

GREATER SAGE-GROUSE RESPONSES TO LIVESTOCK GRAZING IN SAGEBRUSH  
RANGELANDS

2016 ANNUAL REPORT



Prepared by

Wayne Smith and Terry Messmer

Jack H. Berryman Institute,

Department of Wildland Resources

Utah State University, Logan.

December 2016

GREATER SAGE-GROUSE RESPONSES TO LIVESTOCK GRAZING IN SAGEBRUSH  
RANGELANDS

2016 ANNUAL REPORT

Cooperators:

Rich County Coordinated Resources Management

Rich County Commission

Utah Agricultural Experiment Station

Deseret Land and Livestock

Rocky Mountain Power/Pacific Power

Bureau of Land Management

Utah Department of Agriculture and Food

US Forest Service

Utah Cooperative Fish and Wildlife Research Unit

Utah Division of Wildlife Resources

Utah State University Extension

Natural Resources Conservation Service/Sage-grouse Initiative

Intermountain West Joint Venture

Jack H. Berryman Institute

Quinney Professorship for Wildlife Conflict Management

Suggested citation: Smith, W., and T.A. Messmer. 2016. Greater sage-grouse responses to livestock grazing in sagebrush rangelands. Annual Report. Utah Agricultural Experiment Station, Utah State University Extension, and the Jack H. Berryman Institute, Logan UT. 12pps.

**Table of Contents**

Introduction ..... 4  
    *Study Purpose* ..... 4  
    *Objectives* ..... 5  
Study Area ..... 5  
Methods ..... 5  
    *Radio Telemetry*..... 5  
    *Vegetation Surveys*..... 6  
Preliminary Results/Discussion ..... 6  
    *Movement and Habitat Use Patterns* ..... 6  
    *Nesting/Brooding* ..... 7  
Adopt-a-sage-grouse ..... 7  
2017 Plan of Work ..... 8  
Literature Cited ..... 11

**List of Tables and Figures**

Table 1. Mortality rates for greater sage-grouse (*Centrocercus urophasianus*) radio-marked and monitored on Deseret Land and Livestock and the Three Creeks Grazing Allotment in Rich County, Utah, 2016 ..... 8  
  
Table 2. Estimated nesting and brooding rates for greater sage-grouse (*Centrocercus urophasianus*) radio-marked and monitored on Deseret Land and Livestock and the Three Creeks Grazing Allotment in Rich County, Utah, 2016 ..... 8  
  
Figure 1. Deseret Land and Livestock and the Three Creeks Grazing Allotment in Rich County Utah Study Area, 2016 ..... 9  
  
Figure 2. Large seasonal movements for female greater sage-grouse (*Centrocercus urophasianus*) radio-marked and monitored on Deseret Land and Livestock and the Three Creeks Grazing Allotment in Rich County, Utah, 2016 ..... 10

## Introduction

Greater sage-grouse (*Centrocercus urophasianus*: sage-grouse) are restricted to the sagebrush (*Artemisia* spp.) rangelands of western North America. The distribution and abundance of sage-grouse have declined in the last 60 years (Connelly et al. 2004). Currently populations exist in only 10 states and 1 Canadian province. Grazing by domestic livestock is the predominate land use across the sagebrush biome (Connelly et al. 2004) and almost all sagebrush areas are managed for livestock grazing (Knick et al. 2003).

Prior to the 2015 decision not to list sage-grouse for protection under the Endangered Species Act, the U.S. Fish and Wildlife (USFWS) recommended that adequate monitoring of grazing strategies is essential to ensure desired ecological conditions for sage-grouse (USFWS 2013). They further recommended that grazing management strategies must consider the local ecological conditions, including soil types, precipitation zones, vegetation composition, and drought conditions. Livestock numbers must be managed at levels that allow native sagebrush communities to minimally achieve Proper Functioning Conditions (PFC; for riparian areas) or Rangeland Health Standards (RHS; uplands). The USFWS also identified several tools that could be used for developing management strategies (such as Ecological Site Descriptions and PFC metrics), but cautioned that the tools should be tied to sage-grouse habitat and population parameters before they could be used to monitor habitat status (Doherty et al. 2011)

Utah State University Extension in cooperation with the Natural Resources Conservation Service Sage Grouse Initiative, Deseret Land and Livestock (DLL), and the Rich County Coordinated Resource Management initiated research in 2011 to determine if sage-grouse vital rates (i.e., nest and brood success and juvenile and adult survival) differed between areas managed under prescribed and traditional season-long grazing practices, and if any of the observed differences were related to vegetation composition and structure (Dettenmaier and Messmer 2016). While this study provided new information regarding how sage-grouse vital rates may be affected by different grazing practices it did not provide adequate location data to determine how grazing infrastructure (i.e., fences, roads, and water developments) and livestock distributions may alter sage-grouse use of seasonal habitats (Utah Wildlife-in-Need Foundation 2011). Structures which support range management can also have negative impacts on sage-grouse and their habitats by increasing fragmentation (e.g., fences, water developments, and roads) or diminishing habitat quality (e.g., concentrating ungulates in winter habitats; State of Utah 2013).

### *Study Purpose*

This project will provide definitive information and best management practices regarding sage-grouse vital rates, habitat-use, and behavioral responses to the presence of cattle and the effects of livestock grazing on the vegetation composition and structure based on rangeland ecological sites. We are using Global Positioning System (GPS) transmitters to mark and track sage-grouse across the landscape. We will compare our sage-grouse location data to another study on the same landscape that has marked cattle with GPS transmitters to determine how both species use the landscape during the sage-grouse nesting and brood-rearing seasons.

We also will pilot an interactive program called “Adopt-A-Sage-grouse” to share this information with teachers, their classrooms, and other interested stakeholders.

### *Objectives*

- 1). Do female sage-grouse vital rates differ between areas managed under prescribed and traditional season-long grazing practices? If so, what factors (i.e., habitat composition and structure, fragmentation, predator communities, grazing practices) associated with livestock grazing may explain the differences?
- 2). Do female sage-grouse seasonal habitat-use patterns differ under prescribed rotational and season-long grazing practices? If so, can the observed differences be explained by avoidance behavior or differences in vegetation composition and structure that are the result of livestock grazing?
- 3) Create an interactive program to promote education and conservation of sagebrush rangelands. “Adopt-a-sage-grouse” will provide this platform through a website “adoptasagegrouse.usu.edu”.

### **Study Area**

The study area is located in Rich County, Utah (Figure 1). Rich County is located in northeastern Utah and constitutes the southwestern portion of the Wyoming Basin Sage-grouse Management Zone II (Knick and Connelly 2011). The research will be conducted on 2 study sites within Rich County. The first study site is DLL, an 86,900 ha privately owned ranch comprised of roughly 80,600 ha of private lands and 6,300 ha of federal BLM lands located in the lower elevations. The DLL study area is managed as a cohesive unit and land managers there have used rotational prescribed grazing practices since 1979. The second site, Three Creeks, is a 56,900 ha composite of 29 individual BLM and USFS grazing allotments and private lands that are managed under traditional season-long grazing practices. The Three Creeks study area falls within the BLM designated Sagebrush Focal Area (SFA). The SFA designation has been given to areas that have large sage-grouse breeding populations and have high quality sage-grouse habitats.

### **Methods**

#### *Radio-Telemetry*

Beginning in the spring of 2016, we captured and radio-marked 40 female sage-grouse on DLL and Three Creeks with VHF radio collars. We also captured and radio-marked 15 additional female sage-grouse (8 on DLL and 7 on Three Creeks) with camouflaged and solar-powered GPS satellite transmitters following capture protocols described by Connelly et al. (2003). All sage-grouse were captured near leks within the study area during the breeding season. We determined the sex and age of the captured birds, weighed and examined them to assess general health, and recorded the capture location (UTM, 12N, NAD 83). The captured birds were handled with care to mitigate capture related mortality and released on site.

Radio-marked sage-grouse were relocated 1-3 times per week. Radio-marked females were located 2 times weekly until nest initiation. Nest status was checked 4-5 times weekly until nest fate could be determined. Females that successfully hatched a nest were monitored to determine

the status of their broods. Females with broods were located 2-3 times per week to determine chick survival. Broods were flushed after six weeks to determine brood success.

The GPS transmitters deployed on female sage-grouse are capable of recording 6 locations daily. We are currently comparing these location data to livestock habitat selection data which was collected using 47 GPS-collars that were deployed on cattle in DLL and the Three Creeks Allotment study areas.

### *Vegetation Surveys*

Upon re-locating radio-marked sage-grouse, a vegetation survey was conducted at the location to determine the characteristics of the preferred cover and forage plants. Each survey consisted of four transects of 15 m in length at nest sites, habitat use sites, and random locations. The line intercept method was used to determine shrub canopy cover, and the Daubenmire frame technique was used to evaluate height and species composition of forbs and grasses and vegetation concealment (Daubenmire 1959, Robel et al. 1970, Connelly et al. 2003).

Comparisons of these data will be made to determine if differences exist between preferred and random locations based on ecological site and condition. The GPS technology and Geographic Information System (GIS) mapping software will be used to create a viewshed of the species' vital rates, seasonal movements, and habitat use patterns relative to the vegetation structure and composition, livestock distributions, and ecological sites and condition in the study areas.

## **Preliminary Results and Discussion**

### *Movement and Habitat Use Patterns*

We were able to capture and radio-mark 55 female sage-grouse. We marked 9 female sage-grouse on DLL with GPS transmitters and 7 female sage-grouse on Three Creeks with GPS transmitters. The GPS marked sage-grouse have provided data that would have been difficult, if not impossible, to collect using VHF radio collars. Because of the steep terrain and large distances that sage-grouse can move, it was difficult to find some VHF marked sage-grouse more than once a week. The GPS transmitters allowed much greater insight into how sage-grouse use the landscape. We were able to collect over 17,000 GPS locations for 16 GPS marked sage-grouse. We were only able to collect a little over 400 GPS locations for 39 VHF radio marked sage-grouse.

The GPS transmitters allowed us to define movement corridors used for seasonal movements and document large seasonal movement which we would not have been able to detect using VHF technology. For example, a GPS marked sage-grouse moved 20 miles in 4 days, moving from DLL south to a lek near the town of Croydon, UT. This sage-grouse was later killed by a Great Horned owl; the transmitter was found in the nest. Another GPS marked sage-grouse on the Three Creeks study area moved north 16 miles along the west side of Bear Lake near Garden City. A sage-grouse captured in the Three Creeks study area, near the Otter Creek lek, moved 8 miles northwest, nested, and successfully raised a brood. In October 2016, she moved 30 miles

south and is now in the DLL study area (Figure 2). Mortality rates were similar across study areas but mortality rates were higher for GPS marked birds than for VHF marked birds (Table 1).

This fall and in the spring of 2017, we plan to radio-mark an additional 6 female sage-grouse with same brand of GPS transmitter. We also plan to mark an additional 9 female sage-grouse with a different brand of GPS transmitter. The differences in mortality rate of these GPS transmitters will be compared at the end of field season 2017.

Data collected from GPS marked cattle were not available at the time this report was prepared. When this data is received we will compare cattle locations with sage-grouse locations to see if the physical presence of cattle changes habitat uses of sage-grouse. We will compare our data with the researchers studying how the cattle are distributed across the landscape. This comparison study will allow us to see how the presence of cattle and also their movement patterns may affect sage-grouse use of the same landscape.

### ***Nesting/Brooding***

Radio-marked sage-grouse began to initiate nests on April 20<sup>th</sup>. All of the nests we monitored were hatched or predated by June 20<sup>th</sup>, this includes two females that re-nested. Nest elevations ranged from 1960 m to 2300 m. While we made every effort to determine the type of nest predation, it was often difficult to be conclusive as to which predator was responsible. All unsuccessful nests were caused by nest predation; no nests were abandoned. Nesting initiation rates on DLL were lower than on the Creeks but hatching rates and brood success rates were higher on DLL than Three Creeks (Table 2). We will evaluate vegetation data collected and nest and brood locations and random sites in the fall of 2017 to determine if vegetation composition or structure may have influenced nest and brood success.

### **Adopt-a-sage-grouse**

The adopt-a sage-grouse website will incorporate the GPS location data we collect and allow the user to monitor the life history and movements of an “adopted” sage-grouse. The “adoption” will also allow the user to contact the researcher to ask questions and receive answers from the scientists who are doing the research. The site also hosts a curriculum has been developed by the USFWS that will allow the user to learn about sage-grouse biology while they are receiving

weekly updates about their adopted sage-grouse. Teacher can use this curriculum in conjunction with the data associated with the sage-grouse they adopt to teach their class using a real world application of math and science.

**ADOPT A SAGE-GROUSE**

Sage-Grouse Biographies Sage-Grouse Research Sage-grouse Ecology

**BROWSE SAGE-GROUSE**  
Research  
Curriculum  
Sage-grouse Ecology  
Pic of the Week  
Reasons for Concern

**Adopt a Sage Grouse**  
Why Adopt-a-Sage-Grouse?  
Why Adopt-a-Sage-Grouse?  
The adopt-a-sage-grouse project is designed to increase humanities awareness regarding about the greater sage-grouse and the sagebrush seas it depends on, and how best we can work together to conserve it. Many consider the sage-grouse as the icon of the West and sagebrush seas it depends on as the most imperiled ecosystem on our planet.

Tweets by @adoptagrouse  
Adopt-A-Sage-grouse @adoptagrouse  
Just starting to get the website going. In the meantime we are available to answer any sage-grouse questions you might have.

The website was designed with the help from Kirk Salisbury from USU Extension. We anticipate that the website will be available spring of 2017. We are contacting select teachers to help us pilot the program.

### 2017 Plan of Work

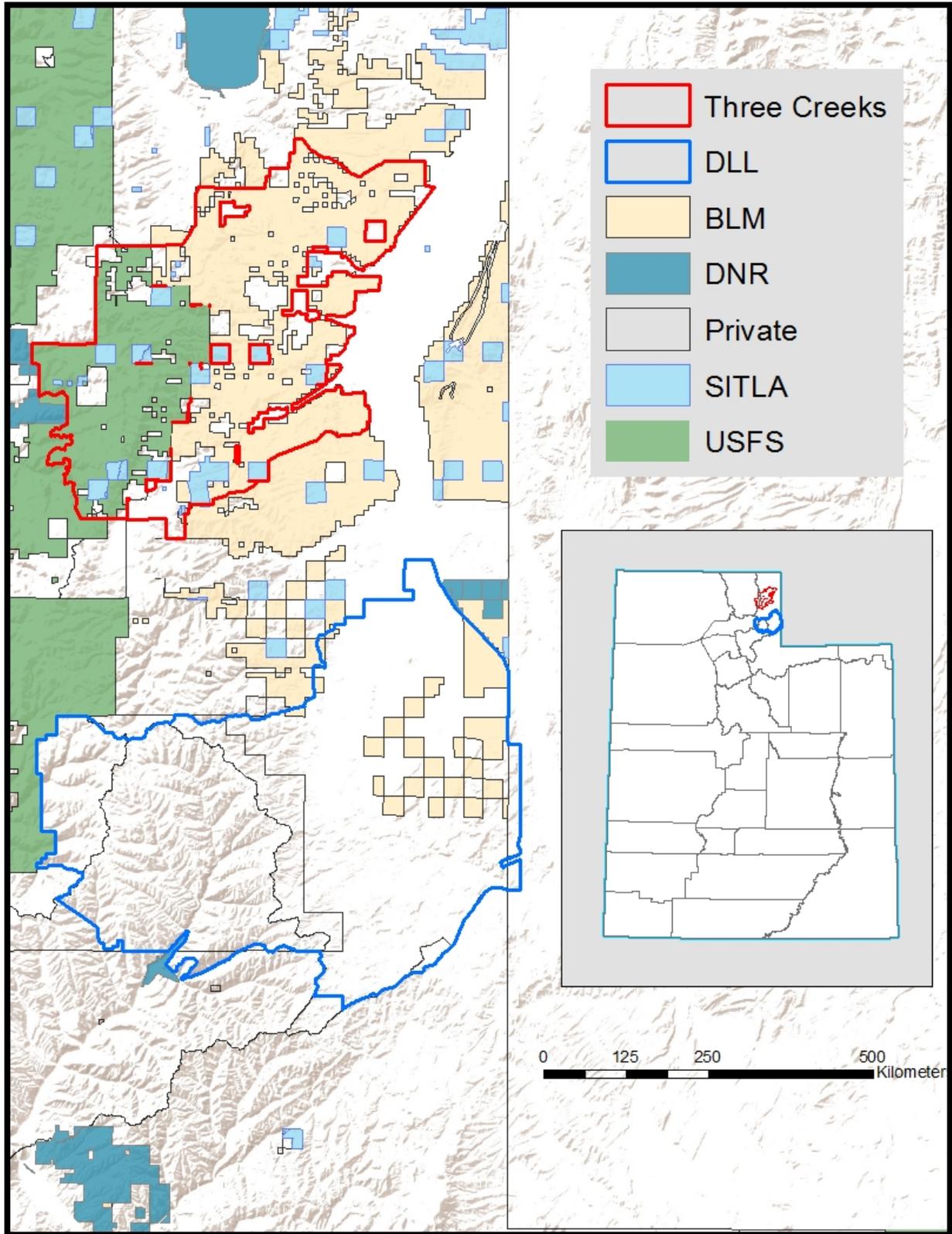
We will continue to monitor GPS marked sage-grouse throughout the year. Our VHF marked sage-grouse will be monitored with periodic telemetry flights. If mortalities are discovered, we will try to recover the transmitters so that they can be redeployed on another sage-grouse. We will begin capturing and marking sage-grouse with GPS transmitter in early 2017. We will monitor marked sage-grouse through the breeding, nesting, and brooding seasons to determine vital rates. Vegetation data will again be collected on selected and random sites. These data will be combined with 2016 data so that a robust data set will be used to determine preferred habitats and how vital rates are influenced by habitat selection.

**Table 1.** Mortality rates for greater sage-grouse (*Centrocercus urophasianus*) radio-marked and monitored on Deseret Land and Livestock (DLL) and the Three Creeks Grazing Allotment in Rich County, Utah, 2016.

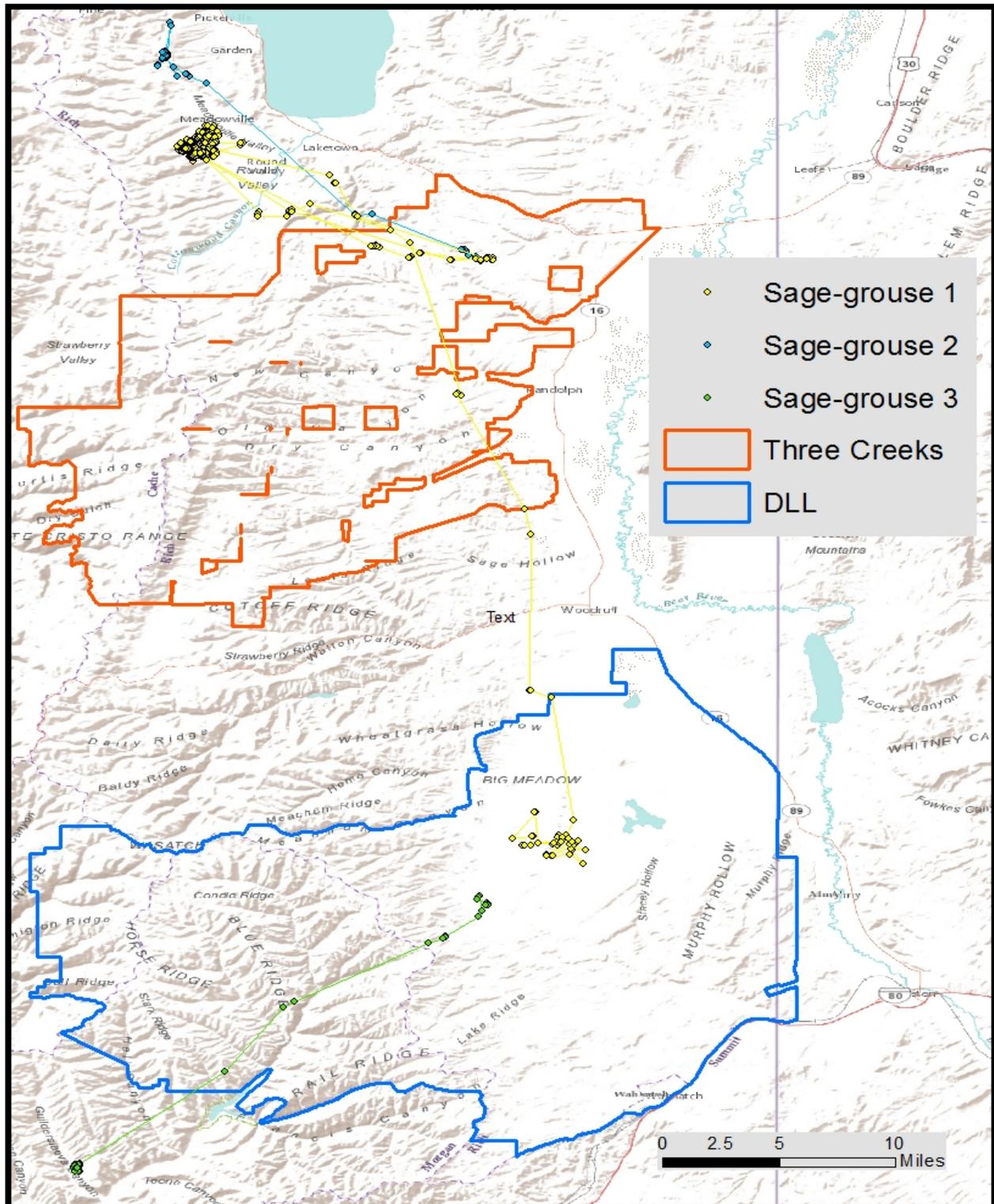
	Transmitter Type	# Marked	Mortalities	Mortality Rate
Total	Combined	55	14	25.5%
DLL	Combined	28	6	21.4%
Three Creeks	Combined	27	8	29.6%
DLL	VHF	19	3	15.8%
DLL	GPS	9	3	33.3%
Three Creeks	VHF	20	5	25.0%
Three Creeks	GPS	7	3	42.9%

**Table 2.** Estimated nesting and brooding rates for greater sage-grouse (*Centrocercus urophasianus*) radio-marked and monitored on Deseret Land and Livestock (DLL) and the Three Creeks Grazing Allotment in Rich County, Utah, 2016

	Nests Initiated	Nesting Rate	Nests Hatched	Hatching Rate	Successful Broods	Brood Success Rate
DLL	13	46.4%	5	38.5%	4	80.0%
Three Creeks	20	74.1%	7	35.0%	1	14.3%
Total	33	60.0%	12	36.4%	5	41.7%



**Figure 1.** Desert Land and Livestock and the Three Creeks Grazing Allotment in Rich County Utah Study Area, 2016.



**Figure 2.** Large seasonal movements for female greater sage-grouse (*Centrocercus urophasianus*) radio-marked and monitored on Desert Land and Livestock and the Three Creeks Grazing Allotment in Rich County, Utah, 2016.

## Literature Cited

- Connelly, J.W., S.S. Knick, M.A. Schroeder, and S.J. Stiver. 2004. Conservation assessment of greater sage-grouse and sagebrush habitats. Western Association of Fish and Wildlife Agencies. Unpublished report. Cheyenne, Wyoming, USA. 600 pp.
- Connelly, J.W., K.P. Reese, and M.A. Schroeder. 2003. Monitoring of greater sage-grouse habitats and populations. Station Bulletin 80. College of Natural Resources Experiment Station. University of Idaho, Moscow, Idaho.  
[http://sagemap.wr.usgs.gov/docs/grouse\\_habitat\\_book.pdf](http://sagemap.wr.usgs.gov/docs/grouse_habitat_book.pdf).
- Daubenmire, R. 1959. A canopy-coverage method of vegetational analysis. *Northwest Science* 33:43–64.
- Dettenmaier, S. and T.A. Messmer. 2016. Final Report. Greater Sage-Grouse Response to Season-Long and Prescribed Grazing. Jack H. Berryman Institute, Department of Wildland Resources, Utah State University, Logan, Utah, USA. 22 pp.
- Doherty, K.E., D.E. Naugle, H.E. Copeland, A. Pocewicz, and J.M. Kiesecker. 2011. Energy development and conservation tradeoffs: systematic planning for Greater Sage-Grouse in their eastern range. Pages 505–516 in S.T. Knick and J.W. Connelly, editors. *Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats*. *Studies in Avian Biology* Vol. 38. University of California Press, Berkeley, California, USA.
- Knick, S.T., D.S. Dobkin, J.T. Rotenberry, M.A. Schroeder, W.M. Vander Haegen, and C. Van Riper III. 2003. Teetering on the edge or too late? Conservation and research issues for avifauna of sagebrush habitats. *Condor* 105:611-634.
- Knick, S.T., and J.W. Connelly. 2011. *Greater Sage-Grouse: Ecology and Conservation of a Landscape Species and its Habitats*. Volume 38. University of California Press, Berkeley, California, USA.
- Robel, R.J., J.N. Briggs, A.D. Dayton, and L.C. Hulbert. 1970. Relationships between visual obstruction measurements and weight of grassland vegetation. *Journal of Range Management* 23:295-297.
- Schroeder, M.A., and R.K. Baydack. 2001. Predation and the management of prairie grouse. *Wildlife Society Bulletin* 29:24–32.
- State-of-Utah 2013. Conservation plan for greater sage-grouse in Utah.  
[https://wildlife.utah.gov/uplandgame/sage-grouse/pdf/greater\\_sage\\_grouse\\_plan.pdf](https://wildlife.utah.gov/uplandgame/sage-grouse/pdf/greater_sage_grouse_plan.pdf) .  
Salt Lake City, Utah, USA.
- USFWS. 2013. Greater Sage-grouse (*Centrocercus urophasianus*) conservation objectives: final report. U.S. Fish and Wildlife Service, Denver, Colorado, USA. 115 pp.
- Utah Wildlife-in-Need Foundation. 2011. Protocol for investigating the effects of tall structures on sage-grouse (*Centrocercus* spp.) within designated or proposed energy corridors. Salt Lake City, Utah, USA.

[http://utahcbcp.org/files/uploads/UWIN\\_SageGrouse\\_Structure\\_ProtocolFinal.pdf](http://utahcbcp.org/files/uploads/UWIN_SageGrouse_Structure_ProtocolFinal.pdf) .  
Accessed January 16, 2016