

Greater sage-grouse Ecology, Movements, and Habitat Use Related to Land Use  
Patterns in the Vicinity of Bear Lake

2010 Progress Report



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Rich County Coordinated Resources Management Working Group

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By

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## **Introduction**

Greater sage-grouse (*Centrocercus urophasianus*; hereafter sage-grouse), the largest grouse species in North America, has been designated as a candidate species by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act of 1973 (USFWS 2010). Sage-grouse currently occupy about 668,412 km<sup>2</sup>, less than 60% of its historic range, which includes 11 states and 2 Canadian Provinces (Schroeder et al. 2004). One of the threats identified by the USFWS (2010) includes lack of effective regulatory mechanisms to protect the species across jurisdictional boundaries. In the U.S., sage-grouse are considered a game bird, and each state has the authority to manage species take. Thus, sage-grouse populations inhabiting multiple states could come under the jurisdiction of different state laws and management plans (Connelly et al. 2004). Sage-grouse inhabiting the Bear Lake area are included in the Wyoming Basin sage-grouse population (Connelly et al. 2011) that includes portions of Idaho, Utah, and Wyoming. Because sage-grouse are capable of migrating considerable distances, the Bear Lake sage-grouse population could occupy habitats in three states. Little is known about the ecology, seasonal movements, and habitat-use patterns of this population relative to existing or potential land uses. Migration information is important to delineate a meta-population, identify essential habitats, and determine the potential effects of land-use on species conservation and management. There exists strong relationships between movement patterns, survival, productivity, and hence conservation (Connelly et al. 2011). The main objective of this research is to describe the ecology, seasonal movements, and habitat-use patterns of sage-grouse that inhabit the Bear Lake area relative to existing land-uses. Because Bear Lake is subject to both natural and anthropogenic barriers and fragmentation, studying the movements and habitat-use of this population will help guide management recommendations. This information will be important in the development of a multi-state management plan to mitigate threats to species conservation.

## **Research Objectives**

1. What are the seasonal movement and habitat use patterns of sage-grouse inhabiting the Bear Lake area? Specifically I will investigate if the sage-grouse population constitutes one tri-state population or a series of isolated meta-populations. Also, I will assess movement and habitat-use patterns of different sex and age groups (specifically yearling males). Information on juvenile movement will also be examined for site selection in the following year. Finally, I will estimate home range sizes of sage-grouse inhabiting the area around Bear Lake and relate overall movement patterns and home range to patterns of habitat fragmentation.
2. What are the land use patterns around Bear Lake and how do they affect sage-grouse habitat-use? Specifically, are sage-grouse avoiding more fragmented areas, as well as natural and anthropogenic barriers? I will define sage-grouse habitat-use patterns relative to natural barriers including: Bear Lake, the Bear River, and habitat edges (where sagebrush and forested habitat intersect) and anthropogenic barriers including: primary roads and maintained unimproved roads, towns, power transmission lines, and railroad tracks. I will investigate hen nest site and brood-rearing habitat selection relative to land uses in areas occupied.
3. What are the population demographics and is this a stable population? I will assess nesting and brood success to determine breeding success for the population(s). I also will determine if population survival rates and mortality factors differ based on habitats occupied by sage-grouse in the different states. Finally, I will investigate movements to see if sage-grouse are freely dispersing among states and out of the population(s).

## **Study Area**

The Bear Lake Study Area is in Bear Lake County, Idaho, Rich County, Utah, and Lincoln County, Wyoming (Figure 1). This area is comprised mostly of private land, with some patches of public Forest Service, U.S. Fish and Wildlife, Bureau of Land Management, and state-owned land. The primary land use is for livestock grazing, but the area also experiences use for recreation purposes and residential expansion.

## **Methodology**

Sage-grouse were trapped on and near leks beginning in March 2010. I will continue to trap additional birds through spring of 2012. Spotlights were used to locate roosting grouse, and they were captured using a dip net, and fitted with radio-collars (Connelly et al. 2003). I plan to capture and collar up to 40 male and 40 females annually. Half the collars will be deployed in Utah and half in Idaho. I will attempt to distribute them evenly on yearling and adults using size and plumage to classify grouse (Dalke 1963). Radio-collared grouse were located using telemetry at least once a week from 1 June to 1 November and once a month from 1 November to 15 March 2011.

In 2010, no nests were monitored because time was dedicated to defining movement patterns. In the future, radio-collared females will be located on nests by approaching and observing them under the same bush for several days. Nest success will be measured by monitoring nest incubation time, and locating nest remains after success or failure. Brood success will be determined by walking up females and counting the number of chicks, or by using pointing dogs and/or night spotlighting.

Nest and brood vegetation will be measured in future years. A Robel pole (Robel 1970) will be used to measure visual cover at nests, and four 15 meter line intercept transects will be at

90 degree angles from the nest and used to measure vegetation cover with a line intercept (Canfield 1941). Along these transects herbaceous cover will be measured using Daubenmire frames. The aspect of the slope where the nest is will also be recorded. Brood sites will be measured using the line-intercept method at four 30 meter transects at 90 degree to measure shrub cover, and Daubenmire Frames will be used to measure ground cover (grass, forb, bare ground, litter, rock) at four locations along theses transects (Daubenmire 1959). Random vegetation points will be taken for each nest and brood discovered to compare selected habitats to all habitat points in the study area (Connelly et al. 2003).

Habitat fragmentation will be measured using GIS technology. Sage-grouse habitat use, production, and seasonal movements will be plotted relative to anthropogenic landscape features (Connelly et al. 2011). These metrics will be used to develop indices of habitat fragmentation to determine if the fragmentation observed constitutes functional habitat loss (USFWS 2010). Sage-grouse movements will also be plotted relative to natural landscape barriers to determine how habitat-use is affected in this area.

## **Current Research Progress**

### ***Captures***

In 2010, 55 sage-grouse were captured and 47 radios were deployed. Because we were interested in maintaining balance sex ratios, some of the males captured in Utah were not radio-collared, hence the discrepancy in numbers captured versus radio-collared. The distribution of collars deployed by age classes and sex are reported in Table 1. During the spring 40 sage-grouse were collared; 23 in Idaho and 17 in Utah. An additional 4 males were captured and banded in Utah but they were not collared. In the fall, 6 adult females and 1 juvenile female were collared in Idaho, and an additional 4 juveniles were captured and banded but not collared.

## ***Locations***

During 2010, 156 female and 188 male locations were recorded (Figure 1). Most of these locations were taken from June 1<sup>st</sup> till September 15<sup>th</sup>. Because intensive field work did not start until 1 June, no nests were found from collared females; only one collared female was observed with a brood of 2 chicks. However, within the study area 12 unmarked females were observed with broods during late spring and summer. I noted two uncharacteristic movement events by 2 radio-marked yearling males in 2010. One male was found with the Bear Lake National Wildlife Refuge, 24 km from the capture lek. The other male was captured in Idaho, found in Utah in May and June, and then found in Wyoming in August; this was a cumulative distance of 30 km. Throughout 2010, I recorded locations for 614 unmarked birds in 131 different locations (Figure 2).

## ***Mortalities***

Five collars deployed on males in Idaho were retrieved due to mortality; 4 were suspected avian mortalities and 1 was suspected mammal mortality. Additionally, 3 collars deployed on females in Idaho were retrieved due to mortality; 2 were suspected avian mortalities and 1 an unknown mortality. Six collars deployed on males in Utah were retrieved due to mortality; 2 were suspected avian mortalities, 2 were suspected mammal mortalities, 1 appeared to be the result of a fence collision, and one was a dropped collar. Finally, two collars deployed on females in Utah were retrieved due to mortality: 1 was suspected mammal mortality and 1 was an unknown mortality.

## **2011 Work Plan**

In 2011, I will continue to study movement patterns of the sage-grouse around Bear Lake. In the spring, I will attempt to deploy 55 more collars around the study area with more emphasis on the west and north sides of the lake. I will also attempt to determine which historical leks are still active and if there are any leks that have been undiscovered in the study area. I will try to locate the birds three times per week in the spring and summer, once a week in the fall, and at least once a month in the winter. I will focus on finding nests and recording success or failure. I will take vegetation measurements for nests and brood locations. Finally, I will start to create a habitat fragmentation index to determine if the fragmentation observed constitutes functional habitat loss.

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## Tables and Figures

Table 1. The distribution of radio-collars deployed on greater sage-grouse in the Bear Lake Study Area during 2010.

Capture Location	Adult Male	Yearling Male	Adult Female	Yearling Female
SPRING CAPTURES				
Idaho- 2B043 Lek	9	6	3	4
Idaho- 2B002 Lek	0	0	1	0
Utah- North Eden Lek	9	0	4	4
FALL CAPTURES				
Idaho- Not on Lek	0	0	6	1
Total for 2010= 47	18	6	14	9

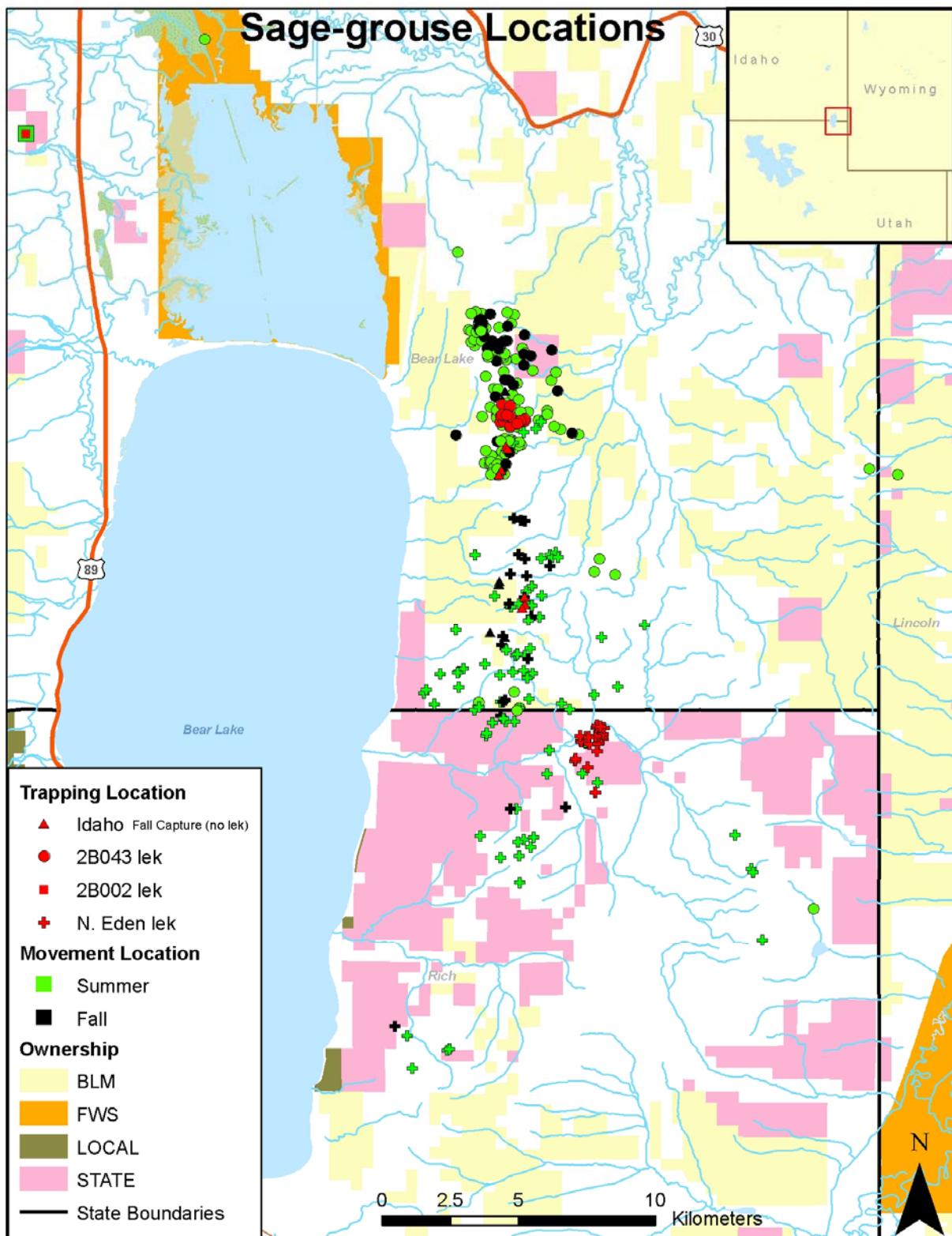


Figure 1. Distribution of sage grouse locations for 2010. Locations were given a symbol by Trapping Location. Colors symbolized trapped location (red), summer (green), and fall (black). (Ownership boundaries acquired from the National Integrated Land System Map)

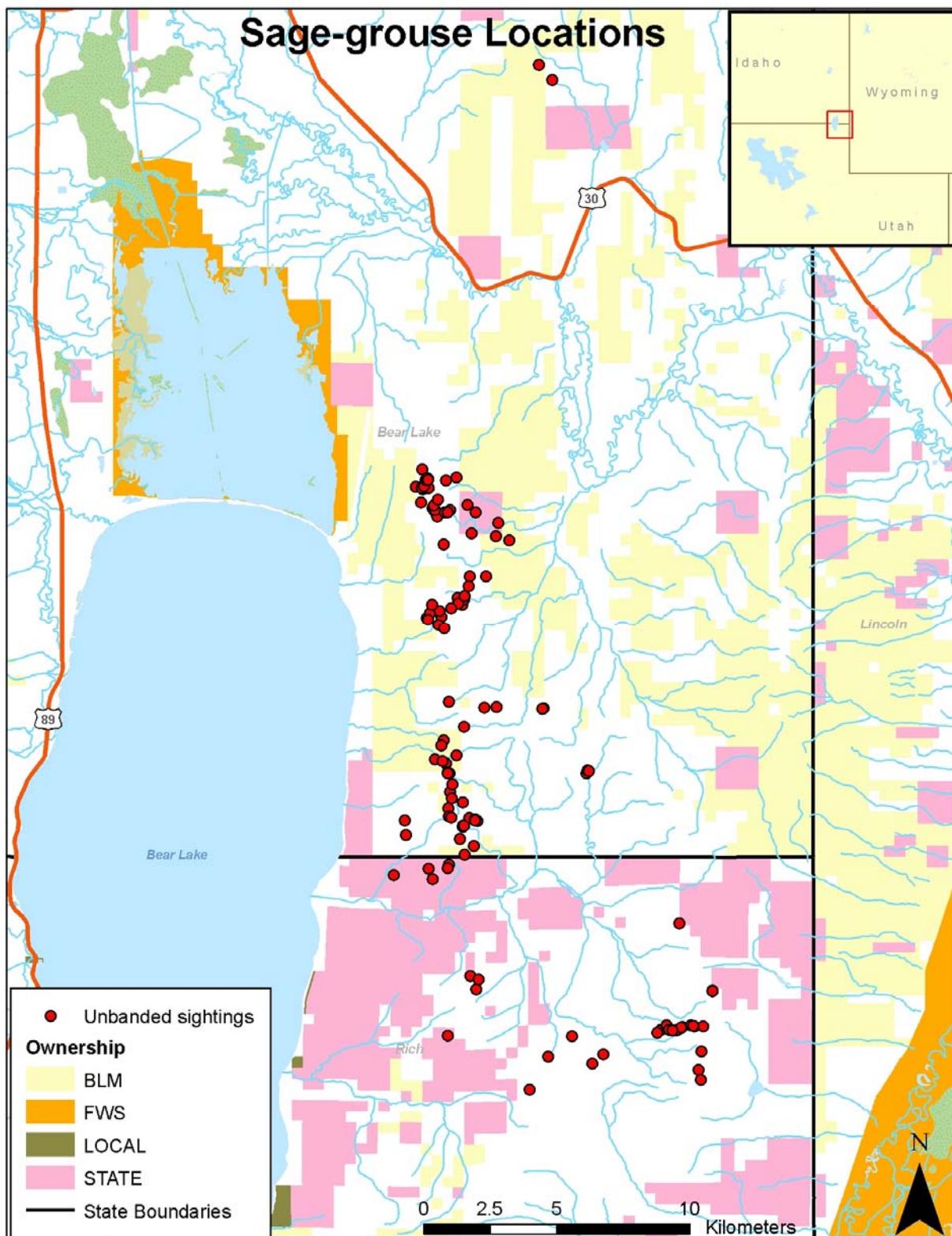


Figure 2. Recorded locations of unbanded sage-grouse for 2010. (Ownership boundaries acquired from the National Integrated Land System Map)