. Wind power development could also lead to effective habitat loss if birds exhibit behavioral avoidance of anthropogenic structures. For example, Ring-necked Pheasants (*Phasianus colchius*) and several species of waterfowl avoid habitats that are close to wind turbines (Larsen and Madsen 2000, Larsen and Guillemette 2007, Devereux et al. 2008, Madsen and Boertmann 2008). The behavioral responses of Greater Prairie-Chickens to anthropogenic structures is unknown, but female Lesser Prairie-Chickens and Greater Sage-Grouse avoid transmission lines, improved roads, oil and gas wellheads, and buildings during nest site selection (Lyon and Anderson 2003, Pitman et al. 2005).

Hypothesis 4: Impacts on fecundity rates.–Greater Prairie-Chickens are ground-nesting birds and most reproductive losses are caused by depredation of nests and young (Svedarsky 1988, Peterson and Silvy 1996, Wisdom and Mills 1997). Wind power development could affect the population viability of prairie-chickens through impacts on nesting and brood-rearing success, if development leads to changes in the abundance or foraging activity of the predator community. Populations of potential nest predators such as corvids, coyotes and smaller mesopredators may increase if carrion from collision mortalities or refuse from human activities provide an alternative food source. Development could also impact prairie-chickens if improved roads and trails provide corridors for predator movements and easier access to nests in grassland sites (Kuehl and Clark 2002).

Hypothesis 5: Impacts on natal dispersal.–Greater Prairie-Chickens disperse considerable distances in their natal year before settling at new breeding sites (10-50 km, Hamerstrom and Hamerstrom 1973, Bowman and Robel 1977, Schroeder and Braun 1993). Long-distance dispersal is essential for maintaining connectivity within grouse populations and for colonization of new habitats (Martin et al. 2000, Fuhlendorf et al. 2002). Wind power development could affect population viability of prairie-chickens if dispersal behavior is affected by habitat fragmentation or landscape modification. Natal dispersal is risky for juvenile grouse, and movement through unfamiliar areas may lead to higher rates of juvenile mortality (Yoder et al. 2004). Finally, loss of connectivity has been shown to lead to reductions in genetic diversity in spatially-structured populations of grouse (Caizergues et al. 2003, Johnson et al. 2004).

Hypothesis 6: Impacts on survival rates.–Population viability of prairie-chickens could be reduced if wind power development increases mortality rates of juveniles or adults. Collision mortality from wind turbines is important for some sites and groups of animals (e.g., raptors, migratory birds and bats, Arnett et al. 2007, Drewitt and Langston 2008), and collisions with fence lines are a major source of mortality for Lesser Prairie-Chickens in Oklahoma (Wolfe et al. 2007). Collisions with wind turbines could increase the mortality rates of Greater Prairie-Chickens, although for most grouse populations, collisions with transmission lines and fence lines are more important as a mortality factor (Miquet 1990, Catt et al. 1994, Bevanger 1995). Changes in the predator communities associated with wind power development could also increase the mortality rates of females during the breeding period. In most grouse, incubation and brood-rearing are completed by the female alone. Female grouse are often vulnerable to predators during incubation because they rely on cryptic coloration to avoid detection (Wiebe and Martin 1998, Hannon et al. 2003). Moreover, female grouse are sometimes killed during the brood-rearing period if they attempt to defend young from predators with aggressive behavior or distraction displays (Bowman and Robel 1977, Svedarsky 1988, Sandercock 1994).

Hypothesis 7: Impacts on population size.–The cumulative impacts of wind power development on lek attendance, habitat use, dispersal and demographic performance may ultimately lead to reductions in the population size of Greater Prairie-Chickens. Declining population numbers are of concern because social facilitation is important in lek-mating grouse. The number of female visits and per capita mating success increase with lek size (Bradbury et al. 1989, Alatalo et al. 1992), and lek-mating birds may have greater risk of extirpation if leks cannot be successfully formed once population numbers are reduced to low numbers (Höglund 1996). Moreover, reductions in population size lead to reduced genetic variation in wildlife populations (Frankham 1996), including Greater Prairie-Chickens (Bouzat et al. 1998*a*, Bellinger et al. 2003).

EXPECTED RESULTS AND BENEFITS

The proposed research project will build on an already established intensive population monitoring program conducted during the preconstruction phase of wind power development, and will yield one of the first comprehensive studies of the impacts of wind power development on the biology of a grassland bird of conservation concern. The project will benefit management for Greater Prairie-Chickens by providing baseline information on ecology, demography and genetic diversity in natural and disturbed habitats. The last major studies of this species in Kansas were published over two decades ago when rangeland management practices were quite different. Baseline data on genetic diversity of Greater Prairie-Chickens will likely be important for future management of relict populations at other sites in the Midwest, as well as declining populations present within Kansas. Overall, our experimental design, strong statistical methods, and combination of movement, demographic and genetic data will provide strong inferences about the potential impacts of development in new wind resource areas. Research results from this project will be useful in planning future wind power development in Kansas, and at other major sites within the range of Lesser Prairie-Chickens and Greater Sage-Grouse. If impacts on prairie-chickens are identified in this project, the data will be used to develop mitigation activities that could include recommendations for siting of wind power facilities, changes in the seasonal or daily timing of human activity, conservation of important habitats, and suggestions for rangeland management. The knowledge resulting from our project will be of benefit to not only Greater Prairie-Chickens, but to other bird species that require native prairies or grasslands for breeding.

APPROACH

Project Results From Prior Support. Following Anderson et al. (1999), our initial experimental design was based on a Before/After-Control/Impact (BACI) approach with three replicated study sites in the Flint Hills and Smoky Hills of eastern Kansas (Fig. 1). In 2006-08, we collected population data for Greater Prairie-Chickens at *treatment* sites where wind resource development was proposed, and *reference* sites matched for similar rangeland management practices where development was not planned during the period of study.

Movement data.–We collected detailed data on movements, demography and population genetics of Greater Prairie-Chickens prior to construction of wind power facilities. In total, we located over 50 lek sites and conducted 670 lek counts. Lek attendance has been highest at northwest (Unit 3) and central sites (Unit 2) with an average of 10.1 to 11.0 birds per lek, and lower at the southern site (Unit 1) with 5.8 birds per lek. A total of 586 adult prairie-chickens have been captured 760 times with bands only attached to 378 males, and bands and radio transmitters attached to 208 females. As of December 2008, 8,560 locations of radio-marked females have been acquired by triangulation or by approaching radio-marked birds on foot, resulting in an average of 22 locations per bird. Our objective is to collect 30-50 locations per individual for estimation of home range size and space use using kernel methods for fitting surfaces to movement data. We have arranged access to private lands and have digitized geographic coordinates of anthropogenic structures on more than 70,000 ha of study area (Fig. 1). A preliminary analysis of space use and habitat selection during breeding seasons prior to the pre-construction period indicates that female prairie-chickens avoid improved roads and areas with <80% grassland cover, but show no avoidance of high capacity transmission lines.

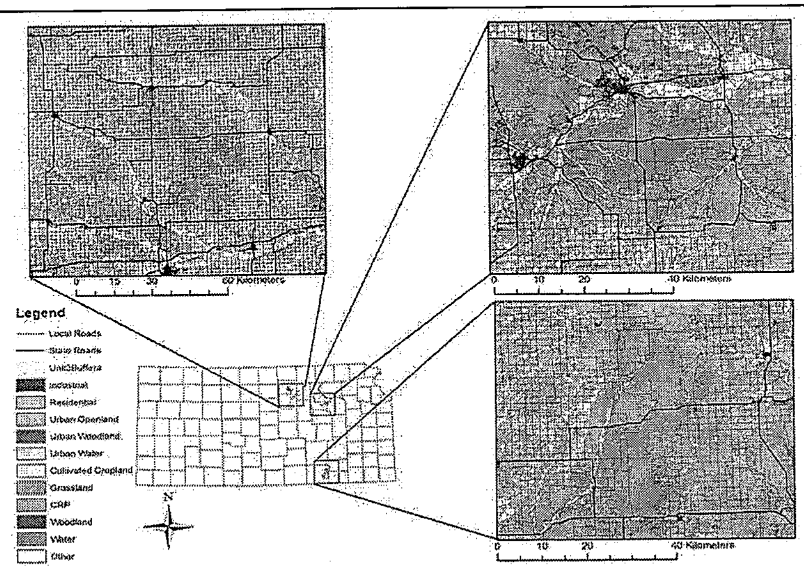


Figure 1. Location of field sites for research on Greater Prairie-chickens in eastern Kansas, 2006-08. The northwest field site (Unit 3) is the location of the 201 MW Meridian Way Wind Farm which was constructed in 2008 in Cloud Co., Kansas by Horizon Alternative Energy.

Demographic data.–Estimates of fecundity are based on a sample of 231 nests located and monitored in 2006-08. Reproductive potential is high because rates of nest initiation rate and renesting were high: 0.82 ± 0.07SE and 0.61 ± 0.09, respectively. Average clutch size of first nests and renests was large at 12.4 ± 2.3SD eggs and 10.5 eggs ± 2.5, respectively. Hatchability of eggs in successful nests was high at 0.82 chicks per egg. However, productivity was reduced by relatively low rates of nest survival: only 25 of 167 first nests and 19 of 64 renesting attempts successfully hatched and produced chicks. The majority of unsuccessful nests were destroyed by nest predators (94%), and the overall probability of nest survival controlling for exposure was 0.11 ± 0.02SE. A total of 14 of 43 broods successfully produced fledglings for an apparent brood survival rate of 33%, and 56% of chicks in successful broods survived from hatching until fledging (14-days old). Overall, fecundity was low across our study sites at 0.15 ± 0.06 female offspring produced per breeding female per year in 2006-08. Annual survival of females from March to February was 0.44 ± 0.07. A total of 108 mortality events were documented in 2006-08, and another 37 prairie-chickens were right-censored when dropped collars were recovered with no signs of mortality. A majority of mortalities (90%) were the result of predation by mammals (57%), raptors (18%), and snakes (1%). To date, only four mortalities (4%) have been the result of collisions with power lines, fences, or vehicles.

Genetic data.–From field work in 2006-08 and earlier years, we have obtained molecular data from 925 Greater Prairie-Chickens, including 517 males, 224 females and 184 juveniles. Birds have been genotyped with a suite of 11 microsatellite markers that have been optimized for use with this species. We have completed quality assurance by reanalysis of homozygotes and a random subset of heterozygotes and determined that our allelic dropout rate is <0.5%. All microsatellite loci are in Hardy-Weinberg equilibrium and none of the loci are linked. We have identified a total of 190 alleles (7 to 37 alleles per locus) which yield a probability of identity $<5.8 \times 10^{-13}$. Genetic diversity of Greater Prairie-Chickens in Kansas is high: $H_o = 0.70 \pm 0.08$, $H_e = 0.78 \pm 0.06$, and AR = 7.27 ± 1.5. Metrics of population genetics indicate mild levels of inbreeding ($F_{is} = 0.10$) and some population differentiation among our study sites ($F_{st} = 0.01$). In support of Hypotheses 2, 5 and 7, we have completed paternity testing of 184 juveniles, and conducted landscape level analyses of population connectivity and landscape fragmentation.

Proposed Research Plan. Our field project will utilize a Before/After-Control/Impact (BACI) design, but will not have replication of study sites. We initially planned for three pairs of treatment and reference sites (Fig. 1), but only 1 of 3 sites has been developed for wind power. Wind power development on this site (Unit 3) was delayed by 2 years, but has now been completed. We propose to focus our intensive population monitoring at the Meridian Way site to evaluate and compare already collected pre-construction data to the proposed post-construction monitoring during a 2-year field and laboratory effort. **Our project is a unique opportunity to measure post-construction impacts of wind power development because we have collected detailed baseline data on movements, demography and genetics on prairie chickens at both impact and reference sites.** Treatment sites will be in the footprint of the Meridian Way Wind Farm, and reference sites will be on nearby private lands selected to match treatment sites in size, topography and rangeland management. Treatment and reference sites were monitored simultaneously during the first two phases of wind power development: pre-development and construction, and this project will monitor prairie chickens during the final phase of development: operation of a fully functional wind power facility.

Study sites will be revisited to monitor existing prairie-chicken leks in mid-March, and to search for new lek locations. Our target sample sizes are to monitor 5-8 leks at the treatment and reference sites, and to capture and mark 50-80 prairie-chickens at each site per year. All lek locations will be mapped with a Global Positioning System (GPS) unit, and the number of males will be surveyed by weekly flush counts and observations from mid-March to late May. Resightings and recaptures of color-banded birds at lek sites will be used to determine annual variation in apparent survival rates, and movement rates of males among lek sites (Hagen et al. 2005).

Trapping of Prairie-Chickens.–Prairie-chickens will be captured with walk-in traps at lek sites in April and May (Nooker and Sandercock 2008). At first capture, all prairie-chickens will be uniquely marked with a combination of a numbered metal leg band and three colored leg bands (UV-resistant Darvic plastics). We will record standard morphometrics including body mass, wing chord, and tarsometatarsus length (Hagen et al. 2004). For genetic analyses, we will collect 50-100 μL of blood from each bird by clipping the outer third of a toenail on one foot. Blood will be immediately placed into 1.5 ml of Longmire's lysis buffer and stored at 4°C until DNA is extracted. Birds will be sexed by plumage characters and aged by feather patterns on the outer two primary feathers of the wing. Males are readily distinguished from females by larger body size, longer pinnae and lack of barring on the head and tail. Yearlings retain the outer two primaries from their juvenile plumage; these feathers are tapered and have less spotting than the same feathers in adults. Females will be equipped with VHF radio transmitters with an elastic necklace harness, a 6-8 hour mortality switch and an expected battery life of 12 months (Model RI-2B, Holohil Systems Ltd., Ontario, Canada). Necklace radios have no impact on the demographic rates of prairie-chickens (Hagen et al. 2006).

Monitoring of radio-marked females.–Radio-marked female prairie-chickens will be monitored by triangulation from project trucks equipped for wildlife telemetry. Project trucks are outfitted with a null-peak telemetry system with an ATS radio receiver and dual 4-element Yagi antennas mounted on a pole through the roof of the cab, a KVH Industries marine electronic compass for plotting triangulation bearings, and a Garmin GPS unit for determining vehicle position. To determine home range and seasonal survival rates, females will be relocated three times per week during the breeding season and biweekly during the nonbreeding season (Hagen et al. 2006; 2007). Bird locations will be determined from triangulation bearings from 2 or 3 positions. All locations will be recorded in Universal Transverse Mercator (UTM) coordinates. To locate nests, females will be relocated on foot when females have settled and their locations have not changed for 2-3 days. Nest locations will be marked discreetly with by a single flag placed at least 20 m from the nest bowl, and geographic coordinates will be recorded with a GPS unit. If a nest fails, the female will monitored to locate renesting attempts. If a radio remains stationary for >6-8 hours, the mortality switch will be activated, resulting in a change in the pulse rate of the radio signal. Radio-marked females will be relocated immediately whenever changes in pulse rate are detected. The event will be considered a *dropped radio* if the transmitter is found with the harness intact and no evidence of a mortality event. The event will be considered a *collision mortality* if the remains show slice marks or evidence of striking a structure. The event will be considered a *predator mortality* if the remains show evidence of bite or chew marks from a mammalian predator, or if the remains are associated with a plucking post and whitewash from a raptor. Despite rapid relocation of dead grouse, it may not be possible to eliminate scavenging as a confounding factor when trying to determine cause of death.

Monitoring of nests and broods.–Estimation of fecundity rates will be conducted using standard protocols for studies of grouse population biology (Sandercock et al. 2005*a-b*). When a nest is first discovered, the contents will be inspected to determine clutch size, and at least five eggs will be floated in a small cup of lukewarm water to determine stage of incubation. Standardized float curves will be used to predict the dates of clutch initiation and hatching (L.B. McNew, unpublished data). Nest attendance by females will be monitored by triangulation every 3-4 days throughout the incubation period. We will not flush females during laying or incubation to minimize losses to nest abandonment (Westemeier et al. 1998*b*). We will revisit nest sites if females are determined to be off of the nest for >2-3 consecutive checks. Nests will be considered *abandoned* if eggs are cold and unattended for >5 days. Nests will be considered *failed* if the eggs are destroyed by flooding, trampling by livestock or by construction equipment. Nests will be considered *depredated* if the entire clutch disappears before the expected date of hatching, or if eggshell and nest remains indicate that the eggs were destroyed by a predator. Nests surviving the incubation period will be visited every 1-2 days around the expected date of hatching. Nests will be considered *successful* if >1 egg produces a chick that leaves the nest. Egg viability will be calculated as the percentage of eggs that hatch and produce chicks, among successful eggs. Eggs that fail to hatch will be opened to determine stage of development and possible timing of embryo failure. We will collect 20 μL of blood from each chick by clipping one toenail. Blood will be stored in 0.5 ml of Queen's lysis buffer at 4°C until DNA is extracted. Successful broods will be relocated every 4-5 days in the fall, and flush counts will be used to estimate survival of chicks to fledging. Broods will be considered *successful* if >1 chick survives until fledging. Fledging success will be calculated as the percentage of chicks that survive until fledging, among successful broods. We will use dipnets and spotlights to capture >30 day old chicks by relocating radio-marked females at night. We will mark juveniles with numbered metal leg bands, record morphometrics and equip them with radio transmitters attached with glue and sutures (Pitman et al. 2005).

Genetic analyses.–DNA will be extracted from blood and muscle tissues with Qiaquick DNeasy tissue extraction kits (Qiagen, Inc.). Chicks and juvenile prairie-chickens will be sexed with a molecular probe based on the CHD-gene (Casey et al. 2009). Population structure and patterns of relatedness will be investigated with microsatellite markers (Goldstein and Pollock 1997). Building on previous work with Greater Prairie-Chickens (Bellinger et al. 2003, Johnson et al. 2004, Bouzat and Johnson 2004), we have optimized 11 microsatellite loci that work well for populations of prairie-chickens in Kansas. Each homozygous single locus genotype and a minimum of 10% of heterozygous genotypes will be rerun to assess allelic drop out. All reactions will be run with a negative control to verify there has been no contamination. Prairie-chicken genotypes will be visualized on an ABI 3730 automated sequencer.

Statistical Analyses. We will use modern statistical methods and specialized software for analyses of spatial, demographic and genetic data for Greater Prairie-Chickens.

Movement data.–A Geographic Information System based on Program ArcView (ver. 3.2) will be used for all analyses of location and movement data for prairie-chickens (Environmental Systems Research Institute). Program Locate III will be used to determine locations of radio-marked prairie-chickens from each set of triangulation bearings (Millspaugh and Marzluff 2001). Spatial information on bird locations, leks, nests, wind turbines and other anthropogenic structures will be recorded imported into ArcView in UTM coordinates. Home range size will be estimated for radio-marked birds using the 95% fixed kernel method within the Animal Movement extension for ArcView (Hooge and Eichenlaub 1997). Kernel methods improve on minimum convex polygons by using least squares cross validation to calculate smoothing parameters that fit a surface to distributions of animal locations (Gitzen and Millspaugh 2003). Kernel methods also permit investigation of resource use by comparing home range configuration to available resources with utilization distributions (Barg et al. 2005). Analyses will be restricted to birds with >25 locations and multiple records of locations at nest sites will be discarded. Distances of activity centers and nest sites to leks and anthropogenic structures will be quantified using the Nearest Feature extension for ArcView (Jenness 2004).

Demographic data.–Variation in demographic parameters will be analyzed with procedures of Program SAS appropriate for continuous (e.g., analysis of variance) and categorical data (e.g., logistic regression, contingency tables). Estimation of demographic parameters will be conducted with Program Mark, a dedicated software package for analysis of live encounter, dead recovery and radio-telemetry data that combines maximum-likelihood estimation with an information-theoretic framework (White and Burnham 1999, Sandercock 2006). The daily survival rate (DSR) of prairie-chicken nests and seasonal estimates of survival for radio-marked females will be estimated using the nest survival procedure, a general model for known fate data (Rotella et al. 2004). Encounter histories will be coded for each nest with four types of information: the day of discovery (k), the last day the nest was known to be active (l), the day the nest hatched or was discovered to have failed (m), and the fate of the nest (f, where 0 = successful and 1 = unsuccessful). Encounter histories for radioed females will use a similar format but will be coded on a 1-2 week time step. The known fate procedure improves upon nonparametric Kaplan-Meier statistics by estimating weekly survival rates with MLE methods. The apparent survival (ϕ) of adults will be calculated with Cormack-Jolly-Seber (CJS) models for live encounter data. Most indices of survival for prairie grouse are based on return rates, the percentage of birds that return to lek sites in two consecutive years. Apparent survival rates improve on return rates because they control for the probability of encounter (p), which is often < 1 in wildlife populations (Sandercock 2006). However, apparent survival rates are the product of true survival (S) and site fidelity (F), and we will use resighting information to determine the site fidelity of males to lek sites (Hagen et al. 2005).

It is possible that some demographic parameters may not be different between treatment and reference sites, but the accrued effects of impacts on demographic performance could determine population viability. To test this possibility, we will synthesize our demographic data into an age-structured population model based on pre-breeding population censuses (Wisdom and Mills 1997, Sandercock et al. 2005*a*; 2008). The model will have a maximum of three nodes for female prairie-chickens:

$$A = \begin{pmatrix} F_1 S_0 & F_2 S_0 & F_{3+} S_0 \\ S_1 & 0 & 0 \\ 0 & S_2 & S_{3+} \end{pmatrix}$$

where F and S are the age-specific fecundity and survival rates, and subscripts $i = 0$ to 3+ indicate hatch year, 1-, 2- and 3+-year-old birds. Fecundity rates will be calculated as the product of nesting attempts per female, mean clutch size, probability of nest success (calculated as DSR^n where n is the mean duration of a nesting attempt), egg viability, probability of brood success, fledging success and sex ratio. Age-specific estimates of survival will be taken from either seasonal estimates (S_0), or annual estimates (S_1 to S_{3+}). Matrices will be parameterized separately for prairie-chickens at treatment and reference sites. Three matrix properties will be calculated using algorithms of Program Matlab (ver. 6.1, Mathworks 2000): the finite rate of population change (λ), the stable age distribution ($\mathbf{w}$) and the weighted reproductive value ($\mathbf{v}$). These values will be combined to estimate the 'lower-level' sensitivity (s_x) and elasticity values (e_x) of the age-specific parameters (Caswell 2001):

$$s_x = \sum \frac{vw}{\langle \mathrm{w}, \mathrm{v} \rangle} \frac{\partial a}{\partial x} \quad \text{and} \quad e_x = \frac{x}{\lambda} s_x$$

where x = the age-specific fecundity or survival (F or S), vw and $\langle \mathrm{w}, \mathrm{v} \rangle$ are the product and scalar product of the eigenvectors v and w, and $\partial a / \partial x$ = the partial derivative of each matrix element (a) with respect to x. Sensitivity and elasticity values are prospective metrics that can be used to identify demographic parameters that would have the greatest potential impact on rates of population change.

Genetic data.–Analyses of genetic diversity and population structure within and among sites will be used to determine whether localized disturbances of wind turbines or large landscape level changes caused by roads and associated infrastructure inhibit dispersal among sites or reduce genetic diversity at leks. Genotypic data from microsatellite loci have been assessed for Hardy-Weinberg equilibrium and we have evaluated spatial variation in the population genetics of prairie-chickens by calculating estimators of genetic diversity: observed and expected heterozygosity (H_o and H_e), and allelic richness (A_r).

We will use Program Bottleneck to test for genetic evidence of rapid population declines at treatment sites (Cornuet and Luikart 1996). The Wilcoxon signed-rank test will be used to determine whether allelic diversity is reduced more quickly than heterozygosity, which would be expected shortly after a bottleneck event. We will also use the mode shift test to determine if the distribution of allele frequencies contained as many low frequency alleles as expected in drift-mutation equilibrium. We will measure the degree of isolation and gene flow within and among leks and sites using both classical population genetic approaches and new coalescent-based methods. Two measures of population differentiation, F_{st} and ρ_{st}, will be calculated using Program GenePop. Coalescent models will be used to estimate *Nm*, the effective number of migrants, using Markov-Chain Monte Carlo (MCMC) simulation with Program Migrate (Beerli and Felsenstein 2001). Estimates of population size, identification of first generation migrants, and average migration rates from genetic data will form the basis of our inference of habitat permeability.

We will compare mating system structure, reproductive success, and effective population size (N_e) between the treatment and reference sites. To analyze mating system structure and reproductive success, we will parentage analyses of chicks with Program Cervus (ver. 2.0, Marshall et al. 1998). For each offspring tested, parentage will be assigned to the most-likely candidate parent calculated from the log-likelihood statistic (δ), a measure of the confidence in parentage assignments based on the information content of the microsatellite loci. We will also compare individual relatedness among adults within leks, within sites and among sites using *R*, a genetic measure of the degree of relatedness. Positive *R*-values indicate that a given group of animals are more closely related to one another than would be expected by random assortative mating, whereas negative *R*-values provide evidence for disassortative mating. Estimates of *R* will be calculated using the jackknife procedure of Program Relatedness (ver. 5.0, Queller and Goodnight 1989). We will estimate relative effective population size using the function $\theta = 4N\mu$, and MCMC simulation with Program Migrate (Beerli and Felsenstein 2001).

For landscape genetic analyses, we will use 300 meter resolution GAP Landcover data (2005) to develop hypothetical models of habitat avoidance and preference. These hypotheses will be tested by correlating composite measures of landscape permeability among populations with pairwise genetic distance. Landscape permeability will be estimated for each hypothesized land use scenario using electrical circuit theory with the program, CircuitScape 2.2 (McRae et al. 2006). For each significant model, we will perform AIC model selection, and choose the best single model as the one most likely to represent habitat types that are most permeable to dispersal by prairie chickens among populations (Table 13). We will use the final landscape permeability model as a cost surface for cost distance analysis in Arc Info 9.2. The resulting path identified by the least cost distance analysis will be buffered at 3,000 meters and mapped back over the landcover data for Kansas, which has been reclassified to an Anderson level 1 classification landcover in raster format. These buffered regions will represent the most permeable path for prairie-chickens across the landscape and therefore may function as corridors important for maintaining connectivity and genetic exchange in the Flint Hills.

SCHEDULE

The project timetable will include trapping and marking of birds in the spring, intensive monitoring of radio-marked females in the summer, mortality and movement monitoring year-round, genetic analyses during the winter, and preparation of quarterly reports (Table 1).

Table 1. Timetable for research tasks from October 1, 2009 to September 30, 2011.												
Year 1: 2009												
Task	J	F	M	A	M	J	J	A	S	O	N	D
Survivorship/movement data										■	■	■
Year 2: 2010												
Trapping			■	■	■							
Reproductive data				■	■	■	■	■				
Survivorship/movement data	■	■	■	■	■	■	■	■	■	■	■	■
Genotyping analysis						■	■	■	■	■	■	■
Quarterly report preparation	■			■			■			■	■	■
Year 3: 2011												
Trapping			■	■	■							
Reproductive data				■	■	■	■	■				
Survivorship/movement data	■	■	■	■	■	■	■	■	■			
Genotyping analysis	■	■	■	■	■	■	■	■	■			
Quarterly report preparation	■			■			■			■		

LOCATION

Our northwest field site (Unit 3) includes the location of the 201 MW Meridian Way Wind Farm which was constructed in 2008 in Cloud Co., Kansas by Horizon Alternative Energy and the focus of research in this proposal. Unit 3 also includes reference sites on private lands in Cloud and Clay Counties. We have already received permission from private landowners and Horizon Alternative Energy to conduct these studies. Laboratory work will take place at Kansas State University in Riley County, Kansas.

DELIVERABLE PRODUCTS

Research results from the proposed project will be disseminated in four ways. First, following our existing agreement with the GS3C committee under the NWCC, the research team of Drs. Wisely and Sandercock, and PhD candidates McNew and Gregory will prepare three quarterly reports and one annual report each calendar year. Research results will be discussed in quarterly conference calls with the Technical Monitor and members of the Oversight Committee. Thus, emerging information from our field project will be critically reviewed by experts and provided to wind power industry on a regular schedule. Second, research results will be shared with wind industry partners and other attendees at national meetings of the American Wind Energy Association (AWEA) and the biennial Wind-Wildlife Research Meeting organized by the National Wind Coordinating Collaborative (NWCC). Under the ground rules of the GS3C, content of our presentations will be reviewed by members of the Technical Committee before the work is presented at national meetings. Third, research results will be prepared as scientific manuscripts and submitted for publication to peer-reviewed journals such as the *Journal of Wildlife Management*. Publication will ensure that our research results are in the public domain for critical evaluation and review. Last, the research results will be used to develop future guidelines for wind power development, including recommendations for site selection and design of wind power facilities. These recommendations and guidelines will be included in the final report to the GS3C and available to all of our constituents once the final draft has been approved. The final report will be a comprehensive document that synthesizes the results of the 6 year study.

PI Wisely has already participated in a Nature Conservancy sponsored effort to create wind power development guidelines that minimize the impacts to wildlife in the State of Kansas. This project will provide strong inferences because it will be based on comprehensive movement, demographic and genetic data for Greater Prairie-chickens. The combination of the baseline data from the past three years, the post-construction monitoring of this proposed project, and the infrastructure of the GS3C committee of the NWCC will provide a robust framework for development of recommendations with opportunities for participation and feedback from a broad-based group of stakeholders.

APPLICANT ORGANIZATION

The study is being conducted by Drs. Wisely and Sandercock who are faculty of the Division of Biology at Kansas State University. The KSU Avian Ecology Laboratory is directed by Sandercock and will be the operational center of all field-based inquiries. The KSU Conservation Genetic and Molecular Ecology Laboratory is directed by Wisely and will be the operational center of all population genetic and GIS related research. Mr. McNew and Gregory, graduate students will be responsible for the project on a daily basis. They will direct temporary field technicians. Genetic lab technicians will be directly supervised by Wisely.

All of the research resources necessary for successful completion of this field project are in place. Major resources include: four half-ton 4x4 pick up trucks for travel to field sites and hauling of trap supplies, materials for 6 complete trap sets for live capture of prairie chickens, 6 ATS radio receivers for radio telemetry, a high-speed computing facilities for analysis of spatial data with GIS software, laptop computers with software for analyses of ecological data, and specialized equipment for genetic analyses in the Conservation Genetics and Molecular Ecology Laboratory, including equipment for extraction of DNA from blood and other animal tissues, and equipment for amplification and sequencing of DNA fragments.

For the past 3 years, Wisely and Sandercock have been principal investigators on an ongoing study of the potential impacts of wind farm development of Greater Prairie-chickens. With data collected for >1000 birds, this project is well positioned to answer questions about potential impacts to prairie chickens. Since the inception of the project, oversight and review of preliminary research results from our field study of the impacts of wind power development on Greater Prairie-chickens has been conducted under the umbrella of the Grassland Shrub-Steppe Steering Committee (GS3C) of the National Wind Coordinating Collaborative (NWCC). Abby Powell and Taylor Kennedy of NWCC have served as Program Facilitators, and Karin Sinclair of the National Renewable Energy Laboratory in Boulder, Colorado has served as the Technical Monitor. The GS3C oversight committee has provided effective oversight for our research activities because the GS3C committee has included diverse representation from members of the wind power industry, state and federal wildlife agencies, and the academic community. The GS3C has developed a detailed set of ground rules for representation on the committee, for confidentiality, for review of preliminary results, and has a designated media spokesperson: Dr.

Robert J. Robel, Emeritus Professor of Wildlife Ecology, Kansas State University. Overall, the GS3C has functioned effectively as a cooperative approach for building consensus and for sharing project results with all stakeholders.

PERSONNEL QUALIFICATIONS

The 2-year project will be conducted by two faculty members and two PhD candidates in the Division of Biology at Kansas State University.

Dr. Samantha M. Wisely, PhD, is an Assistant Professor of Wildlife Biology at Kansas State University and a Research Associate at the Smithsonian Institution. Dr. Wisely directs the Conservation Genetics and Molecular Ecology Laboratory and an Ancient DNA Laboratory. She is a wildlife ecologist with expertise in conservation genetics and the ecology of mammalian predators. Her recent publications include basic research on molecular techniques for avian sexing (Casey et al. 2009), and the ecology of mustelids, including the phylogeography of fishers and wolverines (Wisely et al. 2004, Schwartz et al. 2007), and the conservation genetics of black-footed ferrets (Wisely et al. 2002; 2005; 2008*a-c*). Dr. Wisely will be the PI for this research project, and a member of the supervisory committee for the graduate students.

Dr. Brett K. Sandercock, PhD is an Associate Professor of Wildlife Ecology, and a population biologist with expertise in demographic methods and the ecology of wild grouse populations. Dr. Sandercock has 20 years of field experience working with the population biology of grouse, has published over 50 peer-reviewed research articles, and is currently an Associate Editor with the *Journal of Animal Ecology* and the *Wader Study Group Bulletin*. Recent publications include reviews of statistical models for mark-recapture analyses (Sandercock and Beissinger 2002, Sandercock 2006), and demographic studies of five species of upland gamebirds, including quail (Sandercock et al. 2008), ptarmigan (Sandercock 1994, Sandercock et al. 2005*a-b*) and prairie chickens (Hagen et al. 2005; 2006; 2007, Nooker and Sandercock 2008). Dr. Sandercock will be a co-PI for this project, and will co-advise the graduate students. Drs. Sandercock and Wisely have jointly mentored three graduate students in the past two years (1 MSc and 2 PhD). Drs. Sandercock and Wisely are committed to addressing the potential impacts of wind power on prairie-chickens, and have requested no salary support for participation in this 2-year project.

Lance B. McNew, MSc and **Andrew J. Gregory, MSc** are two PhD students who are currently coadvised by Drs. Sandercock and Wisely. McNew and Gregory have completed their graduate course work and preliminary exams, and have advanced to be PhD Candidates. Both students have 6-10 years of experience working in wildlife ecology, including 3 years of field experience working with Greater Prairie-Chickens. Their technical skills include directing large field crews of undergraduate research technicians, working with private landowners, and specialized training in field and lab techniques.

Project Budget

	Match	Federal	Total
Salaries	$ 82,506.00	$ 53,022.00	$135,528.00

Contracted Services	$ 0.00	$ 43,200.00	$ 43,200.00
Supplies	$ 26,502.00	$ 30,500.00	$ 57,002.00
Travel	$ 0.00	$ 2,000.00	$ 2,000.00
Indirect Costs	$ 36,142.00	$ 16,428.00	$ 62,570.00
Total	$145,150.00	$145,150.00	$299,300.00

The salaries section includes costs for the Principle Investigator, two graduate students, and field technicians. Contracted services include lab fees for genotyping of prairie chickens and rental of facilities. The line for supplies includes fuel, radio transmitters, lab supplies, and other items needed for the successful completion of the project. The state share is provided in part as a cash match in the form or waived costs for overhead, supplies and salaries by the subgrant recipient. No equipment with an individual value of five thousand dollars or more will be purchased with grant funds.

KSU Principal Investigator:

Dr. Samantha Wisely
116 Ackert Hall
Division of Biology
Kansas State University
Manhattan, KS 66506
Phone: 785.532.0978
FAX: 785.532.6653
Email: wisely@ksu.edu

KDWP Grant Coordinator:

Eric Johnson, Ecologist
KDWP Environmental Services
512 SE 25th Avenue
Pratt, Kansas 67124-8174
785-672-0798
ericj@wp.state.ks.us

This proposal is completely covered by categorical exclusion B(1) in 516 DM 8.5.

This proposal does not have significant adverse effects on public health or safety.

This proposal does not have significant adverse effects on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation or refuge lands; wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (Executive Order 11990); floodplains (Executive Order 11988); national monuments; migratory birds (Executive Order 13186); and other ecologically significant or critical areas under Federal ownership or jurisdiction.

This proposal does not have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA Section 102(2)(E)].

This proposal does not have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks.

This proposal does not have a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects.

This proposal does not have a direct relationship to other actions with individually insignificant but cumulatively significant environmental effects.

This proposal does not have significant adverse effects on properties listed or eligible for listing on the National Register of Historic Places as determined by either the bureau or office, the State Historic Preservation Officer, the Tribal Historic Preservation Officer, the Advisory Council on Historic Preservation, or a consulting party under 36 CFR 800.

This proposal does not have significant adverse effects on species listed, or proposed to be listed, on the List of Endangered or Threatened Species, or have significant adverse effects on designated Critical Habitat for these species.

This proposal does not have the possibility of violating a Federal law, or a State, local, or tribal law or requirement imposed for the protection of the environment.

This proposal does not have the possibility for a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898).

This proposal does not have the possibility to limit access to and ceremonial use of Indian sacred sites on Federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007).

This proposal does not have the possibility to significantly contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area or actions that may promote the introduction, growth, or expansion of the range of such species (Federal Noxious Weed Control Act and Executive Order 13112).

REFERENCES CITED

Alatalo, R. V., J. Höglund, A. Lundberg, and W. J. Sutherland. 1992. Evolution of Black Grouse leks: female preferences benefit males in larger leks. Behavioral Ecology 3:53-59.

Aldridge, C. L., and M. S. Boyce. 2007. Linking occurrence and fitness to persistence: habitat-based approach for endangered Greater Sage-Grouse. Ecological Applications 17:508-526.

American Wind Energy Association. 2005. Global wind energy market report 2005 [www document]. URL: www.awea.org/pubs/documents/globalmarket2005.pdf.

American Wind Energy Association. 2008. Wind power outlook 2008 [www document]. URL: www.awea.org/pubs/documents/Outlook_2008.pdf.

Anderson, R., M. Morrison, K. Sinclair, D. Strickland, H. Davis, and W. Kendall. 1999. Studying wind energy/bird interactions: a guidance document. National Wind Coordinating Committee, Washington, DC.

Applegate, R. D., and G. J. Horak. 1999. Status and management of the Greater Prairie Chicken in Kansas. Pages 113-122 *in* W. D. Svedarsky, R. H. Hier, and N. J. Silvy, editor. The Greater Prairie Chicken: a national look. Minnesota Agricultural Experiment Station, Miscellaneous Publication 99-1999, Saint Paul, Minnesota.

Arnett, E. B., D. B. Inkley, D. H. Johnson, R. P. Larkin, S. Manes, A. M. Manville, R. Mason, M. Morrison, M. D. Strickland, and R. Thresher. 2007. Impacts of wind energy facilities on wildlife and wildlife habitat. Wildlife Society Bulletin 30:7-49.

Barg, J. J., J. Jones, and R. J. Robertson. 2005. Describing breeding territories of migratory passerines: suggestion for sampling, choice of estimator, and delineation of core areas. Journal of Animal Ecology 74:139-149.

Beerli, P., and J. Felsenstein. 2001. Maximum likelihood estimation of a migration matrix and effective population sizes in *n* subpopulations by using a coalescent approach. Proceedings of the National Academy of Science of the United States of America 98:4563-4568.

Bellinger, M. R., J. A. Johnson, J. Toepfer, and P.O. Dunn. 2003. Loss of genetic variation in Greater Prairie Chickens following a population bottleneck in Wisconsin, U.S.A. Conservation Biology 17:717-724.

Bevanger, K. 1995. Estimates and population consequences of tetraonid mortality caused by collisions with high tension power lines in Norway. Journal of Applied Ecology 32:745-753.

Bouzat, J. L., and K. Johnson. 2004. Genetic structure among closely spaced leks in a peripheral population of Lesser Prairie-Chickens. Molecular Ecology 13:499-505.

Bouzat, J. L., H. A. Lewin, and K. N. Paige. 1998*b*. The ghost of genetic diversity past: historical DNA analysis of the Greater Prairie Chicken. American Naturalist 153:1-6.

Bouzat, J. L., H. H. Cheng, H. A. Lewin, R. L. Westemeier, J. D. Brawn, and K. N. Paige. 1998*a*. Genetic evaluation of a demographic bottleneck in the Greater Prairie Chicken. Conservation Biology 12:836-843.

Bowman, T. J., and R. J. Robel. 1977. Brood break-up, dispersal, mobility, and mortality of juvenile prairie chickens. Journal of Wildlife Management 41:27-34.

Boycon, A. R., R. M. Gibson, and J. R. Lucas. 2004. How predation risk affects the temporal dynamics of avian leks: Greater Sage Grouse versus Golden Eagles. American Naturalist 163:154-165.

Bradbury, J. W., R. M. Gibson, C. E. McCarthy, and S. L. Vehrencamp. 1989. Dispersion of displaying male Sage Grouse. II. The role of female dispersion. Behavioral Ecology and Sociobiology 24:15-24.

Caizergues, A., O. Rätti, P. Helle, L. Rotelli, L. Ellison, and J.-Y. Rasplus. 2003. Population genetic structure of male Black Grouse (*Tetrao tetrix* L.) in fragmented vs. continuous landscapes. Molecular Ecology 12:2297-2305.

Casey, A., Sandercock, B., Jones, K., and Wisely, S.M. 2009. Heteroduplex molecules cause sexing errors in a standard molecular protocol for avian sexing. Molecular Ecology Resources 9:61-65.

Catt, D. C., D. Dugan, R. E. Green, R. Moncrieff, R. Moss, N. Picozzi, R. W. Summers, and G. A. Tyler. 1994. Collisions against fences by woodland grouse in Scotland. Forestry 67:105-118.

Cornuet, J. M., and G. Luikart. 1996. Description and power analysis of two tests for detecting reent population bottlenecks from allele frequency data. Genetics 144:2001-2014.

Devereux, C. L., M. J. H. Denny, and M. J. Whittingham. 2008. Minimal effects of wind turbines on the distribution of wintering farmland birds. Journal of Applied Ecology 45:1689-1694.

Doherty, K. E., D. E. Naugle, B. L. Walker, and J. M. Graham. 2008. Greater Sage-grouse winter habitat selection and energy development. Journal of Wildlife Management 72:187-195.

Drewitt, A. L., and R. H. W. Langston. 2008. Collision effects of wind-power generators and other obstacles on birds. Annals of the New York Academy of Sciences 1134:233-266.

Federal Register. 2008. Endangered and threatened wildlife and plants; Review of native species that are listed as endangered or threatened; Annual notice of findings on resubmitted petitions; Annual description of progress on listing actions. Federal Register 73:75176-75244.

Frankham, R. 1995. Effective population size/adult population size ratios in wildlife: a review. Genetical Research, Cambridge 66:95-107.

Frankham, R. 1996. Relationship of genetic variation to population size in wildlife. Conservation Biology 10:1500-1508.

Fuhlendorf, S. D., A. J. W. Woodward, D. M. Leslie Jr, and J. S. Shackford. 2002. Multi-scale effects of habitat loss and fragmentation on Lesser Prairie-Chicken populations of the US Southern Great Plains. Landscape Ecology 17:617-628.

Gitzen, R. A., and J. J. Millspaugh. 2003. Comparison of least-squares cross-validation bandwidth options for kernel home-range estimation. Wildlife Society Bulletin 31:823-831.

Goldstein, D. B., and D. D. Pollock. 1997. Launching microsatellites: a review of mutational processes and methods of phylogenetic inference. Journal of Heredity 88:335-342.

Hagen, C. A., J. C. Pitman, B. K. Sandercock, R. J. Robel, and R. D. Applegate. 2005. Age-specific variation in apparent survival rates of male Lesser Prairie-chickens. Condor 107:78-86.

Hagen, C. A., J. C. Pitman, R. J. Robel, and R. D. Applegate. 2004. Morphology of Lesser Prairie-chickens in Kansas. Prairie Naturalist 36:95-101.

Hagen, C.A., B.K. Sandercock, J.C. Pitman, R.J. Robel, and R.D. Applegate. 2006. Radiotelemetry survival estimates of Lesser Prairie-chickens: are there transmitter biases? Wildlife Society Bulletin 34:1064-1069.

Hagen, C.A., J.C. Pitman, B.K. Sandercock, R.J. Robel, and R.D. Applegate. 2007. Age-specific survival and probable causes of mortality in female Lesser Prairie-chickens. Journal of Wildlife Management 71:518-525.
Hamerstrom, F., and F. Hamerstrom. 1973. The Prairie Chicken in Wisconsin: highlights of a 22-year study of counts, behavior, movements, turnover and habitat. Department of Natural Resources, Madison, Wisconsin.
Haukos, D. A., and K. E. Church. 1996. Evaluation of time-series analysis to forecast population indices of Greater Prairie-Chickens in Kansas. Bird Populations 3:1-13.
Haukos, D. M., and L. M. Smith. 1999. Effects of lek age on age structure and attendance of Lesser Prairie-Chickens (*Tympanuchus pallidicinctus*). American Midland Naturalist 142:415-420.
Hoffert, M.I., K. Caldeira, A.K. Jain, and E.F. Haites. 1998. Energy implications of further stabilization of atmospheric CO_2 content. Nature 395:881-884.
Höglund, J. 1996. Can mating systems affect local extinction risks? Two examples of lek-breeding waders. Oikos 77:184-188.
Hooge, P. N., and B. Eichenlaub. 1997. Animal Movement extension to ArcView, ver. 1.1. Alaska Biological Science Center, U.S. Geological Survey, Anchorage, Alaska.
Horak, G. J. 1985. Kansas Prairie Chickens. Kansas Fish and Game Commission, Pratt, Kansas.
Jenness, J. 2004. Nearest features (nearfeat.avx) extension for ArcView 3.x, ver. 3.8a. Jenness Enterprises, Flagstaff, Arizona.
Johnson, J. A., J. E. Toepfer, and P. O. Dunn. 2003. Contrasting patterns of mitochondrial and microsatellite population structure in fragmented populations of Greater Prairie Chickens. Molecular Ecology 12:3335-3347.
Johnson, J. A., M. R. Bellinger, J. E. Toepfer, and P.O. Dunn. 2004. Temporal changes in allele frequencies and low effective population size in Greater Prairie-Chickens. Molecular Ecology 13:2617-2630.
Larsen, J. K., and J. Madsen. 2000. Effects of wind turbines and other physical elements on field utilization by Pink-footed Geese (*Anser brachyrhynchus*) a landscape perspective. Landscape Ecology 15:755-764.
Larsen, J. K., and M. Guillemette. 2007. Effects of wind turbines on flight behaviour of wintering Common Eiders: implications for habitat use and collision risk. Journal of Applied Ecology 44:516-522.
Lyon, A. G., and S. H. Anderson. 2003. Potential gas development impacts on Sage Grouse nest initiation and movement. Wildlife Society Bulletin 31:486-491.
Madsen, J., and D. Boertmann. 2008. Animal behavioral adaptation to changing landscapes: spring-staging geese habituate to wind farms. Landscape Ecology 23:1007-1011.
Marshall, T. C., J. Slate, L. Kruuk, and J. M. Pemberton. 1998. Statistical confidence for likelhood-based paternity inference in natural populations. Molecular Ecology 7:639-655.
Martin, K., P. B. Stacey, and C. E. Braun. 2000. Recruitment, dispersal, and demographic rescue in spatially-structured White-tailed Ptarmigan populations. Condor 102:503-516.
McKee, G., M. R. Ryan, and L. M. Mechlin. 1998. Predicting Greater Prairie-chicken nest success from vegetation and landscape characteristics. Journal of Wildlife Management 82:314-321.
McRae, B.H., B.G. Dickson, T. H. Keith, V. BB. Shah. 2006. Using circuit theory to model connectivity in ecology, evolution, and conservation. Ecology 89: 2712-2724.

Merrill, M. D., K. A. Chapman, K. A. Poiani, and B. Winter. 1999. Land-use patterns surrounding Greater Prairie-Chicken leks in northwestern Minnesota. Journal of Wildlife Management 63:189-198.

Millspaugh, J. J., and J. M. Marzluff. 2001. Radio tracking and animal populations. Academic Press, London, UK.

Miquet, A. 1990. Mortality in Black Grouse *Tetrao tetrix* to elevated cables. Biological Conservation 54:349-355.

Nooker, J.K., and B.K. Sandercock. 2008. Phenotypic correlates and survival consequences of male mating success in lek-mating Greater Prairie-chickens (*Tympanuchus cupido*). Behavioral Ecology and Sociobiology 62:1377-1388.

Nunney, L. 1995. Measuring the ratio of effective population size to adult numbers using genetic and ecological data. Evolution 49:389-392.

Nunney, L., and D. R. Elam. 1994. Estimating the effective population size of conserved populations. Conservation Biology 8:175-184.

Peterson, M. J., and N. J. Silvy. 1996. Reproductive stages limiting productivity of the endangered Attwater's Prairie Chicken. Conservation Biology 10:1264-1276.

Pitman, J. C., C. A. Hagen, R. J. Robel, T. M. Loughin, and R. D. Applegate. 2005. Location and success of Lesser Prairie-Chicken nests in relation to vegetation and human disturbance. Journal of Wildlife Management 69:1259-1269.

Queller, D. C., and K. F. Goodnight. 1989. Estimating genetic relatedness using genetic markers. Evolution 49:258-275.

Rahmig, C. J., W. E. Jensen, and K. A. With. 2009. Grassland bird response to land management in the largest remaining tallgrass prairie. Conservation Biology 23:in press.

Robbins, M. B., A. T. Peterson, and M. A. Ortega-Huerta. 2002. Major negative impacts of early intensive cattle stocking on tallgrass prairies: the case of the Greater Prairie Chicken (*Tympanuchus cupido*). North American Birds 56:239-244.

Robel, R. J., J. A. Harrington Jr, C. A. Hagen, J. C. Pitman, and R. R. Reker. 2004. Effect of energy development and human activity on the use of sand sagebrush habitat by Lesser Prairie Chickens in southwestern Kansas. Transactions of the North American Wildlife and Natural Resources Conference 69:251-266.

Robel, R. J., J. N. Briggs, J. J. Cebula, N. J. Silvy, C. E. Viers, and P. G. Watt. 1970. Greater Prairie Chicken ranges, movements, and habitat usage in Kansas. Journal of Wildlife Management 34:286-306.

Rotella, J. J., S. J. Dinsmore, and T. L. Shaffer. 2004. Modeling nest-survival data: a comparison of recently developed methods that can be implemented in MARK and SAS. Animal Biodiversity and Conservation 27:187-205.

Ryan, M. R., L. W. Burger Jr, and D. P. Jones. 1998. Breeding ecology of Greater Prairie-chickens (*Tympanuchus cupido*) in relation to prairie landscape configuration. American Midland Naturalist 140:111-121.

Sandercock, B. K. 2006. Estimation of demographic parameters from live encounter data: a summary review. Journal of Wildlife Management 70:1504-1520.

Sandercock, B. K. 1994. The effect of manipulated brood size on parental defence in a precocial bird, the Willow Ptarmigan. Journal of Avian Biology 25:281-286.

Sandercock, B. K., K. Martin, and S. J. Hannon. 2005*a*. Demographic consequences of age-structure in extreme environments: population models for arctic and alpine ptarmigan. Oecologia 146:13-24.

Sandercock, B. K., K. Martin, and S. J. Hannon. 2005*b*. Life history strategies in extreme environments: comparative demography of arctic and alpine ptarmigan. Ecology 86:2176-2186.

Sandercock, B.K., and S.R. Beissinger. 2002. Estimating rates of population change for a neotropical parrot with ratio, mark-recapture and matrix methods. Journal of Applied Statistics 29: 589-607.

Sandercock, B.K., W.E. Jensen, C.K. Williams, and R.D. Applegate. 2008. Demographic sensitivity of population change in the Northern Bobwhite. Journal of Wildlife Management 72:970-982.

Schroeder, M. A. 1991. Movement and lek visitation by female Greater Prairie-Chickens in relation to predictions of Bradbury's female preference hypothesis of lek evolution. Auk 108:896-903.

Schroeder, M. A., and C. E. Braun. 1992. Greater Prairie-Chicken attendance at leks and stability of leks in Colorado. Wilson Bulletin 104:273-284.

Schroeder, M. A., and C. E. Braun. 1993. Partial migration in a population of Greater Prairie-Chickens in northeastern Colorado. Auk 110:21-28.

Schroeder, M. A., and G.C. White. 1993. Dispersion of Greater Prairie Chicken nests in relation to lek location: evaluation of the hot-spot hypothesis of lek evolution. Behavioral Ecology 4:266-270.

Schwartz, M.K., Aubry, K.B, McKelvey, K.S., Pilgrim, K.L., Copeland, J.P., Squires, J.R., Inman, R.M., and Wisely, S.M. 2007. Inferring geographic isolation of wolverines in California using ancient DNA. Journal of Wildlife Management. 71:2170-2179.

Sparling Jr, D. W., and W. D. Svedarsky. 1978. Responses of prairie grouse to avian and mammalian visitors on display grounds in northwestern Minnesota. Prairie Naturalist 10:17-22.

Stewart, G. B., A. S. Pullin, and C. F. Coles. 2007. Poor evidence-base for assessment of windfarm impacts on birds. Environmental Conservation 34:1-11.

Svedarsky, W. D. 1988. Reproductive ecology of female Greater Prairie Chickens in Minnesota. Pages 193-239 *in* A. T. Bergerud, and M. W. Gratson, editor. Adaptive strategies and population ecology of northern grouse. University of Minnesota Press, Minneapolis, Minnesota, USA.

United Nations. 2002. United Nations Framework Covention on Climate Change. UNEP/WMO, Climate Change Secretariat, Geneva, Switzerland [www document]. URL: unfccc.int/resource/docs/convkp/conveng.pdf

Walker, B. L., D. E. Naugle, and K. E. Doherty. 2007. Greater Sage-grouse population response to energy development and habitat loss. Journal of Wildlife Management 71:2644-2654.

Weinberg, C., and R. H. Williams. 1990. Energy from the sun. Scientific American Sept:147-155.

Westemeier, R. L., J. D. Brawn, S. A. Simpson, T. L. Esker, R. W. Jansen, J. W. Walk, E. L. Kershner, J. L. Bouzat, and K. N. Paige. 1998*a*. Tracking the long-term decline and recovery of an isolated population. Science 282:1695-1698.

Westemeier, R. L., J. E. Buhnerkempfe, and J. D. Brawn. 1998*b*. Effects of flushing nesting Greater Prairie-Chickens in Illinois. Wilson Bulletin 110:190-197.

White, G. C., and K. P. Burnham. 1999. Program MARK: survival estimation from populations of marked animals. Bird Study (Supplement) 46:S120-S139.

Wiebe, K. L., and K. Martin. 1998. Costs and benefits of nest cover for ptarmigan: changes within and between years. Animal Behaviour 56:1137-1144.

Wiley, R. H. 1991. Lekking in birds and mammals: behavioral and evolutionary issues. Advances in the Study of Behavior 20:201-291.

Wisdom, M. J., and L. S. Mills. 1997. Sensitivity analysis to guide population recovery: prairie-chickens as an example. Journal of Wildlife Management 61:302-312.

Wisely, S.M., Buskirk, S.W., Russell, G., Aubry, K. and Zielinski, W. 2004. Phylogeography and genetic diversity of the fisher (*Martes pennanti*) in a peninsular and peripheral metapopulation. Journal of Mammalogy 85: 640-648.

Wisely, S.M., Fleming, M.A., McDonald, D.B., Buskirk, S.W., and Ostrander, E.A. 2002. Genetic diversity and fitness in black-footed ferrets before and during a bottleneck. Journal of Heredity 93:231-237.

Wisely, S.M., Howard, J.G., Williams, S.A., Bain, O., Santymire, R.M., Bardsley, K.D., Williams, E.S. 2008*a*. An unidentified filarial species and its impact on fitness in wild populations of the black-footed ferret (*Mustela nigripes*). Journal of Wildlife Diseases. 44:53-64.

Wisely, S.M., Santymire, R.M., Livieri, T.M., Mueting, S.A., Howard, J.G. 2008*b*. Genotypic and phenotypic consequences of reintroduction history in the black-footed ferret (*Mustela nigripes*). Conservation Genetics. 9:389-399.

Wisely, S.M., Santymire, R.M., Marinari, P., Kreeger, J. Livieri, T., Wildt, D.E., Howard, J.G. 2005. Environment influences morphology and development of *in situ* and *ex situ* populations of the black-footed ferret. Animal Conservation 8:321-328.

Wisely, S.M., Statham, M.J., Fleischer, R.C. 2008*c*. Pleistocene refugium and Holocene expansion of a grassland dependent species, the black-footed ferret (*Mustela nigripes*). Journal of Mammalogy 89:87-96.

With, K. A., A. W. King, and W. E. Jensen. 2008. Remaining large grasslands may not be sufficient to prevent grassland bird declines. Biological Conservation 141:3152-3167.

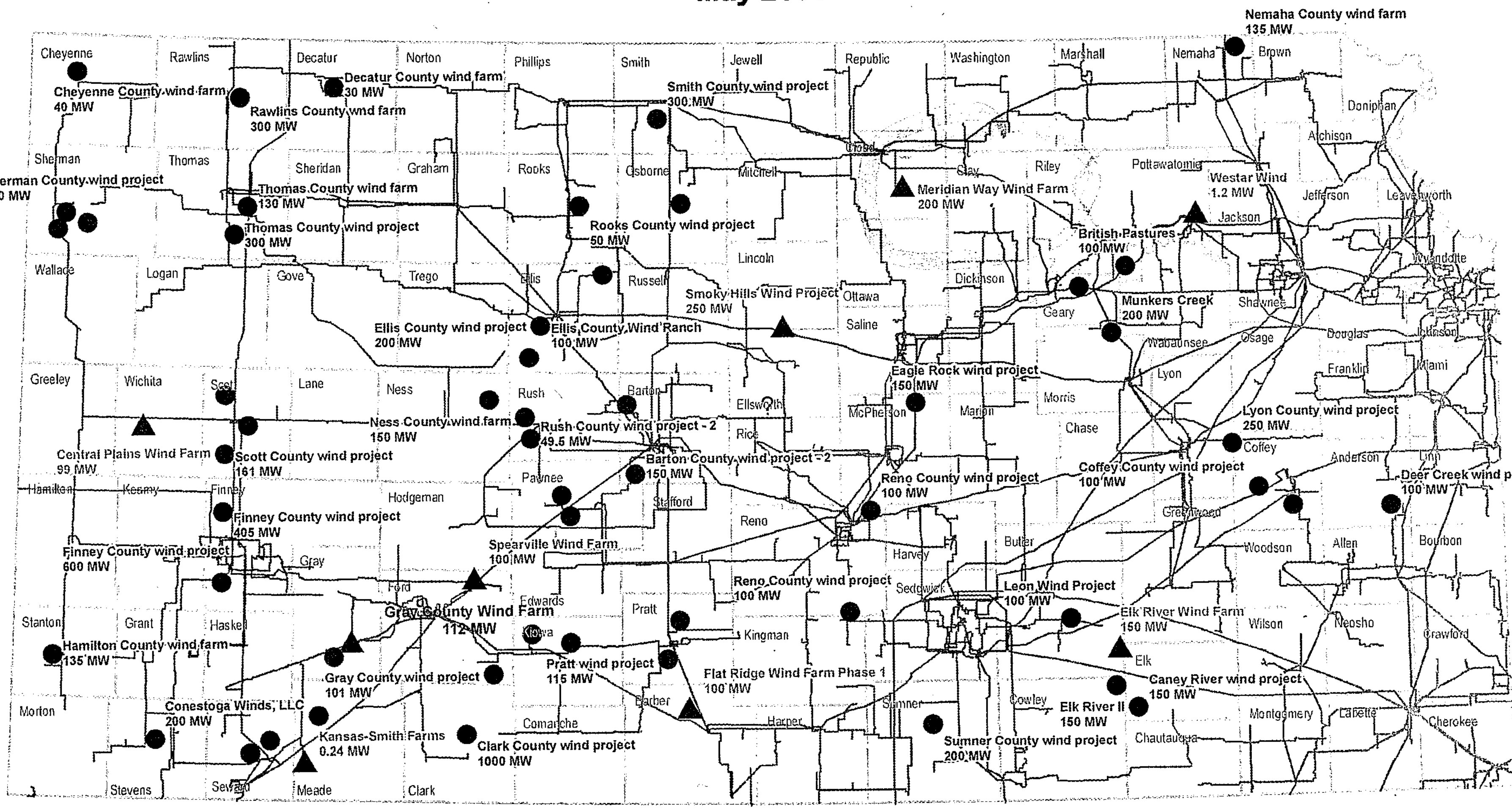
Wolfe, D. H., M. A. Patten, E. Shochat, C. L. Pruett, and S. K. Sherrod. 2007. Causes and patterns of mortality in Lesser Prairie-Chickens *Tympanuchus pallidicinctus* and implications for management. Wildlife Biology 13 (Suppl. 1):95-104.

Woodward, A. J. W., S. D. Fuhlendorf, D. M. Leslie Jr, and J. Shackford. 2001. Influence of landscape composition and change on Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) populations. American Midland Naturalist 145:261-274.

Yoder, J. M., E. A. Marschall, and D. A. Swanson. 2004. The cost of dispersal: predation as a function of movement and site familiarity in Ruffed Grouse. Behavioral Ecology 15:469-476.

Proposed and Existing Wind Projects in Kansas

May 2009



For more information on individual wind projects, go to the Kansas Energy Information Network - Wind Projects page: www.KansasEnergy.org/wind_projects.htm

Legend

Status

- ▲ Existing
- ■ Under Construction
- ● Proposed

Electrical Transmission Lines also shown

Scale: 30 15 0 30 60 Miles; 30 15 0 30 60 Kilometers

N

Projection Information:
Name: Lambert Conformal Conic
Datum: NAD83 Spheroid GRS 1980
Distance Units: meters

KEIN Kansas Energy Information Network

KANSAS
DEPARTMENT OF WILDLIFE AND PARKS

Mark Parkinson, Governor
J. Michael Hayden, Secretary

www.kdwp.state.ks.us

August 19, 2009

Mr. Carl Magnuson, Federal Aid Coordinator
Kansas Department of Wildlife & Parks
1020 S. Kansas, Suite 200
Topeka, KS 66612

RE: State Wildlife Grant – Environmental Impacts of Wind Power Development on Population Biology of Greater Prairie-Chickens

Dear Carl:

We have reviewed the above referenced project proposal for funding through the State Wildlife Grant program. The proposal will address the habitat needs and potential affect of wind energy developments on Greater Prairie-Chickens, which is listed as a Tier I species in the Kansas Comprehensive Wildlife Conservation Plan (CWCP). In addition, this project will address several issues identified for the Tallgrass Prairie Habitat in the Eastern Tallgrass Prairie Conservation Region of the Kansas CWCP, including fragmentation/habitat loss, native habitat management, and lack of data on species and habitat needs. An Environmental Assessment of the activities specified in this project was not deemed necessary as the work will occur within the guidelines of a categorical exclusion as published by the U.S. Fish and Wildlife Service in 516 DM 8.5, B(1). Departmental limitations on the use of categorical exclusions were considered and limitation factors are not present or involved with the proposed actions.

In arriving at this decision, the following items were considered:

1. **Executive Order No. 13112. Invasive Species.** The Department has regulations and guidelines to prevent the introduction of non-native or non-naturalized species into waters or lands where they have not existed, or been stocked previously. Project personnel will adhere to these guidelines and, therefore, there will be no introduction of non-indigenous organisms.

2. **Executive Order No. 11988. Floodplain Management.** Proposed activities include collection of research data in grassland-dominated systems and involve no construction activities in floodplains. As such, there will be no negative floodplain impacts.

3. **Executive Order No. 11990. Protection of Wetlands.** Proposed activities involve only the collection of data and will not result in any adverse wetland impacts.

4. **Public Law 97-98, Farmland Protection Policy Act.** Since all activities relate to the collection of data only, there will be no direct negative impact on any farmland, nor will the projects contribute to the unnecessary conversion of farmland to nonagricultural uses.

5. **National Environmental Policy Act of 1969.** Activities conducted as part of this project will involve no habitat destruction, negligible animal mortality (unintentional), and no introduction of non-indigenous organisms or contaminants.

6. **Endangered Species Act of 1973.** Project activities will focus on the collection of Greater Prairie-Chicken demographic, movement, and habitat use data in Cloud and Clay counties. Federally listed species in these counties include the Eskimo Curlew (*Numenius borealis*), Least Tern (*Sterna antillarum*), Piping Plover (*Charadrius melodus*), and Whooping Crane (*Grus Americana*). In addition, several species in need of conservation also occur in the project area. In general, research activities to be conducted during this project will have no effect on federally listed species. The only exception is that Greater Prairie-Chickens will be captured using walk-in traps and dipnets (juveniles only) for the purpose of banding, attaching radio transmitters, and collecting blood samples for DNA analysis. These capture methods are non-lethal, will be deployed in areas that typically do not support the federally listed species occurring in the project area, and are not conducive to capturing federally listed species. Further, project personnel have known expertise in the use of these capture methods. Therefore, we have determined that the proposed sampling methodology poses minimal mortality risks that **may affect, but are not likely to adversely impact** any federally listed threatened or endangered species. If any federally listed species, Tier I species other than Greater Prairie-Chickens, or Tier II species is captured during sampling, project personnel will release the individual immediately. With respect to Greater Prairie-Chickens, captured individuals will be released immediately following collection of information outlined in this proposal. In the event mortality of a federally listed species occurs, the co-principal investigators will consult the Ecological Services Field Office located in Manhattan, Kansas prior to the continuation of any sampling activity. We based this determination on a review of the project narrative, as well as threatened and endangered species location information and critical habitat designations maintained in the Departments GIS database. (See Attachment A for list of species considered in this review).

Not on FWS database

7. **Executive Order No. 12898. Environmental Justice.** This project will not have adverse human health or environmental effects on low-income populations, minority populations, or Indian tribes. Further, no activities associated with this project, or deriving from this project, will contribute to, or provide support for, discrimination of minority communities.

8. **Historical and Cultural Preservation:** Project activities will consist of collecting data relative to Greater Prairie-Chicken demography and habitat utilization. No activities will be conducted that physically disturb soils. Consequently, this project will not impact cultural or historic resources.

Sincerely,

Murray Laubhan

Murray Laubhan, Chief
Environmental Services Section

Attachment A

SPECIES CONSIDERED IN THIS REVIEW:

Endangered Species Act of 1973.

Federally-listed Threatened and Endangered Species

American Burying Beetle ***(Necrophorus americanus)***
Arkansas River Shiner ***(Notropis girardi)***
Black-capped Vireo ***(Vireo atricapillus)***
Eskimo Curlew ***(Numenius borealis)***
Gray Bat ***(Myotis grisescens)***
Indiana Bat ***(Myotis sodalis)***
Least Tern ***(Sterna antillarum)***
Mead's Milkweed ***(Asclepias meadii)***
Neosho Madtom ***(Noturus placidus)***
Pallid Sturgeon ***(Scaphirhynchus albus)***
Piping Plover ***(Charadrius melodus)***
Running Buffalo Clover ***(Trifolium stoloniferum)***
Topeka Shiner ***(Notropis topeka)***
Western Prairie Fringed Orchid ***(Platanthera praeclara)***
Whooping Crane ***(Grus americana)***

Federally-listed Proposed Species

None

Federally-listed Candidate Species

Neosho Mucket ***(Lampsilis rafinesqueana)***
Sheepnose Mussel ***(Plethobasus cyphyus)***
Lesser Prairie Chicken ***(Tympanuchus pallidicinctus)***
Arkansas Darter ***(Etheostoma cragini)***
Spectaclecase ***(Cumberlandia monodonta)***

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Kansas Department of Wildlife and Parks
Federal Aid Coordination
1020 SW Kansas, Room 200
Topeka, KS 66612

FEDERAL AID GRANT
SHPO REVIEW

The Office of Federal Aid Coordination, Kansas Department of Wildlife and Parks have reviewed the following grant in regard to its impact under Section 106 of the Historic Preservation Act. The grant is titled:

Environmental Impacts of Wind Power on Population Biology of Greater Prarie-Chickens

After review, it has been determined that this grant project meets the conditions of an "Excluded Project" as defined in the July 20, 2000 letter from the U.S. Fish and Wildlife Service, Regions 6 Office of Federal Aid. The specific exclusion that pertains to this grant project is:

> **Research Projects, Chapter 11**
> **Survey and Inventory Projects, Chapter 12**
> **-no potential to cause effects to historic resources**

As defined in this letter, this determination allows the agency to submit this grant application directly to the U.S. Fish and Wildlife Service without having the project reviewed by the State Historic Preservation Office.

If there are questions regarding the basis for this determination, please contact the undersigned.

Terry E. Denker
Terry E. Denker
Chief of Planning and Federal Aid

8/21/09
Date