Researchers study how well greater sage grouse habitat protects other species

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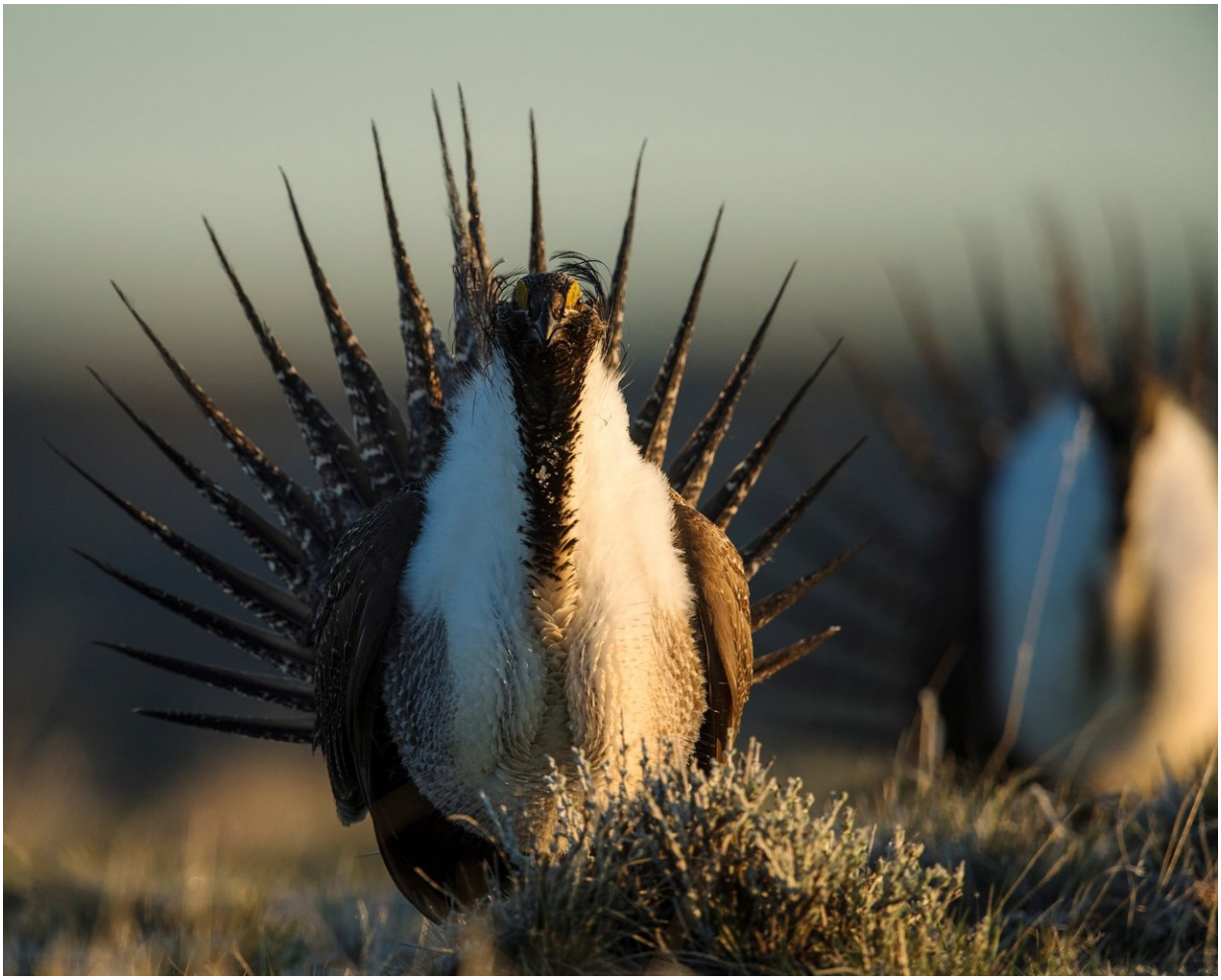

Researchers in the University of Wyoming's Department of Zoology and Physiology and Program in Ecology discovered that reserve size and species similarity are the primary factors in determining whether multiple wildlife species are indirectly protected under the umbrella of a reserve created to enhance conservation for one species -- in this case, the greater sage grouse in

Wyoming. Credit: Dave Showalter

Researchers in the University of Wyoming's Department of Zoology and Physiology and Program in Ecology discovered that size does matter—as it pertains to the effectiveness of secondary species' wildlife protection relative to the size of a wildlife reserve set aside for an umbrella species.

The umbrella species concept is defined as multiple wildlife species being indirectly protected under the umbrella of a reserve created to enhance conservation for one species—in this case, the greater sage grouse in Wyoming. The research group investigated two potential mechanisms—reserve size and species similarity—underlying the concept's successful application. Larger alternative reserves serve as better umbrellas but, regardless of reserve size, not all species received equal protection, the study determined.

"This study provides us a better understanding of which species might fall through the cracks, and which may need targeted attention for their conservation," says Anna Chalfoun, a UW associate professor of zoology and an assistant unit leader for the Wyoming Cooperative Fish and Wildlife Research Unit.

"I was surprised at the findings. The longtime assumption is that what's good for the grouse is good for any other species living in sagebrush country," says Jason Carlisle, a Ph.D. student in UW's Program in Ecology from 2011-17 who led the study. "Sage grouse are often the flagship species in the ecosystem. But, when examining how well the protected area established for sage grouse covers other species that depend on sage grouse habitat, it leaves a lot to be desired."

Carlisle was lead author and Chalfoun a co-author of a paper, titled

"Identifying Holes in the Greater Sage-Grouse Conservation Umbrella," that was published March 30 in the online version of *The Journal of Wildlife Management* and is expected to be in print later this month. The journal publishes manuscripts containing information from original research that contributes to basic wildlife science. Topics include investigations into the biology and ecology of wildlife and their habitats that have direct or indirect implications for wildlife management and conservation.

Douglas Keinath, formerly the lead vertebrate zoologist with the Wyoming Natural Diversity Database at UW; and Shannon Albeke, a research scientist/eco-informaticist in the Wyoming Geographic Information Science Center, were co-authors of the paper. Carlisle and Keinath also were part of the Wyoming Cooperative Fish and Wildlife Research Unit. The project was funded by a state wildlife grant from the Wyoming Game and Fish Department.

"When you hear people generally talking about sage grouse, whether it be land managers or politicians, they oftentimes are already making an assumption that sage grouse, as an umbrella species, is benefiting other species," Chalfoun says. "But, that assumption had not been critically tested."

Until now.

The umbrella species concept is one surrogate species strategy in which a species with large area requirements—such as the greater sage grouse—is provided sufficient protected habitat. In turn, that can provide protection of many other species in the same area. The main advantage of this strategy is the potential to conserve numerous species without extensive, individual consideration for each species, Chalfoun says.

The sagebrush sparrow was one of the species that benefited most from being under the umbrella of a reserve created to enhance conservation for the greater sage grouse. Credit: Taylor Sherr

Carlisle described the concept as such: "The more umbrella you pop up, the more coverage you'll get from rain."

Greater sage grouse are listed as endangered in Canada under the Federal Species at Risk Act. Each of the 11 states, including Wyoming, and two Canadian provinces where greater sage grouse live has a strategic plan to manage the species. Many, like in Wyoming, focus on government-established reserves, called "core areas," that are prevalent throughout the state, Chalfoun says. In 2015, the U.S. Fish and Wildlife Service determined an endangered species listing for greater sage grouse was not warranted in Wyoming or elsewhere.

"The Wyoming politicians and wildlife managers had the foresight to implement the core-area strategy," Chalfoun says. "Certainly, as a result of that, it has resulted in a lot less loss and fragmentation of Wyoming's sagebrush habitat."

A primary reason Wyoming was a good place for this study is that the state is home to approximately 37 percent of the remaining greater sage grouse in the world, says Carlisle, originally from Payson, Utah.

"Wyoming is going to be critical. Wyoming has a strong history in protecting sage grouse," he says. "This is an opportunity to build on that and to look for what sage grouse management is going to mean for other species."

Crunching the Numbers

Carlisle spent the bulk of his time crunching the numbers based on maps compiled by the Wyoming Natural Diversity Database. In what he termed "a poor man's supercomputer," Carlisle used about a dozen desktop computers in the Wyoming Geographic Information Science Center lab that ran simultaneously 24/7 for about a month during one summer. The computers were used to create 80 simulated reserves of various sizes and calculate the overlap they would provide the wildlife species.

The established umbrella reserve, a sagebrush-steppe ecosystem in Wyoming, protected 82 percent of the state's greater sage grouse population and 0-63 percent of the habitat of the background species studied. The established reserve outperformed equally sized, simulated reserves for only 12 of the 52 background species of wildlife listed in the State Wildlife Action Plan as "species of greatest conservation need." These species were associated with vegetation communities where there are greater sage grouse, Chalfoun says.

The dozen species that had the most habitat covered by the umbrella reserve were the Columbian sharp-tailed grouse, pygmy rabbit, sagebrush sparrow, greater short-horned lizard, great basin spadefoot (a toad), black-footed ferret, Idaho pocket gopher, olive-backed pocket mouse, sage thrasher, great basin pocket mouse, ferruginous hawk and the mountain plover.

The pygmy rabbit was another of the species that received good indirect protection from being under the umbrella of a reserve created to enhance conservation for the greater sage grouse. Credit: Spencer Schell

"The species that benefited the most were the ones most similar to the sage grouse—other birds," Chalfoun says of the established reserve.

These species include avian species; those highly associated with sagebrush plant communities; and those with widespread habitat, the paper says.

Carlisle agrees that other birds fared best under the umbrella species

reserve. However, he also pointed to the state reptile, the greater short-horned lizard, as "a good news story." Core sage grouse habitat protected 46 percent of the habitat where the lizards dwell, he says. This was 12 percent higher than the computer simulation results.

In contrast, the habitat of species with restricted distributions, particularly combined with vegetation associations not closely matching the greater sage grouse, did not receive as much protection from the umbrella reserve. Some of these species included the spotted ground squirrel, dwarf shrew, prairie lizard and the plains pocket gopher.

The Wyoming pocket gopher, which is only native to Wyoming and is roughly the size of a guinea pig, was a prime example of a secondary species that did not fare all that well under the umbrella of sage grouse habitat, Carlisle says.

"We found this core area for sage grouse covered about 20 percent of their (Wyoming pocket gophers') habitat in the state," he says. "Twenty percent is not a lot for these types of species. In the simulations we did, the simulated areas covered twice as much (Wyoming pocket gopher) habitat."

The results suggest that wildlife managers should pay close attention to background species with limited habitat, particularly if their vegetation associations do not align closely with those of the umbrella species.

The paper's findings concede whether conservation strategies based on umbrella species are effective at conserving background species because of the selected umbrella species, or because the strategies inherently involve protecting large areas remains an open question.

Understanding which traits predispose background species to protection under an umbrella strategy will be important to the overall success of

conservation based on the umbrella species concept, Chalfoun says.

"The point of this is we can't assume all types of species are benefiting merely because of sage grouse," Chalfoun says. "What might be ideal sagebrush for sage grouse might not be right for other species."

More information: Jason D. Carlisle et al, Identifying holes in the greater sage-grouse conservation umbrella, *The Journal of Wildlife Management* (2018). DOI: 10.1002/jwmg.21460

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