



Evaluation of greater sage-grouse population

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Sage-grouse have become a symbol of the 232,000 square miles of the sagebrush steppe biome, which dominates a significant portion of the West and 38 percent of the land in Wyoming.

The sagebrush biome encompasses 50 percent of its presettlement range (page 11) throughout the West. As the sagebrush biome has decreased in size and become increasingly fragmented, sage-grouse populations, which depend entirely on sagebrush habitats for all life stages and for food, have demonstrated a similar declining trend and are estimated to be 50 percent of presettlement populations. A conservation assessment for greater sage-grouse and sagebrush habitats completed in 2004 by leading sage-grouse researchers concluded that, in Wyoming, sage-grouse populations have declined at an overall rate of 2 percent per year from 1965 to 2003. This rate mirrors population trends in other Western states.

Umbrella Species

Sage-grouse have been identified as an umbrella species. Umbrella species are those representing the health of an ecosystem; therefore, the decline of sage-grouse populations may reflect a decline in the health of the sagebrush steppe ecosystem.

One of our foremost research goals is to generate seasonal probability-of-occurrence maps across our project area on the Atlantic Rim in south-central Wyoming to identify seasonal (breeding, nesting, and brood-rearing) habitats essential for sage-grouse persistence. These outputs can be used by the Bureau of Land Management (BLM), private landowners, and the Wyoming Game and Fish Department (WGFD)

persistence in south-central Wyoming

to protect areas contributing to greater sage-grouse population persistence on the Atlantic Rim. Thus, instead of the somewhat arbitrary buffers that appear to be ineffective in reducing impact to sage-grouse, the BLM could use our research outputs to direct future coal-bed methane (CBM) development on the Atlantic Rim (page 12).

Christopher Kirol became intrigued by greater sage-grouse (*Centrocercus urophasianus*) when, at the age of 17, he first saw male birds performing their courtship dance on a lek (or breeding ground) between Cody and Meeteetse in northwestern Wyoming. He still vividly remembers the crisp spring morning air, the deep booming sound produced by the male sage-grouse inflating and deflating its esophageal sacs that carried across the entire landscape, and the intricate posturing and feather displays of the strutting males (Figure 1). Years later, while working as a biologist for an environmental consulting firm, he spent numerous early spring mornings counting sage-grouse on leks in areas being developed for underlying oil and gas reserves. He became even more interested in the plight of the sage-grouse, which ostensibly were showing a downward trend in many areas being developed.

Development-Sage-grouse Connection

Research conducted by the University of Montana and the Wyoming Cooperative Fish and Wildlife Research Unit at the

University of Wyoming confirmed this negative relationship between certain levels of development and sage-grouse populations. Kirol resolved to pursue a master's degree to conduct research on sage-grouse. He was directed to Assistant Professor Jeff Beck in the College of Agriculture's Department of Renewable Resources, who has studied sage-grouse and their habitats in Colorado, Idaho, Utah, and Wyoming. He took Kirol on, and, in the spring of 2008, Kirol started fieldwork on the Atlantic Rim sage-grouse study. The study is a collaborative effort between the BLM Rawlins Field Office, Anadarko Petroleum Corporation, WGFD, University of Wyoming School of Energy Resources, Department of Renewable Resources, and many local landowners.

In Wyoming, sage-grouse populations have declined at an overall rate of 2 percent per year from 1965 to 2003. This rate mirrors population trends in other Western states.



Photo by Jamie Martin Young

Figure 1. Male sage-grouse strutting on a lek.



Photo by Kurt Smith

Figure 2. Chris Kirol with radio-marked female sage-grouse ready to be released after capture, spring 2008.

The Atlantic Rim extends from Rawlins south approximately 50 miles to Baggs. A control area was also established northwest of Rawlins just south and west of Bairoil. The Atlantic Rim study area encompasses 422 square miles and contains 89 known sage-grouse leks – a density of one lek per every 5 square miles. Few locations in Wyoming contain such a high density of sage-grouse leks. The study area near Bairoil was selected as a control because it has a viable population of sage-grouse, has similar vegetation communities to the Atlantic Rim, and is not currently being influenced by oil and gas development. The control area contains 15 sage-grouse leks and encompasses 316 square miles with a lek density of one lek per every 21 square miles.

Capturing Started in 2008

Kirol began fieldwork in mid-April 2008 with the start of the capturing season. Sage-grouse are captured at night with the aid of all-terrain



Photo by Chris Kirol

Figure 3. Kurt Smith, a field technician assigned to this project, monitors a radio-marked female sage-grouse in the summer of 2008.

vehicles, spotlights, and long-handled hoop nets, quick feet, and a little luck. Efforts focus on female grouse because they provide a wealth of information including demographic rates (nest success, brood productivity, and adult female survival) and habitat selection patterns important to understanding nesting and brood-rearing habitats. The majority of the females are captured around leks where, in the spring, they congregate to select the most desirable males to breed with. Captured were approximately 50 females, 25 of which were in the control area while the remainder were in the Atlantic Rim study area. The captured birds were collared with necklace-mounted radio-transmitters (Figure. 2), weighed, age determined, and quickly released to reduce stress. The Rawlins BLM had collared several female grouse in 2007, so the study had approximately 120 female grouse.

The 120 collared birds were then monitored at least once a week with

the use of radio telemetry for the remainder of the summer and into the fall and are monitored on a monthly basis by fixed-wing aircraft throughout the winter.

Monitoring female sage-grouse throughout the breeding, nesting, and brood-rearing season is essential for our research. First, we can determine fitness over the breeding, nesting, and brood-rearing season by evaluating demographic responses including nest success and brood survival.

Second, this enables us to gather seasonal occurrence data (female sage-grouse locations throughout the season). Occurrence data allows us to evaluate habitat characteristics at locations or habitats female sage-grouse select during critical nesting and brood-rearing stages. These habitats will be analyzed at landscape (macrohabitat) and microhabitat scales through a combination of field measurements and remote sensing data. We collected



Photo by Chris Kriol

Figure 5. Transect established at a hatched sage-grouse nest to measure habitat characteristics.

Oil and gas development has been identified by many researchers across the West as one of the major causes contributing to sage-grouse population declines.

micro-scale vegetation measurements at nests and early and late brood-rearing locations in addition to an equal number of random locations within each study area to describe and compare the characteristics of used (grouse locations) and available (random locations) habitats (Figure 5).

Habitat Characteristics Measured

Some of the habitat characteristics measured at these locations include slope, topographic orientation of the site, shrub canopy cover, shrub density, visual obstruction, herbaceous ground cover, cover of sage-grouse food-forbs and non food-forbs, perennial and annual grass cover, and grass height. These data will provide an understanding of microhabitats selected during critical life stages.

Oil and gas development has been identified by many researchers across the West as one of the major causes contributing to sage-grouse population declines. Compounding the issue is

the fact many of the mineral reserves, especially CBM, directly underlie a large portion of the current sage-grouse range. Direct habitat loss occurs when native vegetation is converted to access roads, well pads, pipelines, and other features. Indirect habitat losses can occur when sage-grouse are displaced or avoid areas near infrastructure

because of increased levels of human disturbances (e.g., traffic, noise, pollution, human presence).

Mitigation Measures

On lands under the authority of the BLM, mitigation measures are used to protect sage-grouse breeding and nesting habitat. These mitigation

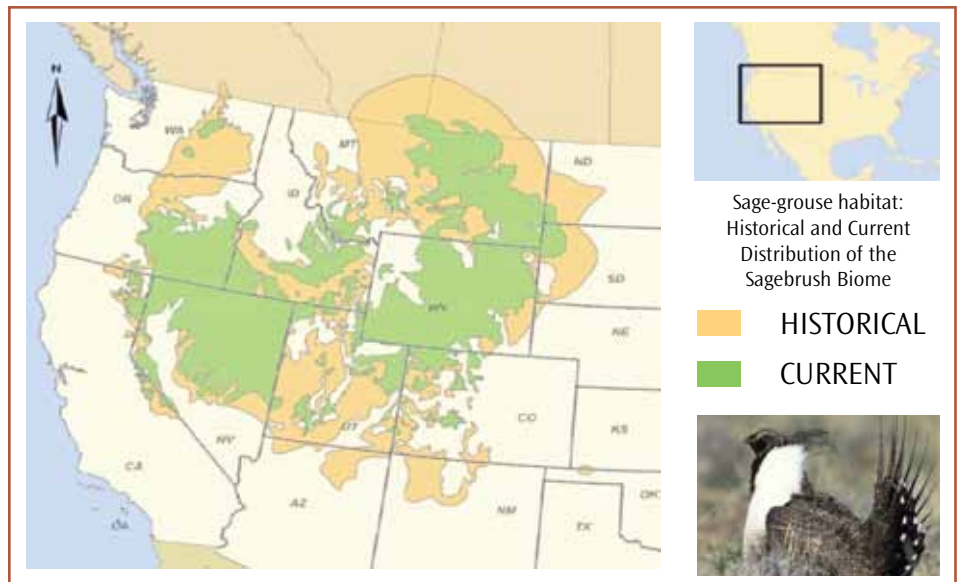


Figure 6. Current and historical distribution of sage-grouse.

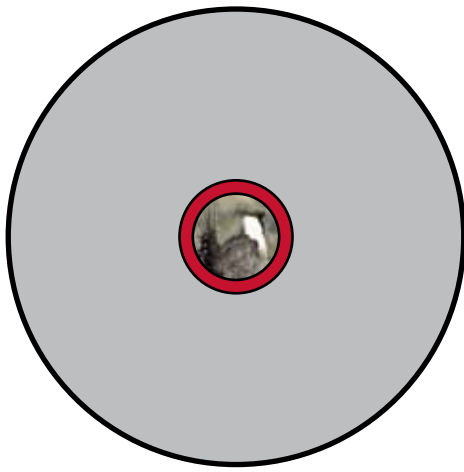


Figure 7. Current nesting habitat mitigation measures utilized by the BLM. The sage-grouse in the center represents a lek, the red circle represents the 0.25-mile no-occupancy buffer, and the gray circle represents the 2-mile seasonal buffer.

measures are based on earlier research and management recommendations that suggest protecting a 2-mile radius (buffer) around a lek site to maintain nesting habitat. The BLM commonly employs this 2-mile buffer; however, this is a seasonal stipulation and only prohibits activities in these areas during the breeding and nesting season from March 1 to June 15. Additionally, the BLM commonly employs a 0.25-mile buffer around each lek prohibiting any surface disturbance (Figure 7).

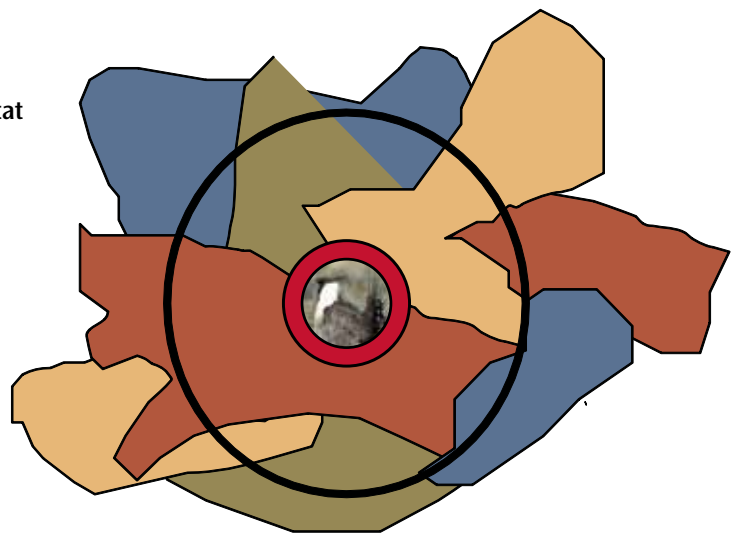


Figure 8. Conceptual output representing nesting or brood-rearing habitat categories. The outer circle represents the currently used 2-mile buffer, the inner circle represents the 0.25-mile buffer, and the sage-grouse in the center represents the lek. The various polygons represent habitat areas and possible distribution of these habitats.

A recent empirical review of multiple sage-grouse studies throughout the West by Beck showed that current BLM mitigation measures do not appear to be effective in mitigating negative sage-grouse population responses to energy development. Consequently, the Atlantic Rim sage-grouse study seeks to identify alternative sage-grouse management options in a developing CBNG field. Specifically, the objectives of our study call for identification of habitats critical for sage-grouse population persistence. These are areas that,

if protected, have the highest potential to maintain viable sage-grouse populations within the project area (Figure 8).

Our study seeks to link ecological conditions on the Atlantic Rim to both sage-grouse occurrence (habitats that animals are likely to use) and population fitness (number of offspring produced that survive to reproduce) to understand and manage for population persistence (Figure 9).

Our study was designed to provide crucial information to prudently develop the CBNG field in the Atlantic Rim while maintaining critical habitats for sage-grouse to persist. Field data collection will continue through 2009, and our project will likely be completed in 2010. If successful, our approach to identifying areas for population persistence could be implemented in other areas where oil and gas reserves and greater sage-grouse populations overlap.

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Occurrence
Habitats that animals are likely to use.



Fitness
The number of offspring produced that survive to reproduce

Figure 9. Linking occurrence to fitness is important in identifying habitats contributing to population persistence. The photograph on the left shows an area a large number of sage-grouse are using. The photograph on the right shows an adult female sage-grouse with one of her chicks. Brood productivity is one of the parameters we are estimating in the Atlantic Rim and the control area. These estimates provide critical information as to the ability of habitats to promote population persistence.