Sage Grouse Saga

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From the start, the Boone and Crockett Club and its members have chosen to work at the crossroads of conservation where science, policy, economics, and social issues intersect. Fifteen years ago the Club expanded its leadership vision by establishing the Boone and Crockett Conservation Program at the University of Montana. In so doing, the Club materially committed itself to support training and development of future conservationists. It has been my good fortune to have experienced how the program is making a difference in the careers of individuals and the conservation landscape overall. Along the way I've learned that the key to effectiveness in wildlife conservation is not just in understanding what ought to be done from a biological perspective, but also how to get it done.

The author banding a sage grouse for his research project.

A Match Made in Montana

In spite of the need for broadly-trained wildlife managers, most graduate programs recruit students with a strong technical background who will focus their coursework and research in a specialized biological discipline. Because I did not fit that mold, my decision to pursue a Ph.D. in the field that had been in my heart all along—wildlife biology—was not getting a serious reception. My background included an undergraduate degree in political science (focus on environmental policy) at Bates College in Maine; several years working as a first mate on sport-fishing boats in New England, an environmental consultant in Utah, and a collaboration facilitator in western Montana; and, an M.S. degree in riparian restoration from the University of Montana's School of Forestry.

After learning about the B&C Conservation Program in 1996 and meeting the Program Chair, Dr. Jack Ward Thomas, I realized I might have found the fit I was looking for. Dr. Thomas viewed my broad experience as an asset, not a liability. The B&C Program mirrored my own goals to build a project that would address a pressing


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wildlife conservation issue, work with private landowners and state and federal wildlife managers, and inform both practical conservation and basic ecological understanding. Accepted into the program as a Boone and Crockett Fellow, my next step was to select a research subject complementary to these goals.

Sage grouse seemed to fill the bill. By the late 1990s, wildlife managers and scientists realized that habitat changes and other stressors had wrought severe declines of sage grouse across the West. I set about designing a project to gain important scientific understanding that could be used in effective conservation of sage grouse in areas where populations were stable, and for recovery in areas of depletion. The start of my doctoral research in January 2000 was timely: just about then, the bird was petitioned for listing under the Endangered Species Act. Knowing that the strength and credibility of this critical project depended on rigorous science, we sought and obtained the cooperation of Dr. Mark Lindberg, an expert in quantitative population ecology, who agreed to co-advise my dissertation work with Dr. Thomas.

Sage Grouse Historical Trends

Sage grouse are chicken-size birds known by hunters and biologists alike for their close association with sagebrush habitats of the western U.S. The drab, mottled birds with black bellies are North America's largest grouse: males tip the scales at a hefty 6 to 8 pounds, and females weigh around 3 pounds. Every spring, sage grouse gather on leks, which are traditional grounds where males engage in a territorial breeding display that, pound for pound, easily rivals the showmanship of bull elk in the fall. Dominant males hold center positions on the lek where a handful, a few dozen, or in some cases, more than one hundred males have gathered. With a repeated strutting pattern, cocks pull their wings across a white chest ruff covered in short, stiff feathers to produce two or three swishing sounds. Then, with a flash of yellow and white and considerable flair, they quickly inflate and deflate yellow air sacs on the breast to seemingly impossible proportions. The movement produces a loud popping sound that advertises their status to would-be mates. Hens assess the displays and select only the best males for breeding. In fact, in any given population, 5 to 10 percent of the males will perform nearly 90 percent of the matings.

Sage grouse are well adapted to dry, harsh environments. It is not unusual for birds in some areas, such as Montana, to experience annual temperature swings of 150 degrees (from -40 in winter to 110 degrees in summer). These birds are true sagebrush obligates, depending entirely on sagebrush habitats for breeding and winter survival. Sage grouse not only survive, but actually thrive on an exclusive diet of sagebrush leaves from fall through spring,

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typically entering the spring breeding season at peak weight. Even during spring and summer months, their diet is more than 50 percent sagebrush.

Despite the bird's tough constitution, populations across the West have plummeted in past decades. Once numbering between 1 and 2 million birds in 15 western states and provinces, sage grouse numbers today, around 150,000 birds, represent a decline of roughly 90 percent. Most of that decline has happened in the past 40 years, with a range-wide reduction of 50 percent occurring between 1965 and 1985. Many populations continue to decline, though generally at a slower rate.

Given the bird's dependence on sagebrush, it is not surprising that much of this decline corresponds to losses of sagebrush habitat. But there's more to it. In areas where sage grouse still persist, breeding numbers are down. So not only has the range of these spectacular birds shrunk, but there are fewer individuals in the areas where they remain. The reason: a host of land uses and impacts has affected nearly every acre of sagebrush habitat in the western U.S. and Canada. Grazing, fire, and weed invasion are primary concerns in many areas. In many areas invasive cheatgrass has replaced the native herbaceous understory on which hens and chicks rely. As well, dry cheatgrass can carry wildfires more quickly and continuously than would the native grass cover. The result: Fires within sagebrush stands that have a cheatgrass understory are more frequent and more likely to be stand-replacing. And because a monoculture of cheatgrass typically results from wildfire, a vicious cycle is in effect.

Grazing, while certainly not always detrimental, does reduce

Hidden Hen on Nest

Sage Grouse Lek Display

Successful Nest

Research Team in the field

Images from the author during his field research.

Male and female sage grouse pictured at left.

the grass cover that helps keep hens obscured from predators during incubation. Numerous studies have found that nest success increases with greater grass height and density. Of course, sage-grouse populations evolved with a host of native herbivores such as deer, elk, pronghorn, and bison. What have changed, in many cases, are the frequency, intensity, and duration of use by domestic livestock held in pastures. As well, the removal of wolves in western states favored coyote populations, which are much more effective predators of sage grouse and their nests. And in areas where coyotes are intensively controlled, red fox, skunks, and raccoons—experts all at nest predation—are able to increase.

New Stressors Enter the Scene

As if these historic stressors were not enough, we observed the onset of two new factors during the course of my doctoral study. Both of these, West Nile virus and escalated energy development, can have considerable negative impacts on sage-grouse populations. West Nile virus was first documented in sage grouse in Wyoming, Montana, and Alberta in 2003, the final year of my doctoral field work. At our Montana study sites, West Nile virus killed about 20 percent of the adult hen population in about two weeks. Based on data from prior years, the expected background rate of mortality during the same period was around 2 percent. Cool weather in subsequent years has depressed numbers of the mosquito *Culex tarsalis*, the primary vector of West Nile virus. But warmer summer weather in 2006 resulted in troubling outbreaks of West Nile–virus deaths in sage grouse across their range.

With recent increases in natural gas prices, drilling for reservoirs of traditional and coalbed natural gas has skyrocketed. Conventional deep drilling in tight sands formations can often make use of directional drilling to place multiple wells (in some cases, more than 20) on a single pad and thereby minimize surface disturbance. But shallow drilling for coalbed gas typically requires vertical drilling of a single well off a single pad. Well pads in coalbed operations are often placed at 10- or 20-acre spacing (equal to 64 or 32 pads per square mile). In some high-yield areas, such as the Jonah Field in western Wyoming, 5-acre spacing (128 wells per square mile) was recently approved. These figures are important because a large proportion of the natural gas reserves in the Rocky Mountain west are located below sagebrush-grassland habitats of Wyoming, Montana, and Colorado. And it's these habitats that are critically important to sage-grouse, mule deer, elk, pronghorn, and a host of other sagebrush-dependent species.

Working at Scales that Matter

Many of the impacts to sage grouse and their habitat have an effect at the landscape scale, meaning that impacts that are not apparent when considering any single sagebrush stand may have a cumulative effect when we "zoom out" our perspective. I decided to work at that larger scale to investigate relationships between habitat and sage-grouse population dynamics (i.e., annual survival and reproduction processes). This would ensure that information collected from the study would be most useful for application to management and conservation. That requires collecting data on a scale similar to the one at which wildlife managers operate and impacts might occur.

I chose to work in south Phillips County because it had some of the most intact and expansive remaining sage-grouse habitat in Montana. With the help of about 20 field technicians, we managed to radio-collar 237 hens, band 350 males, and monitor 287 nests and 100 broods between 2001 and 2004. I measured 426 vegetation plots in

each of three years to characterize habitats used by sage grouse. Under the banner of the University of Montana and the B&C Program, we were successful in not only pulling together multiple partners that had been at odds with each other on occasion, but we also were able to secure access permission to work on 35 private cattle ranches. The payoff of these efforts is a body of information that managers, scientists, and land-owners can apply in maintaining, improving, and restoring sage-grouse habitat and in making land-use decisions that have potential to affect sage-grouse populations.

The project was a success because of the financial and logistical support provided by all partners and the hard work performed by dedicated field hands. In addition, luck was on my side. In any population dynamics study of an animal that can be substantially influenced by environmental conditions, the investigator hopes to capture some degree of variation in precipitation and temperature. Such variation provides insight on how populations respond to drought, winter storms, and the like. By chance, the three years of this project had the near-perfect variety and sequence of environmental conditions that would let us learn about how sage-grouse survival and reproduction figure into the key question of interest: how well do the birds fare from one year to the next? Severe drought in 2001 was followed by cool, wet weather in 2002. The following year (2003) brought mild conditions that preceded the 2003 West Nile virus outbreak and a severe storm that winter. By observing the highest and lowest hen survival rates reported during that time, we were able to pinpoint important seasonal effects—such as West Nile virus and winter weather—that researchers had not been able to identify before.

Many wildlife managers, hunters, and conservationists are concerned about these historic declines, habitat losses, and new threats. In late 2004, the U.S. Fish and Wildlife Service responded to the Endangered Species Act petition, finding that listing of sage grouse was "not warranted" at that time. Since then, fresh information has become available on the nature of impacts from energy development and West Nile virus, and many expect another petition for listing under the ESA.

Reflections of a B&C Fellow

Two years past completion of my Ph.D. in the B&C Program, I am one of only a few wildlife biologists in the Presidential Management Fellows Program. As the Bureau of Land Management (BLM) wildlife biologist in Grand Junction, Colorado, my work includes local habitat management, wildlife conservation, regional monitoring programs, and conservation policy across multiple states from Colorado to Alaska. On reflection, I find that my experiences in the B&C Program were instrumental in launching my career.

The B&C Program is unique in several respects. By actively seeking students with diverse backgrounds such as political science, economics, social science, and resource management, it creates a learning environment well suited for addressing complex wildlife issues. The program provides initial financial support to students so they can focus on creating a project that is both meaningful and original. This initial support also serves as critical seed money to attract other funding sources. In my case, that first year of support allowed me to build a project from the ground up and to pull in an amazing group of partners including the National Fish and Wildlife Foundation, Montana Department of Fish, Wildlife, and Parks, U.S. Fish and Wildlife Service, Bureau of Land Management, U.S. Geological Survey–Cooperative Wildlife Research Unit, and a host of private companies and individuals. By the end of my four-year project, the total B&C/University of Montana contribution of $120,000 for stipend, tuition, and equipment was leveraged to secure an additional $530,000 in support of a large-scale research project on greater sage grouse in north-central Montana. The Club's investment enabled the development of insightful information that will help address sage-grouse conservation in the critical years ahead. It also developed and reaffirmed my commitment to contribute to the great tradition of North American wildlife conservation.

Looking back on my years in the B&C Program, it's clear that I not only developed the rigorous technical training that I sought (the "whats" of conservation). Additionally, under the guidance of Jack Ward Thomas and Mark Lindberg, I also developed a perspective on partnerships, collaboration, and determination (the "hows" of conservation). Well started along my career path, I am honored to continue my connection to the Club and to contribute service as a B&C Professional Member. ■

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