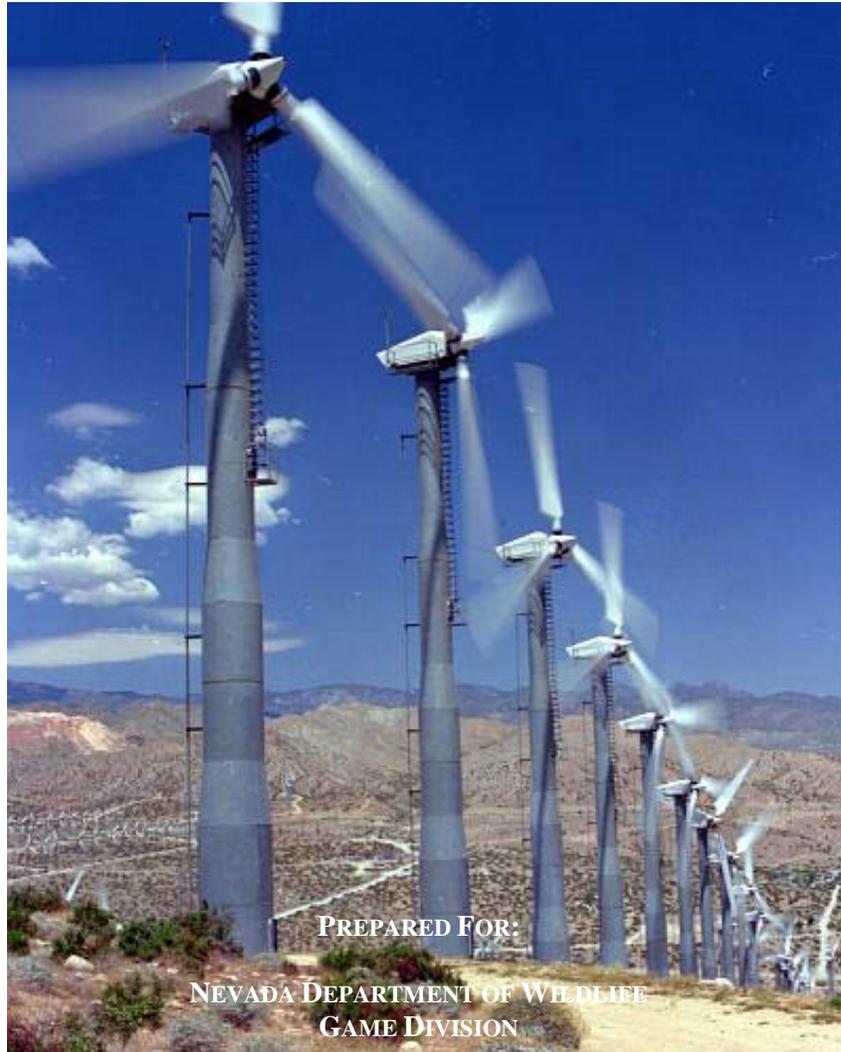


**POTENTIAL IMPACTS OF ENERGY DEVELOPMENT
ON GREATER SAGE-GROUSE
(*Centrocercus urophasianus*)
AND THEIR HABITAT IN NEVADA**

AUGUST 2008



PREPARED FOR:

NEVADA DEPARTMENT OF WILDLIFE
GAME DIVISION



PREPARED BY:

**RESOURCE CONCEPTS, INC.
AND
NEVADA DEPARTMENT OF WILDLIFE**



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**POTENTIAL IMPACTS OF ENERGY DEVELOPMENT ON GREATER SAGE-GROUSE
(*Centrocercus urophasianus*) AND THEIR HABITAT IN NEVADA**

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POTENTIAL IMPACTS OF ENERGY DEVELOPMENT ON GREATER SAGE-GROUSE IN NEVADA

SUMMARY

Given the nature of the shifting national energy policy, it is anticipated that renewable energy developments nationwide will become more prominent. Nevada's geography, geology and climate are favorable in many locations for renewable energy development including wind, solar, geothermal, and biomass. Nevada has a relatively limited power transmission capability, and as a result many prime locations for renewable energy development remain isolated from existing power grid. Non-renewable energy development in Nevada is not as prominent as in other western states; however, there are a large and growing number of oil and gas leases primarily in central and eastern Nevada. New technology and rising oil and gas prices may also result in more domestic exploration and drilling.

Approximately 87 percent of the State of Nevada is public land managed by the U.S. Department of Interior Bureau of Land Management (BLM) and the U.S. Department of Agriculture Forest Service (USFS). Many energy developments, transmission corridors, and oil and gas leases are on public lands within the range of Greater Sage-grouse (*Centrocercus urophasianus*). Although there is not a high volume of published research as of yet, existing research shows "significant impacts of energy and oil and gas development on sage-grouse" (Stiver et al 2006). According to Stiver et al. (2006) the specifics of many impacts are not well known and vary with each type of development. In general, impacts associated with transmission lines, roads and infrastructure in active sage-grouse habitat have included:

- Avoidance behavior of leks and habitat near developments and infrastructure (Lyon and Anderson 2003, Hall and Haney 1997, Braun 1998, Holloran 2005)
- Lower nest initiation rates and success (Hall and Haney 1997, Braun 1998)
- Lower lek attendance of males (Ellis 1984, Hall and Haney 1997, Walker et al. 2007)
- Populations declines (Beck et al. 2006, Connelly et al. 2000)
- Loss or degradation of critical habitat (Braun 1998, Connelly et al. 2000, Crawford et al. 2004, Walker et al. 2007)
- Increase in avian predator populations (Ellis 1984, Braun 1998)
- Collisions with power lines and vehicles (Connelly et al. 2000)

In an effort to determine the possible extent and location of these potential impact areas the Nevada Department of Wildlife (NDOW) and Resource Concepts, Inc. (RCI) conducted an inventory of renewable and non-renewable energy development in Nevada in relation to sage-grouse distributions and known lek locations.

ANALYSIS

RCI obtained 2008 GIS files from NDOW for sage-grouse habitat and sage-grouse lek locations. Seasonal sage-grouse habitat for Nesting / Early Brood, Summer and Winter were combined into a single statewide distribution map that totaled 31,917,404 acres, see Map 1. This base map was overlaid with various energy use data described below. The total acreage within the statewide sage-grouse distribution areas was tabulated for each energy development classification. It should be noted that this analysis did not distinguish between seasonal sage-grouse habitat types.

All 1,981 lek locations in the NDOW database were mapped in two categories, see Map 1. The first category included the 912 leks that NDOW has classified as “active”. Connelly et. al. (2003) defines “active” as the observation of 2 or more males on a lek in 2 or more of any of the previous 5 years. The second category included all leks classified as inactive, historic or unclassified. The total numbers of “active” and “inactive or historic” leks within a given energy use area, or specified buffer area, were tabulated.

RCI obtained GIS files from the Bureau of Land Management Nevada State Office for the following energy use areas:

- Solar Power Right-of-ways (pending and closed)
- Wind Power Right-of-ways (authorized, pending, and closed)
- Geothermal Leases (authorized)
- Power Transmission and Facility Right-of-ways (authorized)
- Oil and Gas Leases (authorized)

It should be noted that all lease and right-of-way information was provided at a sectional (1 square mile) resolution from the LR 2000 database. If any portion of a given 1-square mile section is within a lease or right-of-way, the entire section is mapped. The LR 2000 database only contains information for projects that have been submitted to BLM or other applicable land management agency, such as the US Forest Service. This information does not include right-of-ways that have been designated through land planning processes such as BLM Resource Management Plans.

Right-of-way and lease information from the LR 2000 database is classified into various categories. “Authorized” is used for projects that have been approved, but not necessarily constructed. “Pending” is for projects that have been submitted for review, but has not yet be approved or denied. “Closed” is for projects that have at some point applied for approval; however, these projects have either been denied or withdrawn from consideration. This does not mean that the project is not viable in the future, or that another project can’t be applied for in the same area.

FINDINGS

Renewable Energy Development

The following results are depicted on Map 2:

Of the 31,917,404 acres of sage-grouse range within the State of Nevada:

- None are within sections of land that contain solar energy right-of-ways
- 26,054 acres (0.1 percent) are within sections of land that contain authorized wind right-of-ways.

- 233,429 acres (0.7 percent) are within sections of land that contain closed wind right-of-ways.
- 142,816 acres (0.4 percent) are within sections of land that contain pending wind right-of-ways.
- 92,655 acres (0.3 percent) are within sections of land that contain authorized geothermal leases.

The following are depicted on Map 3:

Of the 1,069 inactive, historic or unclassified lek locations in the Nevada Department of Wildlife database:

- None are within sections of land that contain solar energy right-of-ways
- 2 (0.1 percent) are within sections of land that contain authorized wind right-of-ways
- 20 (1.0 percent) are within sections of land that contain closed wind right-of-ways
- 5 (0.3 percent) are within sections of land that contain pending wind right-of-ways
- None are within sections of land that contain authorized geothermal leases

Of the 912 active lek locations in the Nevada Department of Wildlife database:

- None are within sections of land that contain solar energy right-of-ways
- 6 (0.7 percent) are within sections of land that contain authorized wind right-of-ways
- 20 (2.2 percent) are within sections of land that contain closed wind right-of-ways
- 100 (9.4 percent) are within sections of land that contain pending wind right-of-ways
- 4 (0.4 percent) are within sections of land that contain authorized geothermal leases

Power Transmission and Facilities

The following results are depicted on Map 4:

Of the 31,917,404 acres of sage-grouse range within the State of Nevada:

- 2,152,197 acres (6.7 percent) are within sections of land that contain authorized power transmission and facility right-of-ways.

The following results are depicted on Maps 5, 6.1 and 6.2:

Of the 1,069 inactive, historic or unclassified lek locations in the Nevada Department of Wildlife database:

- None are within sections of land that contain authorized power transmission or facility right-of-ways.
- 255 (23.9 percent) are within a 1-mile (1.6 km) buffer of sections of land that contain authorized power transmission or facility right-of-ways.
- 366 (34.2 percent) are within a 2-mile (3.4 km) buffer of sections of land that contain authorized power transmission or facility right-of-ways.

Of the 912 active lek locations in the Nevada Department of Wildlife database:

- 40 (4.4 percent) are within sections of land that contain authorized power transmission or facility right-of-ways.

- 159 (17.4 percent) are within a 1-mile buffer of sections of land that contain authorized power transmission or facility right-of-ways.
- 241 (26.4 percent) are within a 2-mile buffer of sections of land that contain authorized power transmission or facility right-of-ways.

Non-Renewable Energy Development (Oil and Gas)

The following results are depicted on Map 7:

Of the 31,917,404 acres of sage-grouse range within the State of Nevada:

- 3,607,967 acres (11.3 percent) are within sections of land that contain active oil and gas leases.

The following results are depicted on Map 8:

Of the 1,069 inactive, historic or unclassified lek locations in the Nevada Department of Wildlife database:

- 113 (10.6 percent) are within sections of land that contain authorized oil and gas leases.

Of the 912 active lek locations in the Nevada Department of Wildlife database:

- 74 (8.1 percent) are within sections of land that contain authorized oil and gas leases.

Cumulative Energy Development

The following results are depicted on Map 9:

Of the 31,917,404 acres of sage-grouse range within the State of Nevada:

- 6,455,118 acres (20.2 percent) are within sections of land that contain either:
 - Solar right-of-ways (authorized, pending and closed)
 - Wind right-of-ways (authorized, pending and closed)
 - Geothermal leases (authorized)
 - Power transmission and facility right-of-ways (authorized)
 - Oil and gas leases (authorized)

The following results are depicted on Map 10:

Of the 1,069 inactive, historic or unclassified lek locations in the Nevada Department of Wildlife database:

- 210 (19.6 percent) are within sections of land that contain some form of energy leases or right-of-ways.

Of the 912 active lek locations in the Nevada Department of Wildlife database:

- 135 (14.8 percent) are within sections of land that contain some form of energy leases or right-of-ways.

Table 1: Area (acres) and percent of total sage-grouse habitat designated for various energy leases and right-of-ways within Nevada.

Energy Type	Project Classification	Acreage within sage-grouse Habitat Area	Percent of sage-grouse Habitat Affected
Solar Right-of-Ways	Authorized	DNA ¹	NA
	Pending	0	0.0%
	Closed	0	0.0%
Wind Right-of-Ways	Authorized	26,054	0.1%
	Pending	142,816	0.4%
	Closed	233,429	0.7%
Wind Subtotal:		402,299	1.2%
Geothermal Leases	Authorized	92,655	0.3%
	Pending	DNA	NA
	Closed	DNA ¹	NA
Transmission & Facility Right-of-Ways	Authorized	2,152,197	6.7%
	Pending	DNA	NA
	Closed	DNA	NA
Gas & Oil Leases	Authorized	3,607,967	11.3%
	Pending	DNA	NA
	Closed	DNA	NA
Cumulative Energy Leases & Right-of-Ways	ALL	6,455,118	20.2%

¹Data Not Available

Table 2: Number and percent of sage-grouse leks within areas designated for various energy leases and right-of-ways

Energy Type	Project Classification	Inactive, Historic and Unclassified Leks within Energy Areas of 1,069 Total	Percent of Inactive, Historic & Unclassified Leks within Energy Areas	Active Leks within Energy Areas of 912 Total	Percent of Active Leks within Energy Areas
Solar Right-of-Ways	Authorized	DNA ¹	NA	DNA	NA
	Pending	0	0.0%	0	0.0%
	Closed	0	0.0%	0	0.0%
Wind Right-of-Ways	Authorized	2	0.2%	6	0.7%
	Pending	5	0.5%	0	0.0%
	Closed	20	1.9%	20	2.2%
Wind Subtotal:		27	2.5%	26	2.9%
Geothermal Leases	Authorized	0	0.0%	4	0.4%
	Pending	DNA	NA	DNA	NA
	Closed	DNA	NA	DNA	NA
Transmission & Facility Right-of-Ways	Authorized	100	9.4%	40	4.4%
	Pending	DNA	NA	DNA	NA
	Closed	DNA	NA	DNA	NA
Transmission & Facility Right-of-Ways (1-mile/2-mile buffer)	Authorized	255/366	23.9%/34.2%	159/241	17.4%/26.4%
	Pending	DNA	NA	DNA	NA
	Closed	DNA	NA	DNA	NA
Gas & Oil Leases	Authorized	113	10.6%	74	8.1%
	Pending	DNA	NA	DNA	NA
	Closed	DNA	NA	DNA	NA
Cumulative Energy Leases & Right-of-Ways	ALL	210	19.6%	135	14.8%

¹Data Not Available

DISCUSSION AND RECOMMENDATIONS

The data obtained were sufficient to perform an initial review of the potential impacts of energy development on sage-grouse in Nevada. Existing studies have shown that impacts associated with energy development can result in a variety of impacts including: avoidance behavior of leks and habitat near developments and infrastructure, lower nest initiation rates and success, lower lek attendance of males, loss or degradation of critical habitat, increased avian predator populations, collisions with power lines and vehicles and overall declines in sage-grouse habitat and populations (Ellis 1984, Hall and Haney 1997, Braun 1998, Connelly et al. 2000, Lyon and Anderson 2003, Crawford et al. 2004, Holloran 2005, Beck et al. 2006, Walker et al. 2007). However, further analyses are needed to better understand and quantify such impacts in Nevada. The following items would aid in better understanding the impacts:

- Determine if there are data available for pertinent development on private lands, and if so incorporate it into the analysis.
- Explore existing data and tools such as sage-grouse telemetry data and satellite imagery to more clearly define breeding, nesting, brood rearing and wintering habitat.
- Use updated habitat types outlined above to expand the analysis conducted in this report to include specific impacts within each habitat type.
- Improve and update the data used for this analysis:
 - Various power companies have GIS shape files that include GPS located power lines and facilities within existing corridors; however, time did not permit to obtain the clearances necessary to be provided such information. Clearance should be sought through Sierra Pacific Power Co., Nevada Power or others, and more precise data used to perform the analysis for power transmission and facility right-of-ways.
 - The LR 2000 database did not contain information that classified pending or planned energy leases or right-of-ways, power facility and transmission right-of-ways that are included in federal planning documents, such as Range Management Plans. Steps should be taken to map planned or designated power transmission corridor right-of-ways per land management agency planning documents.
 - No distinction was made in the LR 2000 data that indicated which oil and gas leases had activity versus those that did not. Queries should be made with appropriate land management agencies in order to determine if such data could be obtained in an efficient and cost-effective manner.
 - The maps will need to be updated as more renewable and non-renewable energy development is proposed.
- Continue to review new literature and information related to renewable and non-renewable energy development impacts on Greater Sage-grouse.
- Continue to review new literature and proposed energy development project to determine if effective mitigation actions can be employed to minimize impacts to sage-grouse populations.
- Explore existing and potential biomass energy projects. Determine if these projects can be utilized to improve sage-grouse degraded habitat due to pinion-juniper encroachment.

This analysis did not account for the associated infrastructure that will be associated with much of these exploration or development activities. Utility scale facilities will have associated roads, utility lines and structures that serve as a potential source of disturbance and habitat loss. This will be difficult to quantify until facilities such as these are constructed within the sagebrush biome.

The Nevada Department of Wildlife has recently expressed concern over several wind energy proposals throughout the state. Greater wind energy potential in Nevada generally occurs at the higher elevation mountain tops and ridges. Although this renewable energy source was not found to affect a great number of active leks (2.9%), the area that these facilities may occupy is often prime nesting and brood rearing habitat that sage-grouse migrate to during the late spring and early summer months. The effects of wind energy will be difficult to simply quantify without intensive research and monitoring pre and post facility construction. It should be noted that utility scale wind energy facilities have the greatest potential to affect Greater sage-grouse as opposed to municipal or private individual scales.

A multitude of studies have shown that energy development has the potential to significantly impact sage-grouse habitat and populations in a variety of ways. This analysis further identifies the areas for potential impacts within the state of Nevada. Per Stiver et. al. (2006), it is critical that the mechanisms for impacts be understood so that appropriate management protocols can be applied. Future work should focus on identifying the critical areas within the impact zones identified by this report in addition to updating the impact zone database that has been started. Implementation of new studies, and review of existing or emerging studies should be used in order to quantify and identify the mechanisms for such impacts. From that information, appropriate management protocols can be developed and applied where appropriate.

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