

by Steven T. Knick and  
Ruth W. Jacobs

# Conserving Bird Communities in the Sagebrush Sea

*T*he sagebrush ecosystem, which occupies about 120 million acres (485,600 square kilometers) across 14 western states and 3 Canadian provinces, is one of the largest in North America, and one of its most imperiled. Decades ago, warnings began to appear about the loss

of sagebrush habitats and the consequences for biodiversity. Today, many species of shrubland birds are declining, some severely. The greater sage-grouse (*Centrocercus urophasianus*), which depends on sagebrush habitats to survive, is again being considered for listing

*An example of sagebrush habitat in Central Nevada.*

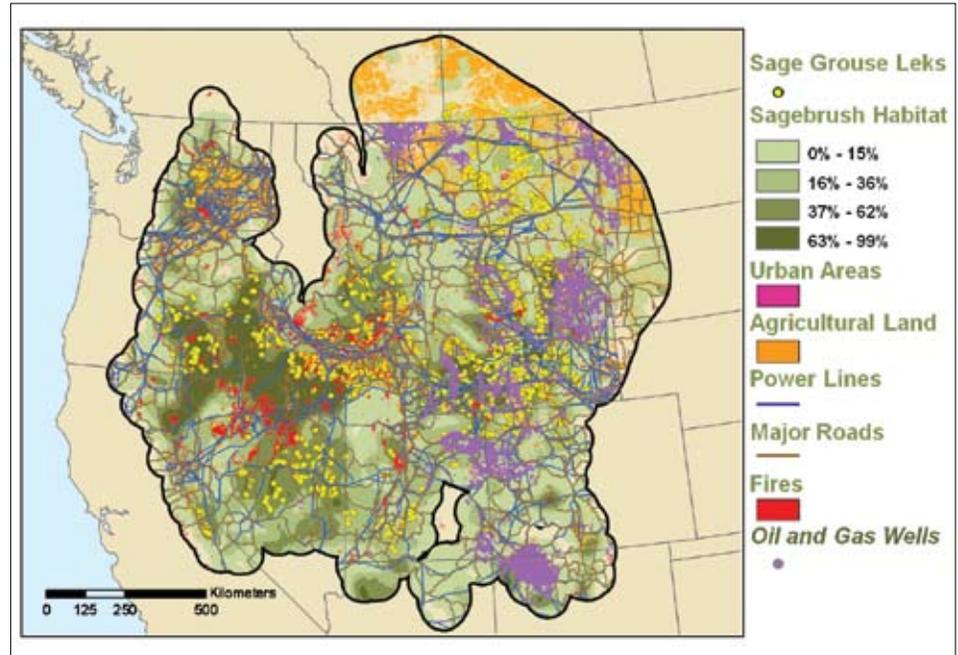


Steve Knick/USGS

under the Endangered Species Act. To be successful in conserving this ecosystem and the birds that depend upon it, managers need a better understanding of how human use is affecting sagebrush habitats, which habitat components are most critical, the importance of wintering grounds and migration pathways, and how to monitor and estimate bird population trends.

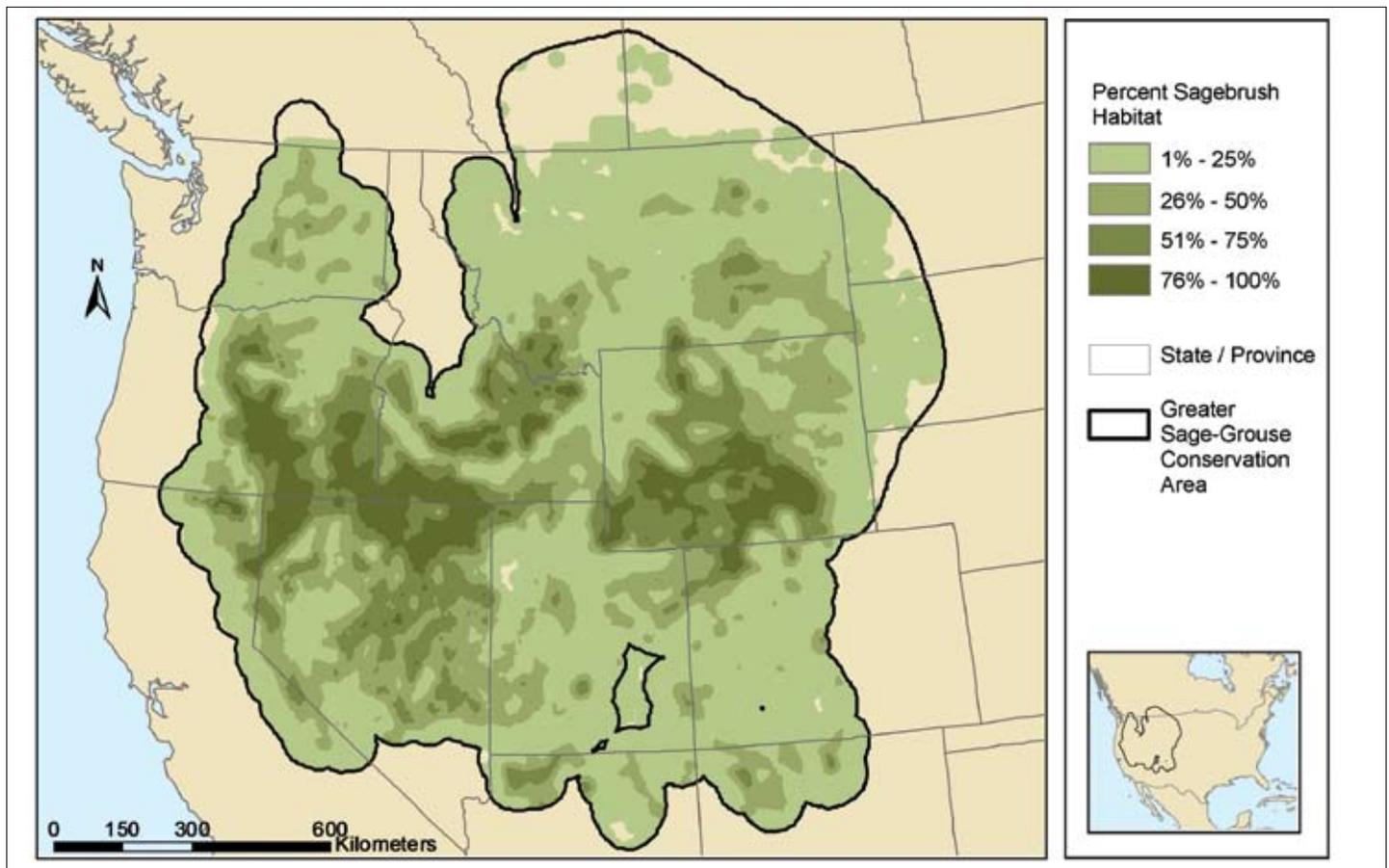
First, managers need more information regarding how human uses, such as oil and gas development or livestock grazing, are affecting sagebrush habitats. As part of a 2004 conservation assessment for sage-grouse, a partnership of state, federal, and university scientists conducted such an analysis. For more than a year, they compiled and analyzed data from thousands of sources to identify, characterize, and quantify the dominant factors (such as agriculture, energy development, and grazing) that influence sagebrush habitats. They systematically documented that almost

all sagebrush habitats used by sage-grouse were influenced by one or more significant land uses. They also described how land uses can act synergistically. For example, those uses that cause the spread



Combined breeding and wintering ranges of Brewer's sparrow, sage sparrow, sage thrasher, green-tailed towhee, and gray flycatcher (reprinted from Knick et al. 2003 with permission from Cooper Ornithological Society).

Approximate current distribution of sagebrush habitats in western North America. The map represents the percent of the landscape dominated by sagebrush habitats.





**Greater sage-grouse.**

of fire-prone invasive plants, such as cheatgrass (*Bromus tectorum*), can result in increasing the size and frequency of fires that ultimately convert even more sagebrush habitat to grasslands. The analysis (available at <http://sagemap.wr.usgs.gov/>) also produced data for use in visualizing habitat change and in conducting additional studies. The result is a valuable baseline for future assessments of sagebrush habitats and other ecosystems in the western United States.

A second research need is basic information about food, cover, space, and water. Surprisingly, little of such information is known for many species of shrubland birds other than sage-grouse, a game bird in many states. Because of new tools to characterize large landscapes, scientists also are learning that the spatial variability in these habitat requirements is an important predictor of population distributions. From a study of shrubland birds and habitat that took three summers and required driving over thousands of miles of dirt roads throughout the Intermountain West, scientists documented that shrubland bird com-

munities were arranged along two major habitat gradients; one ranged from grasslands, through sagebrush shrublands, into juniper woodlands, and the other covered the spectrum from large intact landscapes to highly fragmented systems. The characteristics that determined bird distribution and abundance were precisely aligned with the kinds of habitat changes occurring in sagebrush habitats. These extensive studies show that the distribution of native bird species depends principally on two factors: whether the habitats are predominantly grassland or sagebrush and how much disturbance from human activities have affected the sites.

A third research need emphasizes a better understanding of the importance of wintering grounds and migration pathways. For many species of birds, events during the wintering period may be a significant or even dominant factor in population trends. Obtaining the necessary information to evaluate the influence of the winter period has not been possible using traditional methods because few birds that are leg-banded on research studies are ever recaptured, and the tiny transmitters that can be used on shrubland birds have extremely limited signal strength and battery life. A new technique, based on analyzing feathers for concentrations of stable isotopes, is being used by scientists to link wintering and breeding grounds for shrubland birds. Molting birds replace their feathers on the breeding range each year during the summer. The proteins used to build the new feathers have subtle differences in levels of carbon and nitrogen that vary across the breeding range. Therefore, feathers collected from birds captured and released on the winter range retain this environmental signature that connects them to their summering range. From this study, managers will have essential information to consider the continental scale of influences on the birds breeding in sagebrush habitats.

A fourth research need is to improve methods for estimating bird population trends. Currently, the only consistent

range-wide data are collected by the USGS Breeding Bird Surveys. However, these surveys are not adequate to estimate many of the regional population trends that can be related to changes in habitat. Coordination, data-collection protocols, analysis procedures, technical support for data analysis, and data management are critical tasks to be considered. Technological advances for data recording also are needed, combined with new ways of information analysis involving disparate datasets.

Natural resource agencies have a daunting task to manage and restore sagebrush habitats and the associated species. Cumulative effects of land use and habitat change, coupled with long-term changes from climate change, could result in a large-scale collapse of this vast western landscape. Information systematically collected in the four areas of research described above can be crucial in raising awareness in the scientific community, among land managers, and ultimately of the American public about the challenges and the opportunities associated with conservation of this ecosystem and others. Although specialized skills and data-processing resources are needed to undertake such large-scale studies, that support is available in federal and state research organizations and universities. Most important may be the mindset to better appreciate the value of sagebrush ecosystems and to commit the resources necessary to undertake the studies and apply the knowledge gained for conservation actions.

The four research topics were presented in a paper published in *The Condor* in 2003. A reference for this paper and the two completed studies used as examples is provided below:

Connelly, J.W., Knick, S.T., Schroeder, M.A., Stiver, S.J., 2004, Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats: Unpublished report of Western Association of Fish and Wildlife Agencies, p. 610. (Available at [http://sagemap.wr.usgs.gov/conservation\\_assessment.htm](http://sagemap.wr.usgs.gov/conservation_assessment.htm))

Knick, S.T., Dobkin, D.S., Rotenberry, J.T., Schroeder, M.A., Vander Haegen, M., Van Riper, C., 2003, Teetering on the edge or too late? Conservation and research issues for avifauna of sagebrush habitats: *Condor*, v. 105, p. 611-634.

Knick, S.T., Rotenberry, J.T., Leu, M., 2008, Habitat, topographical, and geographical components structuring shrub-steppe bird communities: *Ecography*, v. 31, p. 389-400.

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*Steve Knick (steve\_knick@usgs.gov, 208-426-5208) is an ecologist with the USGS Forest and Rangeland Ecosystem Science Center and is located in Boise, Idaho. Ruth Jacobs (ruth\_jacobs@usgs.gov, 541-750-1047) is a biologist who focuses on outreach and communications for the USGS Forest and Rangeland Ecosystem Science Center in Corvallis, Oregon.*