

2012 Annual Report

**Greater Sage-Grouse Response to Season-Long and Prescribed Grazing (NRCS
Conservation Practice 528) on Paired Ecological Sites (Phase 1)**



Cooperators

Natural Resources Conservation Service

Rich County Coordinated Resources Management

Rich County Commission

Utah Department of Agriculture and Food

Utah Division of Wildlife Resources

Bureau of Land Management

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Background

The Natural Resources Conservation Service (NRCS) Sage-Grouse (*Centrocercus* spp.) Initiative (SGI) seeks to engage private landowners and other partners in cooperative efforts to reduce threats to sage-grouse populations. The SGI provides targeted technical and financial assistance through Farm Bill programs to assist cooperators with implementing sage-grouse conservation.

In 2010, the greater (*C. urophasianus*) and Gunnison (*C. minimus*) were designated as candidate species for listing for protection by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (USFWS 2010a, USFWS 2010b). The USFWS identified habitat loss and fragmentation as the major threat to the species. The Utah Division of Wildlife Resources (UDWR) reports that sage-grouse were historically found in all 29 Utah counties (UDWR 2009). Today, sage-grouse are found in 26 of Utah's counties. A UDWR analysis indicated that 11,514 mi² (29,821 km²) (13.6%) of Utah currently provides habitat for sage-grouse, and they are thought to only occupy 41% of the habitat they once did (Beck et al. 2003).

The complex mosaic of land ownership, competing resource uses, and administration of the sagebrush habitats compound sage-grouse management and conservation in Utah. One population of sage-grouse during the course of a season may occupy land administered by several different federal and state agencies and private landowners. Privately-owned lands provide 40.5% of the occupied sage-grouse habitat with BLM lands second at 34%. The U. S. Forest Service (USFS) administers 10% of the currently occupied sage-grouse habitat and the State of Utah approximately 9.5%. Of this land base, Utah School and Institutional Trust Land Administration (SITLA) manages 8.0%, Utah Division of Parks and Recreation <1%, and UDWR 1.5%. Ute Tribal land comprises 5.2% and National Park Service and military reservations less than one percent each (UDWR 2009).

Declines in sage-grouse habitat quality and quantity in Utah have mirrored observed declines in sage-grouse numbers. The reasons for habitat loss vary by site but include wildfire, urban expansion, development, agricultural conversion, herbicide treatments, rangeland seeding, noxious weeds/invasive species expansion, conifer encroachment, drought, and improper livestock grazing management (UDWR 2009). The primary land use in Utah is grazing by domestic livestock.

Reported effects of grazing on greater sage-grouse and sagebrush (*Artemisia* spp.) steppe habitats differ (Beck and Mitchell 2000). The reason for this is that no before-after-control-impact (BACI) studies have been conducted to specifically document the long-term impacts on greater sage-grouse vital rates and the effects specific grazing strategies on ecological site condition and trends. Changes to sagebrush steppe vegetation communities in response to management actions may be manifested over decades (Connelly et al. 2004). Concomitantly, the prohibitive costs of meaningfully monitoring vegetation and sage-grouse population changes over extended time periods have precluded meaningful documentation of grazing effects on greater sage-grouse (Beck and Mitchell 2000, Connelly et al. 2004).

The Utah Sage-grouse Strategic Management Plan (UDWR 2009) has identified the following research priorities regarding livestock and sage-grouse.

- a) How does domestic grazing directly affect sage-grouse populations?
- b) How does domestic grazing directly or indirectly affect sage-grouse habitats (all seasonal)?

- c) How do water developments affect sage-grouse and their habitat (directly and indirectly)?
- d) Does domestic grazing alter behavior in seasonal habitat areas (including meadows/riparian areas)?

The SGI is focused on implementing conservation practice on private and public lands as a means to 1) improve sage-grouse habitat, 2) increase sage-grouse vital rates and population size, 3) prolong or enhance the desired effects of other land treatments, and 4) broader land management benefits to include other wildlife and producers. By assisting land managers and livestock producers to improve range condition in core sage-grouse population areas, SGI also seeks to improve sage-grouse habitat quality while ensuring the sustainability of working rangelands. An important component of the SGI is to scientifically document the effectiveness of the conservation practices such as prescribed grazing on sage-grouse habitat use and populations.

Purpose

The purpose of this assessment is to scientifically document greater sage-grouse individual and population responses using a BACI design to vegetation changes that may occur under prescribed grazing of paired sites located in Rich County, Utah. Specific questions to be addressed include:

- 1). Do sage-grouse vital rates differ under prescribed and traditional seasonal-long grazing practices implemented on BLM allotments?
- 2). Do sage-grouse seasonal habitat-use patterns and leks trends differ under prescribed and season-long grazing?
- 3). Does the quality of the seasonal habitats used by sage-grouse under prescribed and season-long grazing differ based structure, composition, and nutrient analysis?

Study Area

This research project is being conducted on 2 study areas in Rich County, Utah. The first study area is Deseret Land and Livestock (DLL) where 81,000 ha (200,000 ac) are privately managed under rotational prescribed grazing practices. Three Creeks is the second study area, and consists of a 59,000 ha (146,000 ac.) collection of 27 Bureau of Land Management (BLM) and U.S. Forest Service (USFS) grazing allotments mixed with private lands and managed under season-long grazing. Elevation at these study areas varies from 1900m (6200 ft.) to 2600m (8530 ft.). The study area consists primarily of sagebrush steppe habitat with stands of aspen and evergreens at higher elevations. Rich County occupies the SW portion of the Wyoming Basins management zone (Connelly et al. 2004, Fig. 1).

Rich County Greater Sage-grouse Research Area

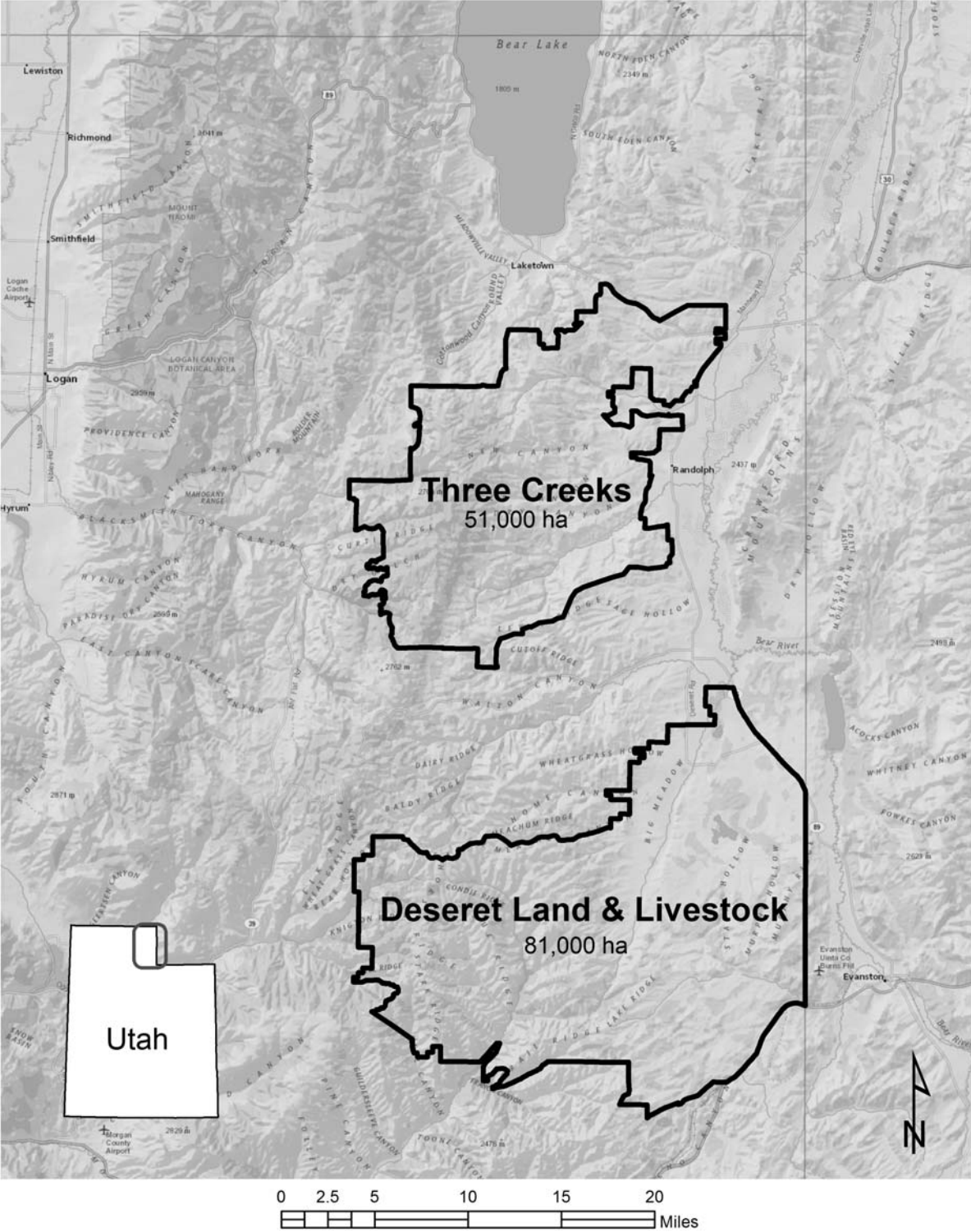


Figure 1. Rich County Study Area.

Methods

Lek Surveys

Lek routes were surveyed during the 2012 spring lekking season to create indices which will be used to monitor sage-grouse population trends. All surveys followed Utah Department of Wildlife Resources (UDWR) methods and occurred from late March through early May. Leks were visited a minimum of 3 times during the breeding season and peak attendance was calculated using the largest male count from each lek.

Radio-Telemetry

Our research goal was to capture and collar 60 sage-grouse at each site (approx. 40♀ and 20♂, n =120). All captured birds were aged, sexed, measured and weighed prior to release (Giesen et al. 1982, Connelly et al. 2003). Collared birds were tracked to determine habitat use, home range and vital rates. Nests and broods were monitored from the date of nest initiation until 42 days after hatch to quantify nest and brood-rearing success for each bird. Movements and home range estimates will be determined using Spatial Analyst tools in ArcMap

Vegetation Surveys

During the summer of 2012 we recorded the locations of nesting and brood sites of collared birds and random points. The vegetation characteristics of these sites were measured and recorded to determine sage-grouse habitat preferences. Vegetation sampling methods were based on four transects that were either 15m for nest sites or 25m for brood locations. Transects were oriented using cardinal directions. Measurement methods included Daubenmire plots, canopy gap line-intercept and Robel pole measurements (Canfield 1941, Daubenmire 1959, Robel et al. 1970, BLM 1996).

Predator Surveys

Predator surveys were conducted to compare predator populations between sites (Gese 2001). Mammalian predator abundance will be quantified using nighttime spotlight surveys and scat transects. Avian predator abundance was measured using 7 point counts located throughout each study area. Each study site was sampled every other week from May through July.

Stakeholder Attitude Surveys

Because the effects of livestock grazing and western rangelands remains controversial, we will conduct a survey of western stakeholders to determine their attitudes, beliefs, perceptions, and knowledge regarding livestock/wildlife relationships. The survey will compare responses to a similar survey that was conducted in 2003 and will determine if and why attitudes may have changed.

Data Analysis

Data analysis will be conducted on annual sage-grouse survival using the Known Fate model within Program MARK (White and Burnham 1999). Other vital rates (i.e. recruitment and λ)

will also be calculated using Program MARK. Basic statistical tests and analyses associated with vegetation data will be conducted using R.

Results

Radio-telemetry

Travel to Rich County to trap and collar birds in wintering areas began in the fall of 2011 and continued into February of 2012. In March full-time crews were stationed on-site to trap lekking areas during peak hen attendance. Trapping efforts continued until mid-April 2012 when all hens had dispersed from the leks. Table 1 summarizes 2011-2012 sage-grouse trapping efforts.

Table 1. Greater sage-grouse captured and radio-collared by study areas, 2011-2012.

Sage-grouse trapped Fall 2011-Spring 2012		
	DLL	Three Creeks
Females collared	29	41
Males collared	18	11
Males banded	20	16

Lek Counts

A total of 32 leks were counted in both study areas following UDWR protocols. Twenty-four leks were located within or adjacent to the DLL study area and the remaining 8 were within or adjacent to Three Creeks. The average count for all leks on each study area was calculated based on the previous 9 years (2003-2011) of lek data. This 9yr average was then compared with 2012 counts. The comparison showed a decline for 2012 in sage-grouse attendance at both study areas. The average 2012 count for Three Creeks was 87% of the previous 9yr average. DLL counts were at 43% of the previous 9yr average.

In discussions with locals and land managers drought had been suggested as the potential cause of 2012's lower lek attendance. To investigate this we will look at Rich County climate data for correlations between precipitation and lek counts for the area.

Table 2. Greater sage-grouse lek count by study areas, 2012.

DLL and Three Creeks Lek counts		
	DLL	Three Creeks
Ave. ♂/ lek (2003-2011)	26	20
Ave. ♂/ lek (2012)	11	17
Num. of leks counted	24	8

Nest Initiation and Success

Sage-grouse hen nest initiation varied between the study areas. For example, 8 hens were located on DLL compared to 24 nesting hens in Three Creeks. This difference is likely attributed to the fact that DLL had 9 hens with older transmitters that likely stopped functioning before the nesting season limiting our ability to track them. Additionally, at least two hens from DLL were found to have nested outside of the study area, further reducing the number of nesting hens on DLL.

We used the Nest Survival model in Program MARK to calculate both the daily nest survival rate and the nesting success for each study area. DLL had an overall nest success of 58.5% compared to a success rate of 31.5% in Three Creeks. Causation of this difference in site nest success including vegetation data, time of nest initiation, and hen age class models will be explored this fall.

Of the more interesting nests observed this season was a juvenile hen that located her nest inside a 1.4 ha grazing enclosure on DLL. While the enclosure provided protection from mammalian predators, it also provided numerous perches for avian predators. The hen hatched 4 chicks with only one surviving to 3 days. The final chick was subsequently abandoned on day 3 during an attempt to verify brood size.

Brood Success

Brood success varied between study areas but was relatively low for both (Table 2). DLL had only one brood out of 8 surviving to 42 days for a brood success of 12.5%. Three Creeks was slightly higher with 4 successful broods out of a total of 23 for a success rate near 17%. When checked at 50 days since hatch the only successful DLL brood consisted of a single chick. The largest brood on Three Creeks at the same time had a total of 5 chicks, however observations suggest this was likely the result of brood mixing.

Table 3. Greater sage-grouse brood success by study areas, 2012.

SG Brood Success (42 days)		
	DLL	Three Creeks
Success	1	4
Failed	7	19

Survival

Sage-grouse survival rates varied between both study areas. DLL had the lowest survival rate of 87.5% where 7 of the 56 collared birds died. Three Creeks birds had a much higher survival rate

of >90% when 5 of 52 birds died. These rates were calculated from 1 March to 30 July and include only those birds whose transmitters were detected.

The differences in survival rates on these study areas may be due to the differences in exposure time for any individual to mortality. The majority of birds trapped on Three Creeks had been collared in March or April of 2012. Some birds on DLL were trapped in spring 2011. Some collared birds on DLL were exposed to mortality risks 12 months longer than collared birds on Three Creeks. This difference in exposure time likely explains some of the difference in survival between the study areas. To adjust for this difference survival data will be analyzed this fall using the Known Fate staggered entry model in Program MARK. Also our ability to determine mortality through locating transmitter signals might also be a confounding factor to consider when comparing these rates.

Vegetation

Field data from vegetation surveys are still being entered into a database. Upon completion, an in depth analysis will be conducted to determine differences in habitat quality between study areas. This task will be completed during winter 2012-2013.

2012-2013 Work Plan

This fall we will be entering the field data collected over the season into an electronic database. Analysis will begin upon completion of this task. Using the programs outlined above, we will determine vital rates among study areas and explore any correlations between these rates and habitat quality.

We'll be looking at habitat use and home range using Geospatial Tools in ArcGIS. Seasonal patterns and dispersal from trap locations and wintering grounds will be determined and used as a guide for trapping efforts in the coming seasons.

Trapping goals for spring 2013 include a minimum of 6 females in the Three Creeks area and 9 females on DLL, however we hope to collar as many hens as possible. Additional collars will be dispatched to replace any over-winter mortalities, lost birds, or failed transmitters.

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