Greater Sage-grouse and Power Lines: Reasons for Concern

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Michael A. Schroeder

Washington Department of Fish and Wildlife
P.O. Box 1077, Bridgeport, WA 98813; schromas@dfw.wa.gov

Introduction

The purpose of this brief report is to highlight some of the information directly related to power lines within greater sage-grouse (*Centrocercus urophasianus*) management areas (Fig. 1). The need for additional energy sources, especially sources that are considered 'green', is an important development issue in the state of Washington. As the pressure to expand these developments into remnant areas of native habitat increases, it is important that we consider the potential impacts on our wildlife resources.

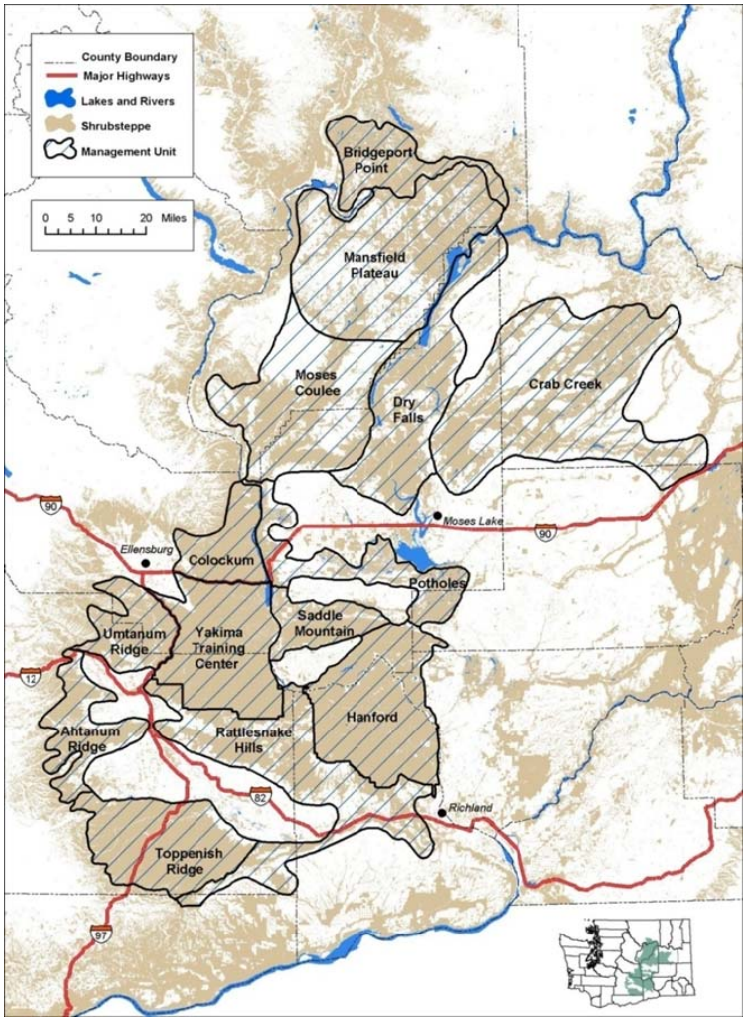

Fig. 1. Greater sage-grouse management units in relation to shrubsteppe cover in Washington.

Potential impacts

The impacts of power lines can be direct and indirect. Direct impacts consist of collisions with power lines and/or mortality due to predation associated with power lines. These issues are not mutually exclusive since grouse are more likely to fly into obstacles when they are pursued by predators. While there has been only one documented collision of a greater sage-grouse with a wind turbine (Foote Creek Rim Wind Farm in Wyoming), documented collisions with power lines are frequent (including in Douglas County in Washington State). The increase in predation has often been cited as a ramification of power lines. Potential mechanisms for this increase may be the creation of additional raptor perches and/or nesting structures for raptors and common ravens (*Corvus corax*, primary nest predators).

The indirect impacts of power lines are the most difficult to measure, but may be the most important. The Washington Department of Fish and Wildlife's (Stinson et al. 2004) sage-grouse recovery plan focuses on the potential for behavioral avoidance of vertical structures like towers. This is consistent with other documents including the U.S. Fish and Wildlife Service (2003) interim wind power guidelines recommending avoidance of turbine placement "in habitat known to be occupied by prairie grouse" or "within 5 miles of known leks". The justification for this recommendation was the instinctive avoidance by prairie grouse of tall structures, even where anti-perching devices were used (Manes et al. 2002).

In California, power lines resulted in sage-grouse lek abandonment and reduced lek attendance up to 3 miles away (Rodgers 2003; F. Hall, pers. comm.). In Colorado, pellet transects illustrated declining habitat use by sage-grouse up to 600 meters from power lines (Braun 1998). In Washington, 19 of 20 leks (95%) documented within 7.5 km of 500 kV power lines are now vacant, while the vacancy rate for leks further than 7.5 km is 59% (22 of 37 leks, Fig. 2).

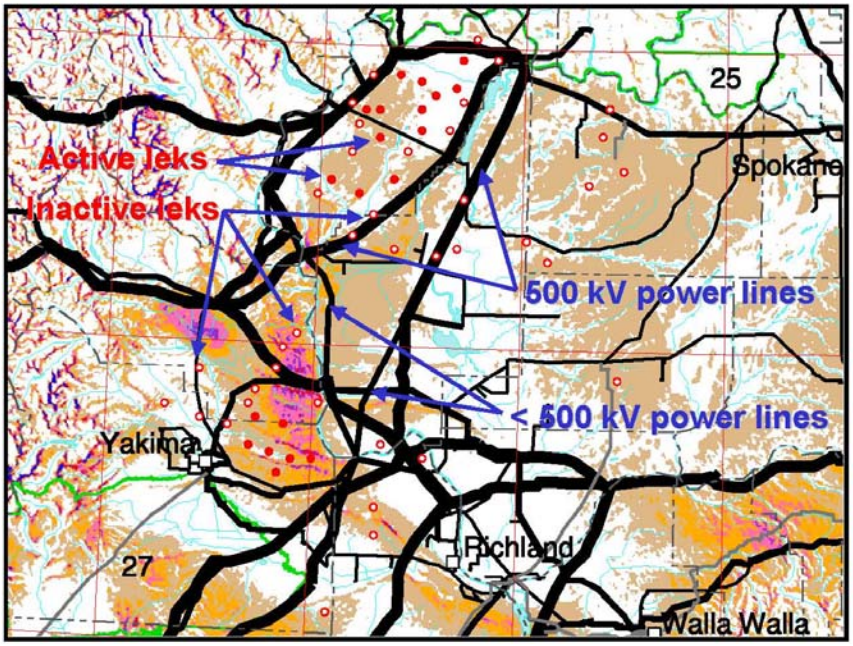

Fig. 2. Distribution of power lines and greater sage-grouse leks in central Washington.

In contrast to the previous studies, no effect of power lines was detected on long-term trends in attendance of males at leks throughout the sage-grouse distribution in North America (Johnson et al. 2010, Fig. 3). However in the case of the Johnson study the vast majority of the powerlines were in place before the 1997-2007 study period and the effects of the power lines may have already been manifested in the persistence of leks. Consequently, these results may not contradict the data for Washington and California.

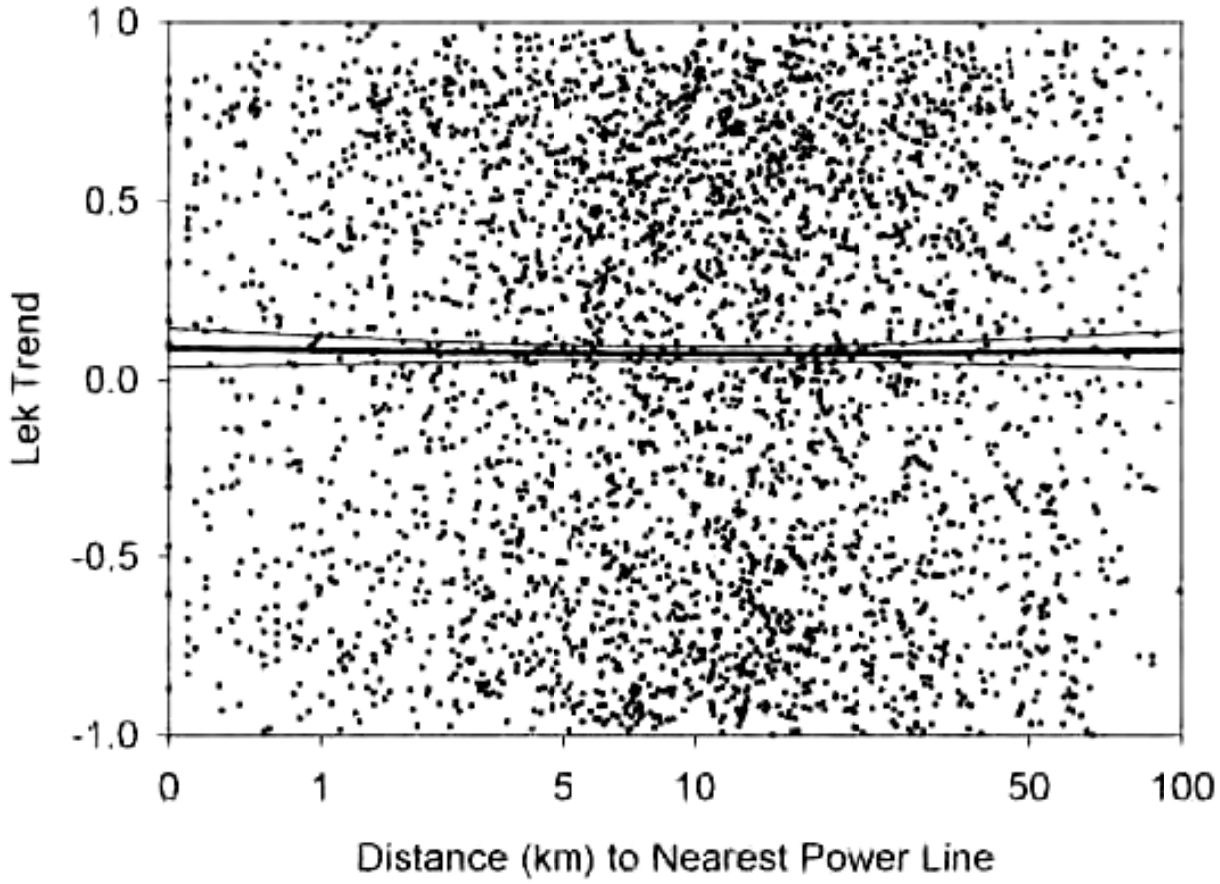

Fig. 3. Trends in annual male attendance at greater sage-grouse leks in North America between 1997 and 2007 in relation to distance to the nearest power line (Johnson et al. 2010).

Additional research is emerging from the states of Nevada and Oregon on power lines. In Nevada a 345 kV power line was constructed in 2003 in sage-grouse habitat. The design for the power line was specifically chosen to minimize opportunities for raptor perches and raven nests. The structures included design options, but also perch and nest deterrents. Despite the deterrents raven nests increased throughout the course of the study. By 2009, male attendance at leks in the vicinity of the power lines had decreased 25% (Clark and Espinosa 2009). The reason for the lag effect in response time appears to be a function of sage-grouse lifespan and fidelity (Schroeder and Robb 2003). For example, sage-grouse females appear to return to their previous year's nesting area despite changes in habitat quality that may have negative impacts on nest success. In contrast young birds may be less likely to recruit to areas that have declining habitat quality. The response to construction of a 250 kV power line in Oregon appeared to be a little more immediate (Oregon Department of Fish and Wildlife 2009, Fig. 4).

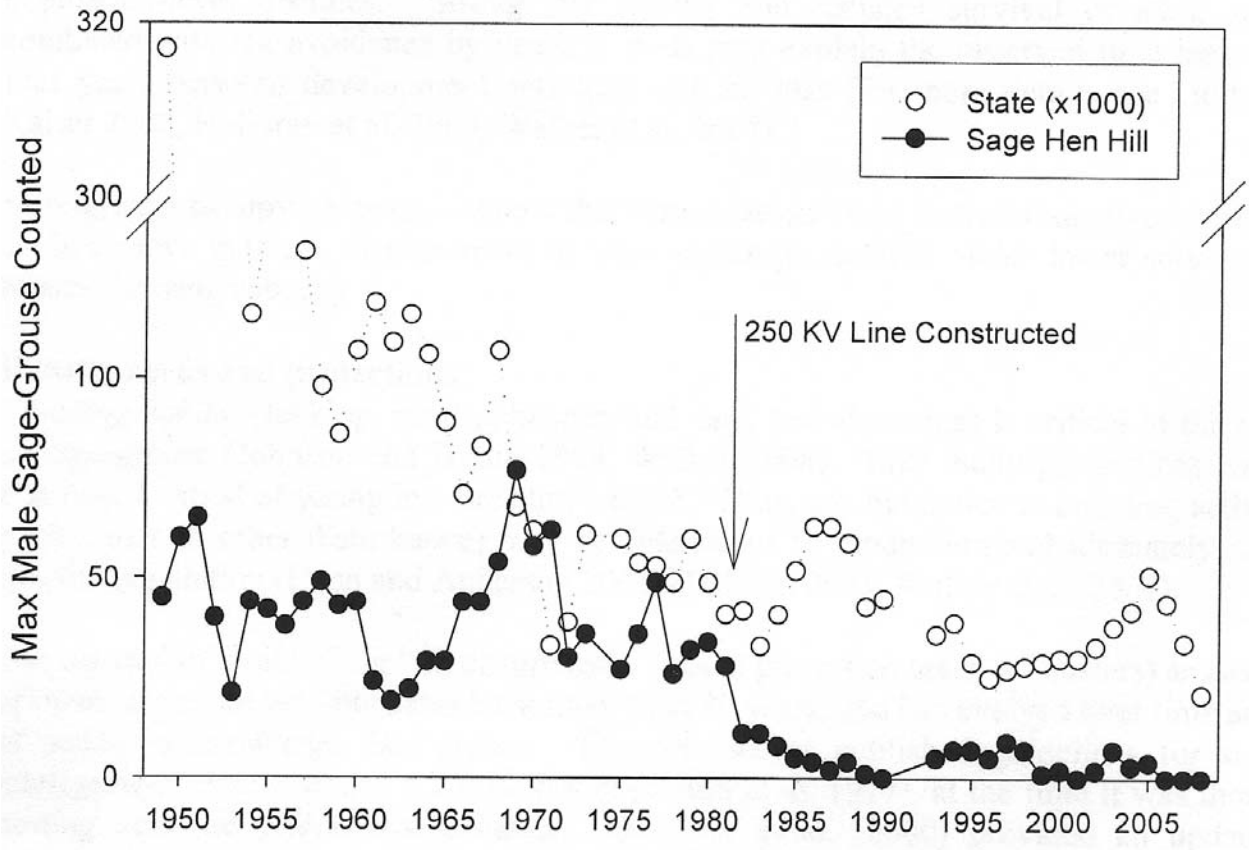

Fig. 4. Lek counts at Sage Hen Hill in Oregon, 1949-2008, relative to lek counts throughout the state of Oregon (Oregon Department of Fish and Wildlife 2009).

Other species

The greater sage grouse is not the only species of grouse potentially impacted by power lines. In the case of lesser prairie-chickens (*Tympanuchus pallidicinctus*) the negative effects of power lines is dramatic. The average displacement of prairie-chicken use sites in Kansas was about 450 meters from power lines and the average displacement of nests was about 650 meters from power lines (Hagen et al. 2004). These observations were similar to those in Oklahoma where the displacement of lesser prairie-chickens from a power line was at least 500 meters (Pruett et al. 2009), despite the fact that research included a relatively pristine and protected grassland (Fig. 5).

Summary

The effects of power lines are difficult to precisely quantify, but most of the evidence shows that a negative effect is likely. It is still unclear if the negative impacts of power lines are due to increased predation opportunities for ravens and raptors or whether the impacts are due to avoidance by sage-grouse. It is also possible that the impacts of power lines reflect a combination of both direct and indirect factors. In any case, the impacts appear to be manifested over a relatively long-term (at least 5 years after construction in most cases) and that the impacts are difficult to avoid once the structures are in place.

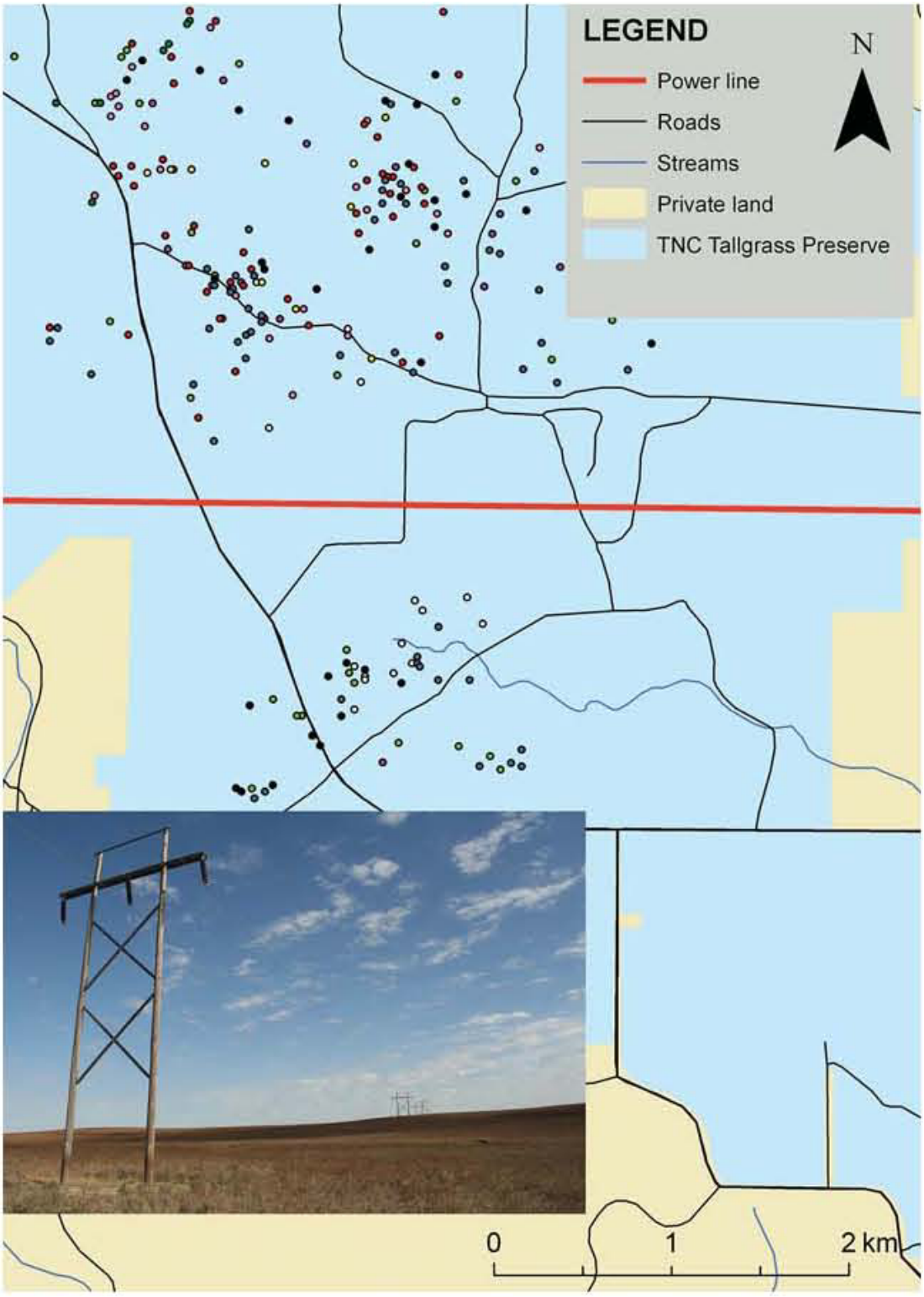

Fig. 5. Apparent transmission power line avoidance by greater prairie-chickens on the Nature Conservancy Tallgrass Prairie Preserve, Oklahoma. Colored circles are different individuals (n = 9) that were tracked using radio telemetry in 1999. Inset photo is of the power line that is being avoided (note suitable habitat beneath and adjacent to the line).

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