Greater Sage-Grouse in Wyoming

AN UMBRELLA SPECIES FOR SAGEBRUSH-DEPENDENT WILDLIFE

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Courtesy of Scott Gamo

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Modern conservation is increasingly reliant on efforts to conserve surrogate species to provide benefits for multiple species. In Wyoming, it's becoming clear that the greater sage-grouse (*Centrocercus urophasianus*; hereafter sage-grouse) could be the perfect surrogate.

In November 2012, the U.S. Fish and Wildlife Service (FWS) issued its annual review of candidate species and determined that although sage-grouse face "imminent" threat from factors such as habitat fragmentation, fire cycles, invasive plants, and energy development, the species is "warranted, but precluded" from listing at this time (FWS 2012). As sage-grouse range extends across 11 western states, a listing would affect a large portion of the U.S. and overlap with extractive and renewable industries, agriculture, and other land uses. In response to these concerns, Wyoming has developed a strategy to conserve the grouse and, at the same time, manage the landscape for the continuing needs of our nation's human population. Because of this effort, and the large expanse of land it affects, the sage-grouse may well serve as an umbrella species for other sagebrush-dependent wildlife (Rich and Altman 2001, Rowland et al. 2006).

Laying the Groundwork

Umbrella species are essentially surrogate species whose protection may provide conservation benefits to many other animals. In Wyoming, protecting sage-grouse as an umbrella species is particularly relevant since the state's sagebrush ecosystems provide habitat not only to sage-grouse but also to nearly 450 species of mammals, birds, amphibians, reptiles, and fish, most of which are classified as non-game species (WGFD). Approximately 6 percent, or 25, of the sagebrush-associated species are species of greatest conservation need (SGCN) "whose conservation status warrants increased management attention, and funding, as well as consideration in conservation, land use, and development planning" (WGFD 2010).

Credit: Jaimel Blajszczak /WGFD

The sage-grouse can serve as an umbrella species for mule deer, pronghorn, reptiles, pygmy rabbits, many bird species, and other sagebrush-dependent wildlife. Wyoming's sage-grouse protections may benefit nearly 450 other species, most of which are non-game.

The idea of sage-grouse as an umbrella species first arose in 2001 (Rich and Altman 2001). Subsequent researchers began testing this idea for other sagebrush-dependent species (Rowland et al. 2006, Hanser and Knick 2011). Their work suggested that this ecological theory may have merit. Some researchers have suggested that sage-grouse meet the criteria of an umbrella species with the exception of legal or regulatory status (Hanser and Knick 2011). We propose that sage-grouse may be an effective umbrella species in Wyoming because its habitat overlaps many other species that are dependent on sagebrush communities.

Umbrella species require large amounts of habitat if the species has a large

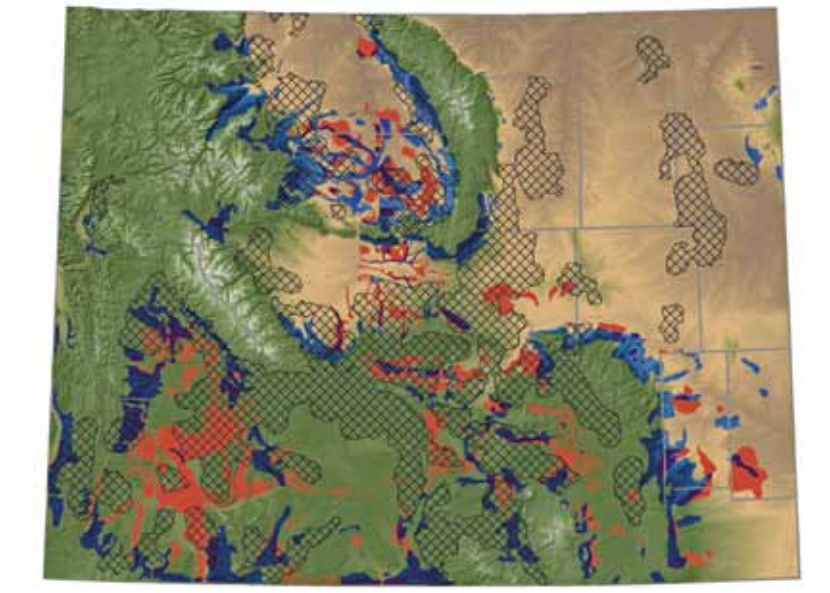
home range or is migratory (Rich and Altman 2001). The first step in modeling habitat for any animal is determining biologically meaningful areas (Fedy et al. 2012). For sage-grouse, those areas are distinct seasonal habitats that occur across large landscapes based on requirements for the following three key life stages:

- **Breeding.** Breeding—which includes lekking, nesting, and early brood-rearing—occurs from spring to early summer, when grouse require habitats composed of sagebrush with an understory of forbs and grasses used for food and cover.
- **Late brood-rearing.** Late summer brood-rearing begins two to six weeks after hatching (Thompson et al. 2006, Hagen et al. 2007), when habitat requirements include plant communities with high herbaceous cover in mesic habitats (Johnson and Boyce 1990, Drut et al. 1994). In xeric big sagebrush communities, late brood-rearing habitat is similar in vegetative structure to that used by grouse for nesting and early brood rearing (Kirol et al. 2012).
- **Wintering.** Wintering habitat requirements are influenced by snow depth and sagebrush height, because sage-grouse rely heavily on sagebrush that protrudes above the snow for food and shelter (Schroeder et al. 1999).

Road to Regulation

In 2007, in response to concerns of potential listing of the sage-grouse, then Wyoming Governor Dave Freudenthal held a forum with representatives of state and federal agencies, non-governmental organizations, and industries. As a result, a team was created to develop a regulatory mechanism for the protection and conservation of the sage-grouse within Wyoming. First, however, an area had to be designated in which that regulatory mechanism could be implemented. This area designation was a key ingredient to provide support for sage-grouse to serve as an umbrella species.

To produce a sage-grouse core protection area map for Wyoming, the governor's sage-grouse team utilized sage-grouse density mapping data and also noted areas of major energy development such as those in southwest and northeast Wyoming. Based on these data, the team created a map of 31 core population areas, which cover approximately 24 percent of the surface land area of Wyoming and include approximately 82 percent of the sage-grouse population within the state (WGFD Cheyenne, unpublished data). Most core areas occur in the sagebrush basins in the western and central portions of the state, with a few in the northeast as well.



Credit: Troy Gerhardt/WGFD

On a map of Wyoming, hatching shows where sage-grouse core population areas (home to 82 percent of the species' population) overlap winter range for mule deer (in blue) and pronghorn (in red). Minimizing surface disturbances in core areas will likely benefit these ungulates.

The Wyoming governor's 2008 Executive Order for Sage-Grouse, or SGEO, provided a process for protecting sage-grouse within the mapped areas, and a revised SGEO issued in 2011 further refined core-area boundaries. The implementation team focused on the protocols, rules, and processes to use in implementing the SGEO within the core population areas. In early 2012, a Bureau of Land Management Instruction Memorandum (BLM IM) laid out guidelines for sage-grouse conservation that closely paralleled those in Wyoming's SGEO.

Contained within the Wyoming SGEO and the BLM IM are protective stipulations for sage-grouse, based upon their biological needs, and a GIS-based procedure for determining levels of anthropogenic disturbance on the landscape within the core population areas (State of Wyoming 2011). These disturbances consist of roads, well pads, pipelines, mine pits, and other such surface alterations. Per direction of the SGEO, such disturbances are threshold limited, thus effectively minimizing anthropogenic activities and disturbances within the core population area boundaries.

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For example, within sage-grouse core population areas, the number of surface disturbances is not to exceed an average density of one per 2.6 square kilometers (640 acres) across the disturbance analysis area defined in the SGEO (State of Wyoming 2011). Total accumulation of surface area affected (both existing and proposed) within an analysis area should not exceed 5 percent. In addition, surface disturbances may not occur within 1 kilometer (0.6 mile) of any active or occupied sage-grouse lek. Outside of the core areas there is greater flexibility and less stringent application of conservation measures, which provides industry incentive to develop outside of core areas.

Common Name	Scientific Name	Distribution (%) in Greater Sage-grouse Core Areas
Birds		
Brewer's sparrow	*Spizella breweri*	36%
Burrowing owl	*Athene cunicularia*	30%
Ferruginous hawk	*Buteo regalis*	37%
Greater sage-grouse	*Centrocercus urophasianus*	33%
Sage sparrow	*Amphispiza belli*	47%
Sage thrasher	*Oreoscoptes montanus*	41%
Short-eared owl	*Asio flammeus*	20%
Mammals		
Pygmy rabbit	*Brachylagus idahoensis*	48%
Sagebrush vole	*Lemmiscus curtatus*	40%
Reptiles		
Greater short-horned lizard	*Phrynosoma hernandesi*	46%
Northern sagebrush lizard	*Sceloporus graciosus*	33%

Credit: J.D. Carlisle and A.D. Chalfoun, unpublished data; Keinath et al. 2010

Distribution models have shown that 11 of Wyoming's species of greatest conservation need—including seven birds, two mammals, and two reptiles—have a significant percentage of their population within the state's sage-grouse core population areas.

Opening the Umbrella

Because sage-grouse core population areas occur as separate units across a larger landscape, they have high potential for overlapping habitat used by other groups of animals such as songbirds, small mammals, and ungulates. Based upon this wide-ranging overlap, high public support for continued existence of sage-grouse, and the regulatory protocol applied within the large expanse of core population areas, the sage-grouse can serve as an effective umbrella species for other species that occur within the sagebrush steppe of Wyoming.

To the extent that a species' spatial distribution overlaps core protected areas and its biological requirements are similar to sage-grouse, that species will be protected within core areas established for sage-grouse. The overlap between sage-grouse core areas in Wyoming (the umbrella) and the predicted spatial distribution of 11 sagebrush-inhabiting SGCN species—two reptiles, two mammals, and seven birds including the greater sage-grouse (Keinath et al. 2010)—suggests that sagebrush-obligate species with restricted distributional ranges (such as the pygmy rabbit [*Brachylagus idahoensis*]) are likely to receive the most conservation benefit under the core area umbrella (J.D. Carlisle and A.D. Chalfoun, unpublished data).

For example, 47 percent of the predicted distribution of the sage sparrow (*Amphispiza belli*) in Wyoming coincides with the sage-grouse core population areas (J.D. Carlisle and A.D. Chalfoun, unpublished data). Thus, the sage sparrow will likely benefit from the protection afforded by sage-grouse core population areas. Other species whose range overlaps sage-grouse core population areas in Wyoming by at least 40 percent (see chart) include the pygmy rabbit, greater short-horned lizard (*Phrynosoma hernandesi*), sage thrasher (*Oreoscoptes montanus*), and sagebrush vole (*Lemmiscus curtatus*). Some non-game species with less overlap—such as the short-eared owl (*Asio flammeus*), whose predicted distribution overlaps core population areas by only 20 percent—may not be afforded as much potential benefit.

A Boon to Ungulates?

The sage-grouse umbrella could yield substantial benefits to ungulates in Wyoming. The state provides habitat to some of the largest populations of ungulates in North America including elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), Rocky Mountain bighorn sheep (*Ovis canadensis*), Shiras moose (*Alces alces shirasi*), and more than 500,000 pronghorn (*Antilocapra americana*). Approximately 45 percent of Wyoming's crucial winter range (a sensitive seasonal habitat) for pronghorn and upwards of double that amount for remaining seasonal habitats overlap with sage-grouse core population areas. By comparison, in the Great Basin ecoregion, sage-grouse habitat overlaps with 50 percent of pronghorn habitat (Rowland et al. 2006).

Many mule deer herds in Wyoming are migratory and utilize sagebrush basins for wintering habitat as they move across a gradient from high-elevation

Credit: Mark Gocke

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A male sage-grouse fans his feathers on sagebrush habitat not far from a line of drilling wells near Pinedale, Wyoming (far left). Biologists who net and collar the birds for study (left) have helped the state establish core sage-grouse areas that limit land-surface disturbances and densities in order to minimize impacts to sage-grouse.

summer habitats (Sawyer et al. 2006, 2009). Although mule deer tend to use mountain slopes and drainages for parturition areas, approximately 33 percent of crucial winter ranges for mule deer in the state are encompassed in sage-grouse core population areas. Thus, a large portion of critical mule deer habitat falls under sage-grouse protective management.

Surface disturbances such as roads, oil and gas well pads, and other man-made features and activities are known to impact mule deer (Sawyer et al. 2006, 2009), pronghorn (Beckman et al 2012), and elk (C.B. Buchanan and J.L. Beck, unpublished data). For example, elk calves were displaced by simulated mining activity in Idaho (Kuck et al. 1985), and research on arctic caribou (*Rangifer tarandus*) and woodland caribou (*R. t. caribou*) has shown that caribou tend to avoid industrial activity such as roads, communities, human camps, and mines (Cameron et al. 2005, Vols et al. 2006, Sorensen et al. 2007, Polfus et al. 2011). Presumably, then, the restrictions placed on development and other anthropogenic activities in sage-grouse core population areas in Wyoming should yield benefits to large, mobile ungulates.

Those benefits may vary, however, depending on the level of human activity. For example, researchers found that piping oil and gas waste fluids through pipelines, rather than trucking the material out of winter range, reduced truck traffic and resulted in greater use of these areas by mule deer (Sawyer et al. 2009). Thus, reduced truck traffic lessened negative impacts on wintering mule deer. Another study found that when human activity around mines, cabins, and hunting camps was minimal, caribou came much closer to these areas than during periods of high human activity (Polfus et al. 2011). Such findings suggest that management strategies to reduce development and activity levels should benefit ungulates on winter ranges where they overlap sage-grouse core areas.

Because sage-grouse core area designations provide habitat for other sagebrush-dependent species—including passerine birds, reptiles, small mammals, and ungulates—sage-grouse fit the requirements of an umbrella species as defined by Noss (1990). We therefore believe that the management of sage-grouse as an umbrella species within the core population area framework shows promise and deserves thorough evaluation. Minimizing the number and scale of anthropogenic disturbances should result in a higher probability of continued use of these habitats by sage-grouse, non-game species, and ungulates alike. Thus, the State of Wyoming has not only created areas of higher protection for sage-grouse, but likely provided additional protections for a suite of other wildlife species.

In Wyoming, as landscapes continue to be subjected to ever-increasing pressures to provide extractive and renewable resources, effective means of conserving wildlife species must be continuously evaluated. We are hopeful that the intense focus on the conservation of an umbrella species such as the sage-grouse will also ultimately bestow benefits on familiar and not-so-familiar co-occurring species. ■

This article has been reviewed by subject-matter experts.

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