

Greater Sage-grouse Use of Restored Sagebrush Areas in Rich County Utah

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Thomas C. Edwards, Jr. (USU) Co-PI; Michael White (USU) Investigator (Vegetation); Karen H. Beard (USU) Investigator (Small mammals); Mike Wolfe (USU) Investigator (ungulates); Mary Connor (USU) Investigator (ungulates)

List Five Relevant Publications in Last Five Years

- Norvell, R. E. and F. P. Howe. 2006. Shrubsteppe Bird Monitoring in Rich County Utah: 2005 IWJV Progress Report. Utah Division of Wildlife Resources, Salt Lake City, UT.
- Howe, F., K. Bunnell and D. Mitchell. 2005. Monitoring Shrubsteppe Obligate Birds, Mammals and Herptiles: Endangered Species Mitigation Fund Annual Report, Project Number 1705. Utah Division of Wildlife Resources, Salt Lake City, UT.
- Norvell, R. E., F. P. Howe, and J. R. Parrish. 2003. A seven year comparison of relative abundance and distance sampling methods. *Auk* 120:1013–1028
- Howe, F. P., R. L. Knight, L. C. McEwen, and T. L. George. 2000. Diet switching and food delivery by shrubsteppe passerines in response to an experimental reduction of food availability. *Western North American Naturalist* 60:139-154
- White, G. C., W. B. Block, F. P. Howe, et al. 2000. Science vs. Reality: The Mexican Spotted Owl as a model for management of threatened species on federal lands. Transactions, 64th North American Wildlife and Natural Resources Conference.
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PROPOSAL ABSTRACT

We will be using several methods to assess habitat use by Greater Sage-grouse in areas where sagebrush cover has been reduced (treated) and in untreated areas. In addition to evaluating sage-grouse use, we will simultaneously assess efficacy of several techniques from “quick and dirty” to state-of-the-art. This will allow us to develop portable and efficient means of evaluating sage-grouse use on a broader scale. Methodologies will include distance sampling to estimate density of sage-grouse pellets (potential index to use), flushing counts using trained dogs (“snapshot” measure of use) and GPS radio technologies (nearly continuous measure of use). Since habitat use may vary with population size, we will conduct lek counts in association with habitat use measures. GPS radio-telemetry technology is not currently adequate to meet sage-grouse research needs; however, we anticipate that this technology will be suitable by Year 3 of the study. In Year 1 and 2, we will use standard radio-telemetry equipment to monitor sage-grouse roost locations and season movements and identify “bounds” of study populations. Habitat treatments have taken place in several areas of Rich County.

Our study will focus on two areas where large scale treatments have been recently conducted and where additional treatments are planned in the near future (Deseret Ranch and Duck Creek Allotment); in these areas we will collect data before and after treatments in treated and untreated areas. We will also collect information from historically treated areas in the county (i.e., retrospective study). This combination of evaluation approaches will provide a look at the immediate impact of treatments as well as a longer-term look at recovery after treatment. Similar techniques have been employed in western Utah under different environmental and treatment conditions. Thus this study will also provide a further test of several promising techniques.

INTRODUCTION/BACKGROUND (400 Word Limit)

This project will tie directly to a county-wide project designed to provide us with an understanding of both wildlife and habitat responses to sagebrush restoration efforts and provide tools for adaptive shrubsteppe management. The wildlife aspect of the project will focus on how shrubsteppe obligates, e.g., Greater Sage-grouse, respond to reductions in sage cover; it will also focus on comparing several techniques and technologies in order to develop effective, portable monitoring tools. Other wildlife components include passerines (ongoing), pygmy rabbits (ongoing), small mammals (starting 2006) and mule deer (starting 2006). The two major habitat components will involve 1) evaluating how several remote sensing datasets can be used to produce maps of existing vegetation and model habitat/wildlife associations and 2) studying the dynamics of the shrubsteppe ecosystem in order to develop models that will allow us to predict how vegetation might change in response to conservation actions (e.g., reducing sagebrush cover). The latter will be done by determining the vegetative response to past disturbances (retrospective study) and current actions. Shrubsteppe management is changing rapidly in response to both environmental (e.g., sage-grouse petitions for listing) and economic (e.g., sustainable grazing) issues. Land managers, both private and public, are interested in treating shrubsteppe habitats in order to improve forage production, water quality, and wildlife abundance (particularly Sage-grouse and mule deer) on their lands. In Rich County, there is a remarkable degree of cooperation between public and private landholders, and a convergence of private, state and federal interests allowing us to address effects of changing management on wildlife species.

Shrubsteppe and grassland birds are declining faster than any other group of bird species in North America (Knick et al. 2003); several authors have documented Greater Sage-grouse population and management issues (Connelly et al. 2000, Mitchell and Maxfield 2001, UDWR 2002, American Lands Alliance 2003, Beck et al. 2003, Connelly et al. 2003, Connelly et al. 2004, Schroeder et al. 2004, USDOJ 2004, USFWS 2004). While sage-grouse have been well studied, their response to shrubsteppe restoration efforts have rarely been studied (see Sedgewick 2004). The Utah Division of Wildlife Resources has identified determining sage-grouse use of treated and non-treated sagebrush habitats as a high priority statewide (UDWR 2002) and the highest priority in Rich County (Dean Mitchell, UDWR, personal communication).

PURPOSE AND OBJECTIVES

Proposed projects must specifically address efficacy of integration of the effects of conservation provisions of the 2002 Farm Bill on sagebrush-steppe obligate species. See research priorities for specific guidance. The purpose of this study is to evaluate response of sage-grouse to the reduction of sagebrush cover. Planned treatments involve use of pasture aerators; historical treatments used mechanical methods, chemicals and fire. These treatment types are identical to conservation practices used under the 2002 Farm Bill. Rich County lands with Farm Bill projects have been identified (Tim Julander, NRCS, personal communication) and will be incorporated into the study.

The major project objectives are:

- 1) Monitor sage-grouse response to sagebrush reduction by comparing use on treated and untreated areas.
- 2) Identify Ecological Sites and determine habitat characteristics of areas used by sage-grouse.
- 3) Model habitat characteristics of sage-grouse use areas.
- 4) Develop “portable” and efficient sage-grouse monitoring techniques through evaluation of various methodologies.

We will address Greater Sage-grouse habitat and ecology issues and broader shrubsteppe ecosystem

issues raised by Connelly et al. (2004). We will also field-test recommendations from existing management documents such as Connelly et al. (2000), Parrish et al. (2002), and UDWR (2002) using spatially integrated field methods, appropriate statistical tools, and remote sensing. The study will combine high-intensity data collection at a few key sites, Duck Creek Allotment (Duck Creek) and Deseret Land and Livestock (DLL), with less intense but statically rigorous data collection at several additional sites; this will allow us to develop monitoring methods useful across the state. By incorporating before-after-control-impact design with a retrospective approach, the study will also provide information on both impact and recovery (Wiens and Parker 1995, Parker and Wiens 2005).

STUDY SITE (200 Word Limit)

Rich County is located in northeastern Utah and is 2,740 km² in size. Approximately 40% of the county is dominated by shrubsteppe communities (1500 – 2250 m elevation) typical of the Wyoming Basin Ecoregion. Vegetation is dominated by large expanses of Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) interspersed with basin big sagebrush (*A. t. tridentata*) in draws and black sagebrush (*A. nova*) on gravelly ridges. Rabbitbrush (*Chrysothamnus* spp.) is also frequently present. In most areas wheatgrasses (*Agropyron* spp.) codominate with shrubs; in disturbed areas wheatgrasses and forbs dominate.

DLL is an 810 km² privately owned ranch in southern Rich County. Duck Creek is a 95 km² allotment consisting of federal, state and private lands administered by the Bureau of Land Management. Both support large stands of vegetation typical of the county. Rich County provides a great opportunity for public-private cooperation. This study will combine the buy-in of private landholders, the management focus of both state and federal agencies, and the expertise of university researchers to accomplish our goals. The Rich County Coordinated Resource Management team and sage-grouse working group have facilitated cooperation with local landowners. As such, we have already secured access to many private lands in the county.

STUDY DESIGN METHODS

A systematic (tessellation) grid of sampling points (with a random start) has been established across the county (this is a Forest Inventory and Analysis-type grid). Sampling points will be selected from the grid to provide “anchors” for various data collection techniques (e.g., pellet transects in and out of treatments), and this will serve to link the various project components (e.g., sage-grouse use, remotely sensed vegetation). Overall design of the study will follow a before-after-control-impact (BACI) design approach (Underwood 1994, Smith 2002). Over the course of the study, two vegetative treatments are planned for Duck Creek (after 2006) and two treatments per year are planned for DLL. Most pellet transect will be done on DLL and Duck Creek though additional transects will be done at grid points across Rich County in historically treated areas and matched controls (retrospective study – Morrison et al. 2002). Habitat use data will be modeled using on-the-ground vegetation data with fine and course-grained vegetation data derived from remote sensing platforms. Distance sampling (Buckland et al. 2003) will be used to estimate density of sage-grouse pellets. We will follow the field protocol of Dahlgren (Utah State University, personal communication) and record number and type (fecal, cecal, roost) of pellets and distance of pellets to line and habitat edge; habitat characteristics will also be recorded. All lines and pellets will be georeferenced (GPS). We will use trained dogs to flush sage-grouse in treated and untreated areas (Connelly et al. 2003, E. Perkins UDWR Northern Region Advisory Council, personal communication). Plots will be thoroughly surveyed at least twice per year; we will evaluate the use of distance transects in large plots if a census is not possible. We will record age, sex, number and GPS location for all flushed grouse. We will conduct lek counts according to Connelly et al. (2003) using UDWR protocols (Mitchell personal communication) in the primary study areas. A minimum of three counts will be made at weekly intervals between 20 March and 1 May

from ½ hr before to 1 ½ hrs after sunrise. We will record number and sex of grouse observed as well as weather conditions. We will search for all leks from road or by air prior to conducting counts. Double counting will be avoided by counting densely distributed leks simultaneously and avoiding flushing. Supplemental UDWR lek count data will be available from across the county. Standard (VHF) radio-telemetry will be used to determine seasonal sage-grouse movements and determine the geographic extent of the study population.

We will use the accepted protocols (see Fuller et al. 2005, Connelly et al. 2003) for sage-grouse capture (e.g., spotlighting), handling and transmitter attachment (e.g., necklace). Tracking will be done from the ground and air. Radio-telemetry will also be used to collect incidental information on roosting, nesting and other behaviors (though this is not a primary objective). We will begin to evaluate sage-grouse use of habitats with radio-telemetry in Year 3 of the study. Ideally, GPS radio-telemetry will have sufficiently advanced to be used on sage-grouse. If it is not possible to use GPS radio-telemetry, we will use standard radio-telemetry and additional technician time. Procedures discussed by Fuller et al. (2005) will be followed to avoid spatial autocorrelation, minimize error polygons and insure proper inference regarding habitat use and availability.

Ecological sites will be identified using the accepted protocol (Shane Green, NRCS, personal communication) and vegetation will be measured using a combination of line intercept, Daubenmire and Robel pole techniques; these provide reliable estimates of shrubsteppe vertical and horizontal cover (see Connelly et al. 2003). On-the-ground vegetation data collection will be combined with remote sensing data gathered from several platforms. Various satellites collect different types of information at different resolutions; these include spectral bands (infrared, visible, ultraviolet), and radar images among others.

The ability of these various remote sensing data sets to correctly depict shrubsteppe habitat variables and sage-grouse habitats will be assessed. We will also determine whether scales (resolutions) of these remote sensing platforms are appropriate for use in grouse/habitat association models. Much remote sensing information for Duck Creek has already been acquired and is currently being evaluated by Dr. Mike White of Utah State University. Sample sizes for each study component will be determined by considering effect size, power and error variances. Since sage-grouse are relatively well studied, error variances should be readily available from other studies in Utah and surrounding states. While standard statistical analyses (McDonald et al. 2005) may be appropriate, it is likely that model selection and multimodel inference can be used in most analyses (Burnham and Anderson 2002, McDonald et al. 2005).

EXPECTED BENEFITS

1. Note the importance of the response of sage-grouse and/or sagebrush obligates to 2002 Farm Bill conservation practices.
2. Note the technology and tools to be developed by the project. Of special concern is the importance of the project to NRCS, SCD and state wildlife agency field staff from a planning perspective.
3. Note the importance of technology and tools to be developed to partners (NGOs, State wildlife agencies, etc.)

The primary benefit from this project will be the availability of information on Greater Sage-grouse response to sagebrush reduction treatments. Such treatments are frequently done to enhance wildlife habitat and cattle forage, though little monitoring of vegetation (habitat) or sage-grouse response has been done. This study will monitor these factors; a related study in Rich County by the same

investigators will provide wildlife response information for passerines, pygmy rabbits and small mammals. In combination, these studies will allow us to evaluate the concept of sage-grouse as an umbrella species (Rich and Allen 2001).

These two studies will also provide recommendations for a shrubsteppe habitat restoration methods handbook (though the writing of this would be beyond the scope of this project). At the local level, information useful to the Rich County and other Sage-grouse Working Teams will be made available; this information will be particularly beneficial in the development and refinement of sage-grouse viability tables. Project information will also have value for wildlife and land managers including ranchers, NRCS, BLM, UDWR and others.

Specific benefits from the project include:

- 1) Habitat use data for sage-grouse in relation to large-scale shrubsteppe treatments.
- 2) Models of sage-grouse/habitat associations.
- 3) A multi-scaled assessment of habitat treatment effects on sage-grouse.
- 4) Methodological comparisons of pellet transects, flushing and radio-telemetry.
- 5) Tools to monitor Greater Sage-grouse response to management changes on a statewide basis.
- 6) Community level analyses illustrating sage-grouse relationship to other shrubsteppe obligates (passerines, pygmy rabbits, small mammals).

These benefits will be delivered through annual progress reports, a comprehensive final report, peer-reviewed publications, photos, a wildlife technical note, a PowerPoint presentation and field tours.

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BUDGET

BUDGET (YEAR 1)

NOTE: All numbers should be entered without commas.

SALARIES: 28300 X 8.3 30650
(Fringe Percentage)

TRAVEL: 4310

COMMODITIES: 12640

CONTRACTUAL: 2400

TOTAL: 50000

BUDGET (YEAR 2)

NOTE: All numbers should be entered without commas.

SALARIES: 28300 * 8.3 30650
(Fringe Percentage)

TRAVEL: 4310

COMMODITIES: 12640

CONTRACTUAL: 2400
TOTAL: 50000

BUDGET (YEAR 3)

NOTE: All numbers should be entered without commas.

SALARIES: 28300 * 8.3 30650
(Fringe Percentage)

TRAVEL: 4310

COMMODITIES: 12640

CONTRACTUAL: 2400

TOTAL: 50000

TOTAL BUDGET FOR THREE YEARS: 150000

Leveraged funds, in-kind support from Partners and other sources (list partner(s) and amount(s)).

The following are contributions towards treatments on Duck Creek:

DWR \$145000; BLM \$28500; NRCS \$60000; USFWS \$20960; Permittees \$48800; NFWF \$72000; SFW \$21000; QRM \$10000.

Deseret Land and Livestock has treated and will continue to treat approximately 1000 acres/year at a cost of \$30/acre (\$30000 per year).

In addition, the following contribute annually toward monitoring all wildlife and vegetation response to treatments:

DWR \$32000; DNR-ESMF \$115000; USFWS \$109000; IWJV \$50000; BLM \$46000; USU \$60000; NRCS \$155000.

NRCS estimates 4650 acres of brush management to be completed in Rich County from 2005-2011.

Per acre estimates of management are not currently available but are likely between \$30 - \$50 (\$139500 – \$232500).