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Sage Grouse and Geothermal Development: A Case Study

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ABSTRACT

The recent U.S. Fish and Wildlife decision deeming sage grouse eligible for Endangered Species Act protection could profoundly curtail geothermal development in the Western U.S. Federal and State regulators seek to apply restrictions on geothermal exploration developed from studies of oil and gas development. The author analyzes published scientific literature and uses Ormat's explorations at Glass Buttes, Oregon as a case study to show why geothermal development is unlikely to have the same impacts on sage grouse as oil and gas development. Unless regulators adopt geothermal-specific sage grouse rules, impending regulations will unduly restrict geothermal exploration at a time when other Federal and State policies seek to encourage geothermal development.

Introduction

The U.S. government has recently set forth two important policies for Federal lands in the Western US: Maintain and enhance sage grouse numbers and habitat while encouraging renewable energy development. Western states with renewable energy resources and sage grouse habitat have followed suit with these policies. For example, the Oregon Department of Fish and Wildlife (ODFW) has recently revised its Sage Grouse Conservation Strategy[1] to add restrictions on geothermal development while the State continues its many policies aimed at encouraging geothermal development.[2]

Because of the great overlap between sage grouse habitat and geothermal resources in states such as Oregon, Nevada, Idaho and Utah (Figure 1), the juxtaposition of these policies has important implications for development of the United States' geothermal

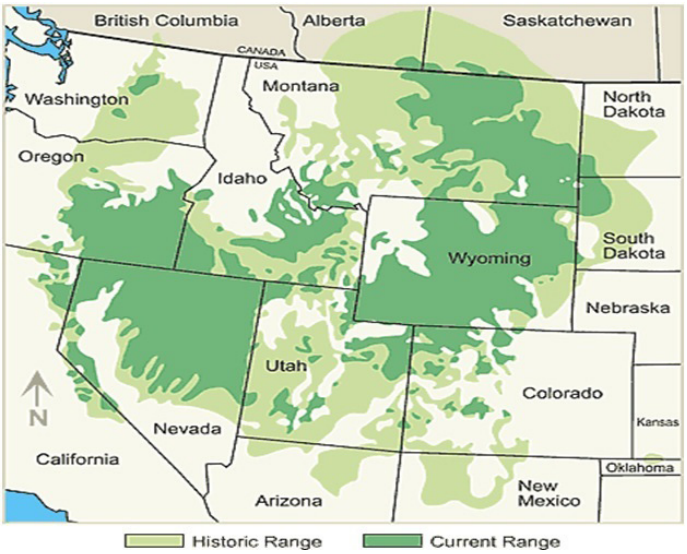

Figure 1a. Sage grouse range in the Western U.S. Source: U.S.D.A. Natural Resource Conservation Service.

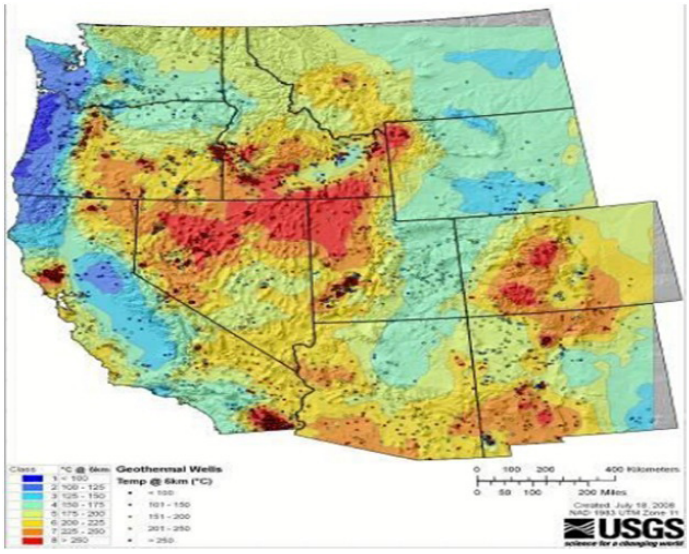

Figure 1b. Geothermal resources in the Western U.S. Source: U.S. Geological Survey.

resources. As can be seen in Figure 1, significant portions of prospective geothermal areas of Oregon, Nevada and Idaho (and, to a lesser extent, Utah) could soon be off-limits to geothermal development. Remarkably, there is no published scientific evidence regarding sage grouse and geothermal development to justify this sweeping ban.[3] Instead, available evidence supports the conclusion that a typical Basin-and-Range[4] geothermal development could be completed with no meaningful impact on sage grouse.[5]

In the absence of research on geothermal exploration and development activities, agencies such as USFWS and ODFW have applied oil and gas regulations to geothermal. There is much scientific research on the effects of oil and gas development on sage grouse. For example, biologists have amply documented the sage grouse's near extirpation from the Powder River Basin caused by development of the area's coal bed methane resource.

Regulatory agencies have reasoned that "[g]eothermal energy production is similar to oil and gas development such that it requires surface exploration, exploratory drilling, field development, and plant construction and operation,"[6] and thus geothermal should be regulated as is oil and gas. Unfortunately, such a regulatory approach overlooks key differences between oil and gas and geothermal projects and unduly and unfairly restricts geothermal exploration and development.

Research Examining Effects of Oil and Gas Development on Sage Grouse

Published scholarly research on sage grouse has examined the correlation between the number of structures (e.g., well pads, roads and transmission lines) within a set distance (e.g., 5km or 18km) from leks and the number of birds at leks.[7] Generally, these studies have concluded that oil and gas developments within two to four miles of sage grouse leks and/or nesting areas had deleterious effects on sage grouse populations.[8]

Naugle et al. (in press) is a leading sage grouse researcher who recently conducted a literature review of studies investigating the relationship between sage grouse and energy development. Naugle draws on seven scientific investigations (Table 1) to reach more specific conclusions about the relationship between oil and gas development and sage grouse declines. These studies all concerned large energy development projects covering vast areas and including numerous wells. Most significantly for sage grouse research, these projects all included areas where the density of wells near leks was extremely high. Table 2 provides examples of studied developments.

Table 1. Seven scientific studies cited by Naugle et al (in press) in reaching specific conclusions about the impacts of oil and gas development on sage grouse.

Researcher(s)	Study Location
Walker et al (2007a)	Powder River Basin (WY, MT)
Doherty et al. (2008)	Powder River Basin (WY, MT)
Lyon and Anderson (2003)	Pinedale Mesa (WY)
Holloran (2005)	Pinedale Anticline (WY)
Aldridge & Boyce (2007)	Manyberries (AB)

Naugle et al. (in press) identified a threshold of development beyond which sage grouse populations would begin to decline.

Table 2. Examples of oil and gas developments studied in sage grouse scientific literature.

Powder River Basin, WY/CO – CBM
- Study Area 24,000 km^2 (~6M acres)
- Regulatory limit of 1 well/80 acres
- 35,000 producing wells drilled
- 1 producing well ea 170 acres
- Up to 242 well pads within 5 km^2 & 2,984 wells within 18 km^2 of leks

Pinedale Anticline, WY – CBM
- Study area 2,550 km^2 (630,000 acres)
- Regulatory limit of 1 well/40 acres
- 700 producing wells
- 645km pipeline
- 445km roads
- 1 producing well ea 900 acres
- Up to 485 well pads within 5 km^2 & 5,968 wells within 18 km^2 of leks

Manyberries, AB – oil
- 150 km^2 or 37,000 acres or 57.9mi^2
- No well/acre restriction
- ~1,500 wells
- Assume 2 wells/pad
- 1 well pad ea 50 acres
- Up to 388 wells within 5 km^2 & 4,774 wells within 18 km^2 of leks

Specifically, development of more than one pad per 2.6km^2 (1.6mi^2) resulted in impacts to breeding populations. Impacts at conventional well densities – eight pads per 2.6km^2 – exceed the species' threshold of tolerance. Dougherty et al. (2008) reached a similar conclusion, finding that development of two or more well pads per section of land (640 acres or 1mi^2) diminishes the use of otherwise suitable sage-grouse winter habitat by 10 percent and with 22 wells use is diminished by 47 percent."

A second large-scale sage grouse study comes from Johnston et al. (in press), who studied the correlation between lek trends and the proximity of "a variety of natural and anthropogenic features" to leks (within 5- and 18-km radii) throughout the historic sage grouse range: 2,063,000 km2 covering 14 states and 3 provinces. These researchers found that, "[f]or the count of producing [oil and gas] wells within 5km [of leks], there was no overall effect until about 10 wells, after which the curve declined. For the count of producing [oil and gas] wells within 18 km, the pattern across all management zones suggested lower trends beginning with about 160 wells."

Comparison to Geothermal Development in Sage Grouse Habitat

The scale and density of the studied oil and gas development projects dwarfs typical geothermal developments in sage grouse habitat. Such a geothermal development would include eight-to-10 well pads (approx. four-to-five producing wells and four-to-five injecting wells). This level of development represents approximately 0.3 wells per section of land within 5km of leks. Table 3 shows a comparison of oil and gas developments to geothermal developments on key measures shown to impact sage grouse

Table 3. Comparison of oil and gas developments and geothermal developments on key measures shown to impact sage grouse populations.

Wells within 5km (19,404 acres) of leks:
- Oil and gas: 151 to 485
- Geothermal: 8 to 10

Wells within 18km (238,720 acres) of leks:
- Oil and gas: 1,865 and 5,968
- Geothermal: 8 to 10

Well density within 5km of leks:
- Oil and gas: 5 to 16 wells/section
- Geothermal: 0.3 wells/section

populations. This analysis assumes all eight-to-10 geothermal wells would be within the critical 5km circle of at least one lek.

The typical level of development required for geothermal, 0.3 geothermal wells per section within 5 km of leks, is well below Doherty et al. (2008)'s threshold of two wells per section required for a 10 percent reduction in use of winter habitat and far below the 22 wells per 988 acre threshold for 47 percent reduction in use of winter habitat. Additionally, one geothermal well per 3mi^2 within 5 km of leks is well below Naugle et al. (in press)'s threshold of one pad per 2.6km^2 for impacts to breeding populations and very far below "conventional [oil and gas] well densities" of eight pads per 2.6km^2 that exceed the species' threshold of tolerance.

Finally, 10 wells within 5 km of a lek is at Johnson et al. (in press)'s threshold for lek decline of 10 wells within 5 km of lek. But 10 oil and gas wells are likely to have more impact than 10 geothermal wells because many of the oil and gas developments studied in the scientific literature had no seasonal restrictions on operations such restrictions are routinely placed on geothermal drilling in sage grouse habitat. No published studies have examined mitigation measures such as seasonal drilling restrictions.

Conclusion

Research on oil and gas projects is relevant to understanding how geothermal development may impact sage grouse, but key differences in development density, size and operation may mean that the impacts documented may not be generalizable to geothermal development.

References

[1] Available at http://www.dfw.state.or.us/wildlife/sagegrouse/docs/20110301_GRSG_March_final_red.pdf (last visited April 13, 2011).

[2] Perhaps the two most notable of which are Oregon's ambitious "25 by 25" RPS law (http://www.oregon.gov/ENERGY/RENEW/docs/Oregon_RPS_Summary_Oct2007.pdf?ga=t) and the Business Energy Tax Credit (BETC), which can provide significant assistance for utility-scale geothermal projects (http://www.oregon.gov/ENERGY/CONS/BUS/tax/BETC-Renewables.shtml#Tier_Three___projected_facility_costs_____6_000_000) (last visited April 13, 2011).

[3] "Currently there is a lack of specific information about the effects of renewable energy development [*inc. geothermal*] on sage grouse ecology." ODFW Draft Plan, p. 104. "Best management practices for minimizing the effects of geothermal development and operations on sage-grouse are guidance only and are general in nature." BLM and USFWS 2008a, pp. 4.82-4.83.

[4] Basin-and-Range is the name of the geologic province and distinctive geothermal resource type roughly co-extensive with sage grouse habitat in the Western U.S.

[5] Ironically, geothermal energy mitigates one of the greatest threats to sage grouse, habitat changes caused by global warming (see ODFW Final Plan, p. 45) (last visited April 13, 2011).

[6] USFWS Proposed Rule, p. 43.

[7] Counts of males at leks during breeding season is considered a reliable indicator of population size and health.

[8] Lyon and Anderson 2003, Holloran 2005, Walker et al 2007.