Science to Solutions

Sage Grouse Need Intact Landscapes For Long-Distance Movement

In Brief: Two new studies revealed unknown long-distance dispersal and migration movements in sage grouse that offer fresh insights for conservation. Using DNA from feathers dropped at leks, scientists discovered that some grouse (about 1% of populations) travel long distances to explore breeding areas up to 120 miles away—movements that can potentially boost populations and temper inbreeding. A separate satellite-telemetry study of sage grouse that migrate between Saskatchewan and Montana found that this population migrates annually up to 150 miles round-trip between seasonal ranges. During migration, grouse use pathways through intact habitat and rest and refuel at stopover sites. Taken together, these findings underscore the need to conserve intact sagebrush habitats across large landscapes on both public and private lands to sustain sage grouse movement pathways, their populations, and genetic diversity.

DNA and Satellites Reveal Unexpected Journeys

Innovative research techniques can shed new light on animal behavior and ecology, as well as supplement conventional knowledge about a species. Two recent studies took a fresh look at movements of sage grouse—a bird that returns faithfully to leks to breed in spring and is typically considered a home-body, moving short distances as necessary between seasonal ranges.

The first study examined dispersal movements of sage grouse between breeding sites, finding that about 1% of a population has a travel itch—rather than stay at known leks, they will disperse surprisingly long distances to new lek sites. The second study looked at the seasonal movement patterns of a population that migrates much farther than any grouse species known, making a 150-mile round-trip journey between breeding areas in Canada and winter range in the US.

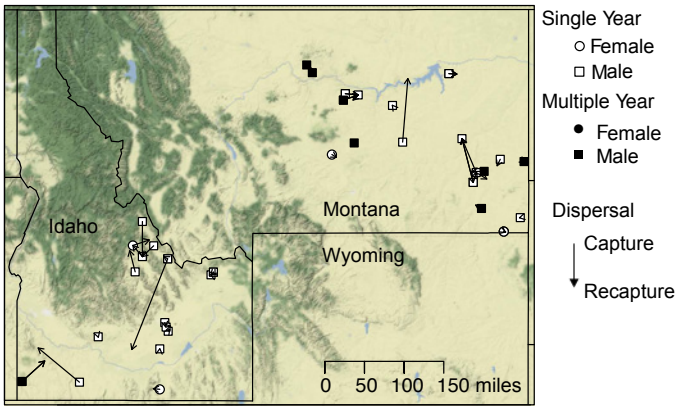
Using feather DNA and satellite telemetry, scientists recently discovered record-breaking long-distance movements by greater sage-grouse. Photos by John C. Carlson.

Tell-Tale Feathers

Researchers have long known that tracking animals by telemetry often misses and underestimates long-distance dispersal. To overcome this problem, Todd Cross, an SGI researcher affiliated with the U.S. Forest Service Rocky Mountain Research Station, used a non-invasive molecular technique to track sage grouse movements among leks. Rather than capture and radio-tag individual grouse, Cross extracted DNA from feathers collected at leks to identify and "recapture" individual birds. Between 2007 and 2013, surveyors conducting annual lek counts collected more than 7,600 fallen grouse feathers from 835 leks in Idaho, Montana, North Dakota and South Dakota. Cross and his colleagues then genotyped the feather DNA and successfully identified 3,212 individual grouse.

Among the thousands of individuals identified, 78 (about 2.5%) popped up twice in the samples and were "recaptured" either at the same or at different leks. Of these, 39 grouse were recaptured on the same lek, illustrating the breeding site fidelity (called *philopatry*) typical of sage grouse. Yet in 41 genetic recaptures, birds shifted to different leks. Seven of these birds journeyed more than 30 miles away, six within the same breeding season, and one recapture was as far as 120 miles away during the same spring.

Dispersal is a genetic mixer. On the one hand, if birds stick to the same breeding sites, they have the advantage of knowing their competitors as well as the local landscape. This knowledge can boost survival and mating success, but there is also a risk of genetic isolation and inbreeding.

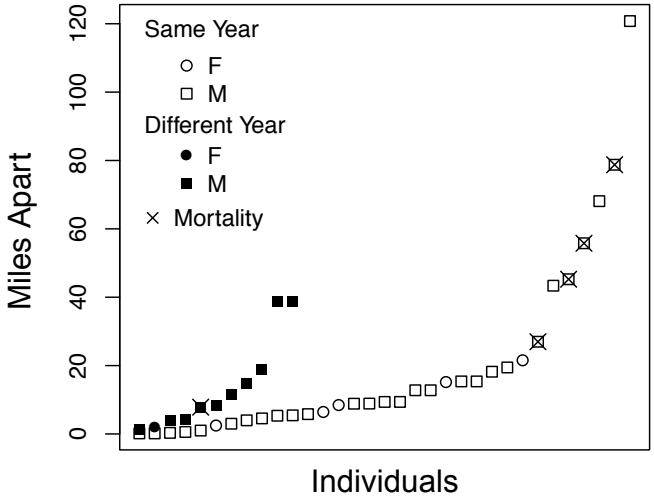


Breeding dispersal movements of sage grouse observed within a single year or over multiple years among leks in Idaho, Montana, North Dakota, and South Dakota (2007-2013). Arrows show the direction of dispersal between leks where individuals were genetically captured and recaptured. Map courtesy of Todd Cross.

Dispersal vs. Migration

Dispersal is a one-way ticket: individuals move from their birth site to a breeding site (natal dispersal) or from one breeding site to another (breeding dispersal).

Migration is a round-trip journey: animals move from one region to another between seasons. Some sage grouse are non-migratory; some migrate between winter range and breeding areas (called 1-stage migration); and some migrate between winter, breeding, and summer brood-rearing ranges (2-stage migration).



Distance individual birds dispersed between genetic capture and recapture on leks in Idaho, Montana, North Dakota, and South Dakota (2007–2013). While most recaptures showed movements of <20 miles, several individuals dispersed >30 miles between leks.

Male and female sage grouse. Photo by Ken Miracle.

Males and females may seek new opportunities to breed if they haven't had good luck at known leks, or are looking to increase their mating chances elsewhere. Survival for dispersers can be slim—and the chance of breeding even less—but it's a risk worth taking if birds breed successfully. Ultimately, birds mix their genes across the larger population, which reduces inbreeding, increases genetic variation, and helps keep populations healthy. Even one individual in a generation can stem genetic isolation. The birds don't know this, of course, but something in a few individuals drives them to strike out for parts unknown.

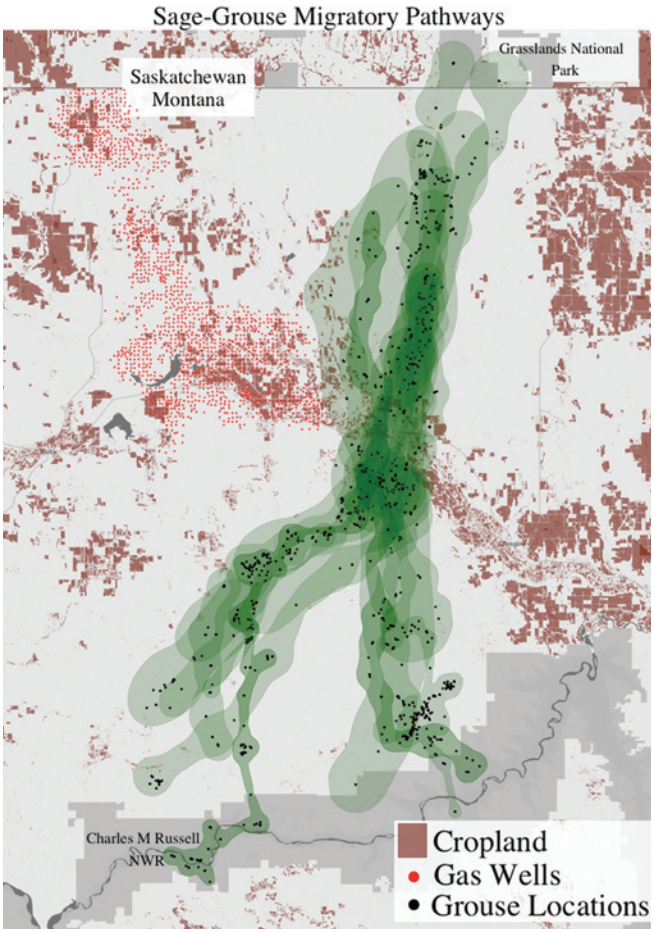
Migration Pathways and Stepping Stones

In southern Saskatchewan and northern Montana, sage grouse make a trans-boundary journey each spring and autumn. Although most sage grouse migrate locally—moving less than 37 miles between breeding and wintering areas—this population covers twice that distance: 75 miles one-way between Canada's Grasslands National Park (GNP) and the Charles M. Russell National Wildlife Refuge (CMR) in Montana. A new study conducted by Jason Tack and Rebecca Newton at the University of Montana tracked these birds with GPS satellite-telemetry to better understand why they migrate so far and how they move across the landscape.

Satellite telemetry offers a more intimate view of animal movements because transmitters can remotely record an animal's location multiple times a day, rather than chasing them around with hand-held antennas. In 2010, the researchers placed GPS transmitters on 24 sage grouse. The transmitters recorded locations four times a day over two years, which allowed the scientists to map migration behavior and display how the grouse used different habitats in the landscape.

In Grasslands National Park and the northern part of Valley County, Montana, sage grouse breed in terrain that is a mix of shortgrass prairie and sparse silver sagebrush *(Artemisia cana cana).* While the silver sagebrush provides good forage in spring, it becomes completely covered by snow in winter. Since sagebrush is all that grouse eat in winter, these birds must migrate to find a reliable winter food source. On the CMR, the grouse are able to survive the winter by foraging in taller and denser stands of Wyoming big sagebrush *(Artemisia tridentata wyomingensis)* that protrude above the snow.

The GPS telemetry revealed that, much like a river with many intertwining braids, grouse follow multiple routes that together serve as a migratory pathway between seasonal ranges. During migration, they follow gently rolling grasslands and sagebrush flats and avoid cultivated croplands. In addition, they move in "stepping stone" fashion, spending up to a day at each of several stopover sites along the way to rest and refuel. Spring and autumn, they average seven to nine stopovers. This type of punctuated movement between stopover sites is typical of many other migratory birds, such as waterfowl and shorebirds, and was recently documented in long-distance migrations of mule deer.



GPS telemetry revealed multiple braided pathways across the landscape as grouse migrated between Grasslands National Park in Saskatchewan and the Charles M. Russell National Wildlife Refuge in Montana. Map courtesy of Jason Tack.

The GPS telemetry revealed another surprise: these birds can adapt their migratory behavior to weather events. In the winter of 2010-11, unusually deep snow pushed the grouse to make a second migration farther south. They moved another 26 to 72 miles to where they were able to find exposed sagebrush on open, wind-blown slopes. Yet despite the heavy winter and longer migration, not one of the tagged grouse died during the harsher winter, showing a remarkable ability to adapt their use of the landscape in the face of changing conditions.

Keeping the Connections

Taken together, these studies underscore that sage grouse require large landscapes of healthy native sagebrush habitat for their survival. The genetic data revealed that sage grouse disperse farther than previously thought, and GPS-tracked birds taught us that sage grouse not only undertake long migrations, but they do so by using

"The results of these studies profoundly changed our view of the landscape and what these birds need. Working in partnership to conserve habitats across a patchwork of ownerships is the only way to maintain the wide-open spaces sage grouse need to thrive."

~John C. Carlson, Montana Zone 1 Greater Sage-Grouse Lead, Bureau of Land Management, Billings.

pathways and stopover sites of intact sagebrush habitat. In addition to conserving seasonal ranges, keeping big landscapes intact is essential for maintaining these birds' movement pathways, which provide for migration and gene flow.

"Without private lands conservation, the value of habitat on public land declines. Both public and private land managers play vital roles in maintaining large and intact landscapes that support ranching and wildlife. Simply put, we're all in this together," explains John Carlson, Montana Zone 1 Greater Sage-Grouse Lead for the Bureau of Land Management.

To conserve sage grouse habitat and movement pathways, the NRCS-led Sage Grouse Initiative partners with agencies, nonprofits, and landowners. Through voluntary projects with private landowners, SGI secures conservation easements to protect native grazing lands from cultivation and subdivision, sets up grazing systems that help producers remain profitable and productive, and removes invading conifers to restore pastures and open up pathways between seasonal grouse ranges. These programs benefit agricultural producers who depend on healthy rangeland for their livelihood, while safeguarding sagebrush habitats and vital connections at the scale sage grouse need.

Intact, healthy rangeland is vital for working lands and wildlife. Photo by Tatiana Gettelman.

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Sources

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Learn More

SGI's Interactive Web App helps managers and landowners plan sagebrush conservation projects by visualizing and mapping resources: **http://map.sagegrouseinitiative.com**

The Sage Grouse Initiative is a partnership-based, science-driven effort that uses voluntary incentives to proactively conserve America's western rangelands, wildlife, and rural way of life. This initiative is part of Working Lands For Wildlife, which is led by USDA's Natural Resources Conservation Service: **www.sagegrouseinitiative.com**