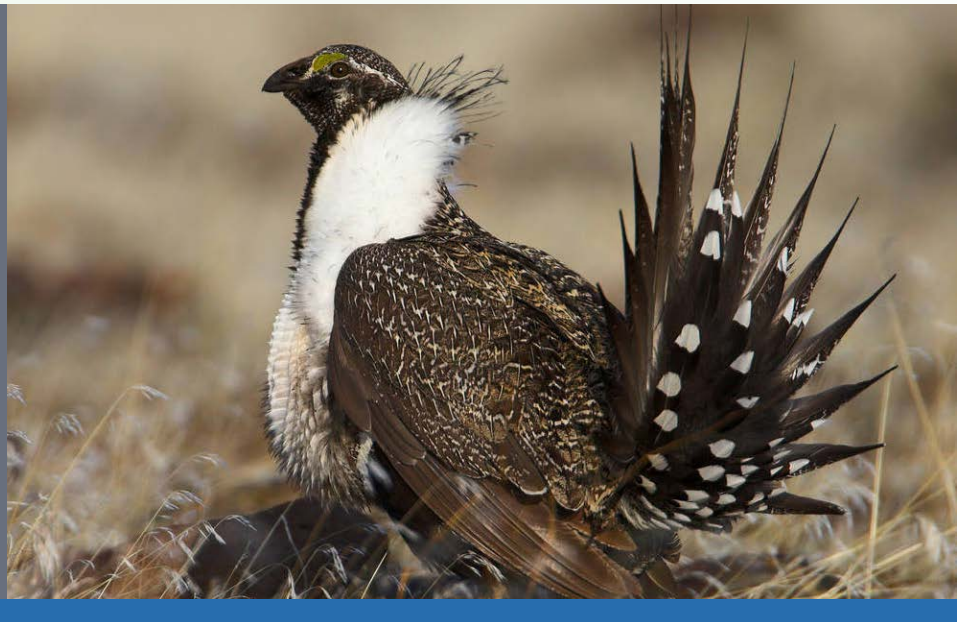
Greater Sage-Grouse

Overview and Effects of Wind Energy Development

September 2017

This fact sheet provides an overview of current knowledge on greater sage-grouse (sage-grouse) ecology, status, conservation challenges, and current conservation efforts, and presents a summary of recent research findings on the interactions between sage-grouse and wind energy development.

There is a wide range of research outcomes on sage-grouse ecology and some uncertainty remains. This fact sheet presents current knowledge based on recent research and the references cited provide further information on specific findings. Please view the references at www.nationalwind.org/sage-grouse-fact-sheet/.



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Sage-Grouse Ecology

Greater sage-grouse (*Centrocercus urophasianus*) is a key species for an ecologically important landscape in the western United States and southern Canada often referred to as the Sagebrush Sea. Sage-grouse appear to need large areas of undisturbed sagebrush grasslands to maintain healthy, connected populations. This species therefore may serve as an umbrella species, where efforts to protect sage-grouse habitat contribute to the conservation of other species.[1]

Sage-grouse depend on a variety of areas within their habitat during the mating, nesting, brood-rearing, and winter periods. Male and female sage-grouse congregate each spring on leks, which are areas used by males for display to attract hens. Leks are thought to be associated with quality nesting and brood-rearing habitats, although some hens might nest farther away from a lek to secure higher quality nesting sites and will continue to use the same location year after year. The quality of the habitat is a critical factor in population success as nest, brood, and female survival are reduced by poor habitat quality.[2] Sage-grouse have high site fidelity, meaning that they will return to the same sites year after year, which is thought to limit their adaptability to disturbance.[3] Adult female survival and chick survival have both been identified as important factors in sage-grouse population growth.[4]

Population Status

Sage-grouse populations have been declining since the mid-1960s.[5] Estimates place the range-wide decline at 45 – 80%, from several million prior to European settlement in the western U.S. to 200,000 – 400,000 today.[6] This species is thought to have been displaced from approximately 50% of its original range.[7]

Sage-grouse population declines are largely due to direct and indirect anthropogenic disturbance. Mineral mining, natural gas and oil extraction, land conversion for agriculture and development, habitat change caused by invasive juniper, and wildfires worsened by the spread of the invasive species cheatgrass have all contributed to degradation of sage-grouse habitat.[8] Sage-grouse are also sensitive to noise disturbances, and energy development can bring significant noise activity in addition to degrading and fragmenting habitat.[9] Several studies indicate that oil and gas development and production within three to five miles of active leks have significant negative impacts on sage-grouse populations.[10] Additionally, ponds created by coal-bed natural gas development, which occurs near sage-grouse habitat in Wyoming and Montana, may increase potential for sage-grouse mortality from West Nile virus.[11]

The IUCN currently lists sage-grouse as "near threatened."[12] The health of sage-grouse populations reflects the health of the sagebrush landscape. Conservation of sage-grouse conserves landscapes that support an abundance of other species, and the decline of sage-grouse indicates a decline in overall quality of the sagebrush ecosystem.[13]

Conservation Efforts

Due to the decline in sage-grouse populations and suitable habitat, conservation plans, state government directives, and federal land-use plans have been issued in recent years. In September 2015, the Bureau of Land Management (BLM) and U.S. Forest Service (USFS) National Greater Sage-Grouse Planning Strategy was completed in an effort to manage disturbance and fragmentation levels in sage-grouse Priority Habitat Management Areas and to avoid the need for the U.S. Fish and Wildlife Service to list sage-grouse under the Endangered Species Act. This strategy incorporated strong grouse conservation measures into 98 BLM and USFS land-use plans covering nearly 70 million acres of federal lands in 10 western states.[14]

Protections for sage-grouse have also been instituted at the state level. Wyoming, which has the largest population of sage-grouse and approximately 38% of the world's sage-grouse habitat, developed the Greater Sage-Grouse Core Protection Area Strategy in 2008, which defines core habitat areas where development is prohibited or limited and sets out standards for monitoring and tracking sage-grouse populations.[15] As of 2017, the states with sage-grouse populations have conservation plans in place. Limited hunting of sage-grouse is permitted in some states.[16]

In August 2017, the U.S. Department of the Interior (DOI) and representatives from western governors' offices released a report that identified issues for clarification and potential changes to the 2015 BLM Sage-Grouse Plan Amendments.[17] The recommendations based on this review included increased flexibility for land use, redefining protected habitat areas, and allowing states to incorporate conservation management approaches on population targets, including allowing captive breeding and predator control to meet targets. The Secretary of the Interior directed immediate implementation of these recommendations, and in August 2017 the BLM began collaborating with other DOI agencies to start the process of implementing the actions set out in the report. [18]

Wind Energy and Sage-Grouse

There has been increasing interest in wind energy development in the sagebrush region because of high wind capacity, and many areas that are promising for wind energy development overlap with sage-grouse habitat.[19] Due to findings of negative impacts from other anthropogenic disturbances, including other forms of energy development, there has been concern that wind energy development may also have negative impacts to sage-grouse habitat and populations. For example, it is hypothesized that prairie grouse avoid trees or other tall structures that may serve as predator perches, and as a result, could avoid otherwise favorable habitat.[20] To ensure that expansion of wind energy in the sagebrush region does not contribute to negative impacts on sage-grouse populations, it is important to understand the type and magnitude of possible impacts to mitigate those impacts through effective siting, operation, and conservation practices.

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NWCC Sage-Grouse Research Collaborative

The NWCC Sage-Grouse Research Collaborative was founded in 2010 to coordinate studies examining the potential impacts of wind energy development on sage-grouse across their range to inform wind energy development and sage-grouse management strategies. The Collaborative built on the NWCC's support of research on greater prairie-chickens. Through a competitive process conducted in 2011, the Collaborative selected research projects to support with funds raised from federal, state, and industry sources.[21]

The first project is a study of the ecology of male sage-grouse in relation to wind energy development in Wyoming. The study, conducted in conjunction with the proposed Chokecherry-Sierra Madre wind energy project, uses a before-after-control-impact design (BACI). To date, this study has provided extensive baseline data on seasonal habitat use, movement patterns, and male use and movement between leks.[22]

The second project involves a post-construction study of the impacts of wind energy development on sage-grouse populations at the Seven Mile Hill wind energy facility located in southeastern Wyoming between 2009 and 2014.[23] Results of this project are discussed below.

Study Results

The post-construction study at Seven Mile Hill monitored 346 female sage-grouse instrumented with radio/satellite transmitters and examined male lek attendance. The study tracked sage-grouse captured in a reference area of undisturbed landscape near the wind facility and a treatment area within the boundary of the wind facility. Results to date indicate that many demographic features and habitat-use factors, including selection of nest sites and nest, brood, and female survival were not negatively affected by proximity to turbines. Female survival was higher in areas with a higher density of turbines and access roads. A similar effect on female survival was noted in the NWCC-supported 2013 study from Kansas on greater prairie-chickens, a related grouse species.[24]

Over the six-year study, female sage-grouse continued to select nest sites in and around turbines and this selection pattern did not result in negative impacts to nest survival. Brood site selection and summer habitat selection were both negatively affected by surface disturbance, such as cleared ground related to roads and turbine pads. Once females successfully hatched eggs, they raised their broods in habitats with lower densities of turbines and access roads out to 1.2 km from the facility. This selection pattern continued during the summer period after females had fledged their broods. However, these selection patterns did not result in negative effects on brood or female survival.[25] Trends in the number of males attending leks were not negatively affected eight years following the development of a wind energy facility. However, the authors recommended caution when placing turbines within 1.5 km of occupied sage-grouse leks until further research is conducted.[26]

Implications and Further Research Needs

The results of the Seven Mile Hill study suggest that the sensitivity of sage-grouse to wind energy development varies with the life history stage of this species. Further, the cumulative effect of the mix of positive effects (female survival) and negative effects (brood site and summer habitat selection) on the Seven Mile Hill sage-grouse population is unknown. Research at other wind facilities would help determine whether the results from Seven Mile Hill are observed at other wind facilities with different sage-grouse populations. Additionally, the effect of wind energy development on sage-grouse habitat connectivity has not been studied. Further research is needed to increase our understanding of the relationship between wind energy development and sage-grouse populations.[27]

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