GREATER SAGE-GROUSE (*Centrocercus urophasianus*) ECOLOGY IN WESTERN BOX ELDER COUNTY, UTAH

2005 Annual Report

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by

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Introduction

Historically, Greater Sage-grouse (*Centrocercus urophasianus*) were believed to be one of the most abundant and widely distributed indigenous upland game birds in the western United States (Dalke et al. 1963). Sage-grouse were once found in portions of at least 12 states and 3 Canadian provinces (Connelly et al. 2004, Schroeder et al. 2004). In Utah, sage grouse once occupied all 29 counties in Utah. The species is currently found in 26 counties and inhabits 50% of their historical distribution (UDWR 2002, Beck et al. 2003). Western Box Elder County supports one of the largest Greater sage-grouse populations in the state (UDWR 2002, Beck et al. 2003).

Due to continued downward population trends, several organizations have petitioned the US Fish and Wildlife Service to list Greater Sage-grouse for protection under the Endangered Species Act of 1973 (Connelly et al. 2004). In 1996, the Western Association of Fish and Wildlife Agencies (WAFWA) recommended the formation of local working groups in each state that the birds occupy (Connelly et al. 2004). One of the main goals of these working groups is to research and address local area conservation issues regarding sage-grouse and their required habitat. By 2004, a total of 44 groups had been formed (Connelly et al. 2004). Sage-grouse are not currently listed for protection in the United States.

Box Elder County Adaptive Resource Management (BARM)

The Box Elder County Adaptive Resource Management Coalition (BARM) is a public and private partnership that was organized in 2002 to address stakeholder concerns about declining sage-grouse populations. The partnership employs an adaptive management approach designed to address local stakeholder concerns while working toward achieving the goal of providing multiple resource benefits (Bergerud 1988). These benefits include conservation of Greater Sage-grouse populations and local community economic sustainability.

The partnership is chaired by local landowners and administered by the Utah State University Extension's Community-Based Conservation Program (CBCP). The coalition proposes to implement a 10-year adaptive resource management plan that blends Greater Sage-grouse conservation and regional socio-economic sustainability with restoration of sagebrush communities. The coalition believes that baseline information on sage-grouse ecology in Box Elder County is needed to prioritize conservation actions and measure impacts..

Study Objectives

The objectives of this study are:

1) To collect baseline data on Greater Sage-grouse ecology in western Box Elder County.

2) To gather information on general habitat-use, nesting and brood-rearing habitat, nesting initiation and success, survival, seasonal movement patterns, and male lek fidelity.

3) To document interlek movements or nomadic breeding of male sage-grouse in the study area.

Study Area

The study area is located in the Grouse Creek Mountain range in western Box Elder County, Utah (Figure 1). This area is a sub-management unit of the Box Elder County Adaptive Resource Management area. The area is bounded by the Idaho border on the north, Nevada border on the west, and Route 30 on the south and east. There are 37 active leks within the study area, ranging from 1500-2100 m in elevation. The area encompasses approximately 1572 square km of public and private lands. Grazing by domestic livestock is the primary use of these lands.

The vegetation in the study area consists mainly of shrub-steppe intermixed with grassy meadows, and woodlands. Common shrubs and trees include big sagebrush (*Artemisia tridentata*), black sagebrush (*A. nova*), rabbitbrush (*Chrysothamnus spp.*), serviceberry (*Amelanchier utahensis*), snowberry (*Symphoricarpos albus*), bitterbrush (*Purshia tridentata*), juniper (*Juniperus osteosperma*), quaking aspen (*Populus tremuloides*), and chokecherry (*Prunus virginiana*). Common grasses include wheatgrasses (*Agropyron spp*., *Elymus spp*.), Kentucky bluegrass (*Poa pratensis*), cheatgrass (*Bromus tectorum*), and great basin wildrye (*Elymus cinereus*). Common forbs include phlox (*Phlox spp*.), astragalus (*Astragalus spp*.), arrowleaf balsamroot (*Balsamorhiza sagittata*), lupine (*Lupinus caudatus*), western yarrow (*Achillea millefolium*), prickly pear (*Opuntia humifusa*), and wild onion (*Allium acuminatum*).

Mehtods

Objectives 1-2 (Ecology and Habitat Use)

Lek surveys

The methods used to obtain the sage grouse population data follow UDWR standard protocols and those of Connelly et al. (2003). The completed counts from each lek are estimated to represent 75% of the total male attendance. Using a 2:1 female to male ratio, population estimates are calculated. The population estimates are useful in comparing relative changes from year to year (Beck and Braun 1980).

Lek sites within the study area were counted once a week from the last week in March to the end of April 2005. The lek counts were conducted using a combination of the techniques described by Patterson (1952), Beck and Braun (1980). Lek counts were conducted one half hour before sunrise in reasonably good weather, light or no wind and partly cloudy to clear skies (Emmons and Braun 1984). A location was selected near the

lek that allowed for good visibility of the lek but did not disturb the birds. The time that the lek count began was recorded, and then the birds were counted from right to left. The observer then waited 5 to 10 minutes then counted the number of males on the lek from left to right; waited 5 to 10 minutes, and then counted a third time from right to left. The highest number of males observed in one of the three counts was recorded. This was repeated for two or three more lek sites. A maximum of four lek sites was observed per morning.

Captures and radio-telemetry

To collect baseline habitat use and ecology data on Greater sage-grouse, we proposed to capture up to 30 birds (at least 75% females) and fit them with radio-transmitters. The birds were captured in March and April of 2005 on or near the leks. Sage-grouse were located by spotlighting from the back of a truck or ATV and captured with a long handled net (Giesen et al. 1982). Age (adult or juvenile) was assigned based on primary feather characteristics (Dalke et al. 1963). The birds were then fitted with a programmed (mortality signal and 19 hours on 5 hours off) ATS radio-collar. A GPS location was also recorded within 5 m accuracy for each capture site.

Radio-tracking enabled the evaluation of movement, number of nests initiated, brood survival, adult mortalities, and habitat utilization of the Greater Sage-grouse in the study area. Radio-collared birds were located using Communications Specialists receivers and Telonics 3-element hand-held Yagi antennae, and omni antennae.

Nests were identified and flagged at a distance of 50-100 m for future reference. Nests were checked at least 3 times a week from the time they are located until they were predated, abandoned, or successfully hatched. Predated nests were evaluated for potential identification of nest predators from any eggshells, scat, tracks, or hairs. Visual locations were obtained on females with broods approximately 3 times a week between May and September of 2005. Females with broods were not flushed until chicks were at least 3 weeks old to avoid chick abandonment. Visual locations on females without broods and males were obtained at least once a week. Birds were located at least once from fixed-wing aircraft from September to April. Adult mortalities were examined to determine depredating species (Zablan et al. 2003).

Habitat monitoring

There are four general reasons for assessing habitats: 1) to document current conditions and trends of habitat; 2) to evaluate impacts of a land treatment; 3) to assess the success of a habitat restoration program; and 4) to evaluate the ability of habitat to support a reintroduction population (Connelly et al. 2003). We hope to determine the baseline information that will aid management in the future to decide which management options will best meet the desired goals and objectives.

At each nest site, GPS location (within 5 m), slope, aspect, and clutch size were recorded, along with predation information if necessary. Vegetation measurements were taken in

four directions (every 90° starting with a randomly chosen direction). The visual obstruction of the vegetation to and from the nest was measured using a Robel pole (Robel et al. 1970). The Robel pole is a widespread method of measuring visual obstruction and is applicable for numerous species and habitats, and is generally recommended for assessing sage-grouse habitat (Connelly et al. 2003). We sampled shrub canopy coverage using a modified line-intercept method (Canfield 1941), and the percentage of ground vegetation was measured using 20X50 cm Daubenmire (1959) frames. Percent cover of shrubs was measured with a 15-meter tape. The amount of live shrub canopy intersecting an imaginary vertical plane on the tape was measured. Gaps in the foliage smaller than 5 cm were counted as continuous, gaps 5 cm and larger were not counted. The amount of total shrub intersecting the line was summed and then divided by the length of the line to determine total shrub canopy coverage (Connelly et al. 2003). Use of the line intercept method will allow us direct comparison with data from many other studies because this is a very common method of measuring sagebrush canopy cover (Lyon 2000, Connelly et al. 2003). The Daubenmire frame is one of the most common methods of estimating herbaceous cover in sagebrush habitats (Connelly et al. 2003). Daubenmire frames were placed every 3 m along the 15 m tape to estimate percentages of grasses, forbs, litter, rock, and bare ground (Daubenmire 1959).

At locations of collared hens with broods, a measurement of slope, aspect, number of visible chicks was recorded, as well as a GPS location (within 5 m). Within 24 hours, the vegetation at each brood location was also measured using the Robel pole and line-intercept method, but with a 10 meter tape. A 20X50 cm Daubenmire frame (Daubenmire 1959) was placed every 2.5 meters along the tape. These measurements were only made if the hen had or was suspected to still have a brood. In addition, locations of 2 females without broods and 2 males were randomly chosen each week for 10 weeks for vegetation sampling.

For each nest, brood, and random bird vegetation measurement site, a random site was also selected by moving 80 m in a randomly chosen direction. Vegetation measurements were taken at each random site using identical techniques. Measuring the vegetation at random sites will allow us to compare use sites to non-use sites within the same habitat.

Arthropod sampling

Arthropods, particularly insects, are an essential element of early brood-rearing habitat (Patterson 1952). Sage-grouse chicks require insects in their diet for survival and normal growth, especially in the first 3 weeks after hatching (Johnson and Boyce 1990). In order to assess insect abundance in brood foraging habitat, pitfall (Morrill 1975, Connelly et al. 2003) and pan traps were used.

Hens with broods were located 3 times each week for 7 weeks after hatching, unless it was determined that chicks were no longer present. Each week one location from each hen with a brood was randomly selected to test insect abundance and diversity. After vegetation measurements were taken, a total of 8 pitfall traps were placed flush with the ground along each of the 4 transects used in the line-intercept method (see above). Pitfall

traps were placed at 5 and 10 m from the hen location along each transect. In addition, a total of 4 pan traps were placed at 5 m from the hen location, one in each space between the transects. Insect traps were also placed at the random site chosen for vegetation measurements.

Pitfall traps were filled with a 50/50 solution of water and antifreeze. Pan traps were filled with water and a drop of soap will be added to decrease surface tension. All traps were opened for 48 hours, at which time all insects were collected. Insects from all traps in a single site were consolidated and refrigerated for preservation. All insects from each location will be separated by class, and each class will then be counted for individuals and measured for volume (E. Evans, USU, personal communication).

Results

Objectives 1-2. Ecology and Habitat Use

Lek surveys

There are 37 active leks within the study area. In the spring of 2005, 32 of these leks were surveyed. A total of 477 strutting males were counted attending the leks in the study area.

Captures and radio-telemetry

Twenty-four Greater Sage-grouse (13 female and 11 male) were captured and fitted with radio-collars between 14 April and 7 May 2005. Of the females, 10 were juveniles and 3 were adults, with weights ranging between 1150 and 1525 g. All captured males were adults. Weights were not taken on males because the birds did not fit in the bags that were used to weight the hens.

Sage-grouse were captured between the hours of 2330 - 0545 on or in the areas surrounding leks. The captures took place surrounding Dry Canyon Mountain, Devil's Gate, Red Bank Springs, Twin Meadows, and Kimball Creek leks. While most males were caught on leks, females tended to roost on the ridges surrounding the leks and were more difficult to locate and capture.

Nesting

Of the 13 collars that were placed on females, one malfunctioned, so it was only possible to track 12 females. Ten females initiated nests that were located between 3 and 19 May. Nesting locations were between 61 m and 1.5 km (mean = 747 m) from trapping locations. Seven females nested under big sagebrush and 3 females nested under juniper.

Seven nests were predated. Likely nest predators included both avian and mammalian species. But in most cases, we could not be certain of the specific predator. All nests located under junipers were predated. One nest was abandoned due to observer

influence. Two nests successfully hatched (20%) on 28 May and 6 June. The number of days between the location of the nest and hatching was ranged from 20 to 24 days. Clutch size was between 4 and 5 chicks. One egg did not hatch.

Brood survival and habitat use

Both females with broods were successful in raising chicks past 50 days. Females were observed with 1 to 6 chicks throughout this time period. Many uncollared females with broods were observed in the same vicinity. Broods were located in areas with dense shrub canopy cover and rich in forbs and insects. Mormon crickets were especially abundant in brood-rearing areas. As vegetation began to dessicate, one brooding female frequented aspen and chokecherry stands with very succulent groundcover.

Movements and habitat use

Between the hatching date and 11 August, females with broods traveled 1.3 to 2.5 km (mean = 1.9 km) from their nesting locations. Females without broods traveled up to 15 km (mean = 3.7 km) from their initial trapping location. Males traveled 3.3 km to 16.8 km (mean = 9.5 km). Common shrubs in bird locations included big sagebrush, rabbitbrush, bitterbrush, snowberry, and Utah serviceberry. One male and one brooding female used aspen and chokecherry stands. Common grasses included wheatgrasses (*Agropyron* spp.), Kentucky bluegrass, cheatgrass, and great basin wildrye. Common forbs included phlox (*Phlox* spp.), astragalus, arrowleaf balsamroot, lupine, and wild onion.

Bird use of the proposed treatment area

Ten birds (4 female and 6 male) were initially trapped and collared in the proposed treatment study area. By 17 August, all but 2 females had moved from the area. The birds that left the area either moved east into the Kimball Creek area, or west into Simplot property. In the beginning of the field season, uncollared birds (both male and female) flushed from the area. Toward the end of the season, however, only small groups of females and females with broods were seen in the area.

Survival

Between 10 May and 20 December, 2 female and 6 male mortalities occurred. In 2 cases (1 male and 1 female), only a head and the collar were left under a sagebrush, and these were assumed to be from mammalian predators. The second female was found relatively intact, and may have died of natural causes. Two collars were found with tooth marks in the rubber neckpiece and were assumed to be killed by mammalian predators. The remaining 3 collars were found in pristine condition with no sign of a struggle or predation in the area. It is a possibility that in these cases, the birds somehow removed the collars, or they were placed on the bird too loosely and came off on their own.

Habitat monitoring and arthropods

Greater Sage-grouse habitat use was monitored throughout the summer. Vegetation measurements were taken at nest sites, brood locations, and 4 single bird (2 female and 2 male) locations per week, along with a random site paired with each known site. Measurements were taken using the line-intercept method (Canfield 1941) for shrub canopy cover, the Daubenmire method (Daubenmire 1959) for ground cover, and the Robel method (Robel et al. 1970) for visual obstruction. Arthropod sampling was also conducted at nest, brood, and associated random locations using pitfall (Morrill 1975, Connelly et al. 2003) and pan traps.

The habitat data are still in the process of being analyzed. Percent shrub canopy cover and percent groundcover of grasses, forbs, litter, rock, and bare ground will be calculated for each site. Arthropods will be separated by class, and each class will be counted for individuals and measured for volume (E. Evans, USU, personal communication). Comparisons will be made between known and random sites, successful and unsuccessful nest sites, and brood, single female, and male use sites.

2006 Plan of Work

Next year the field season will begin earlier than in 2005, with an experimental study to determine lek fidelity and nomadic breeding among male Greater Sage-grouse (Objective 3). Trapping will commence as soon as males begin to visit leks, in late February or early March. We will capture and radio-collar up to 30 males, and track them throughout the breeding season. By doing this, we will be able to determine if male sage-grouse are using the same lek throughout the entire breeding season, or if they are using several leks. This information will be invaluable to biologists when calculating population estimates in the area.

Female sage-grouse will also be captured and radio-collared in the same areas as 2005 in April, in order to gather more information on nesting and brooding habitat use. The same methods will be used to monitor habitat use. Arthropod data will also be collected, using only pitfall traps. We found that although we placed pan traps at sampling sites to catch jumping insects such as grasshoppers and crickets, these traps were not very successful. We will also continue to monitor the birds that are still marked from last season.

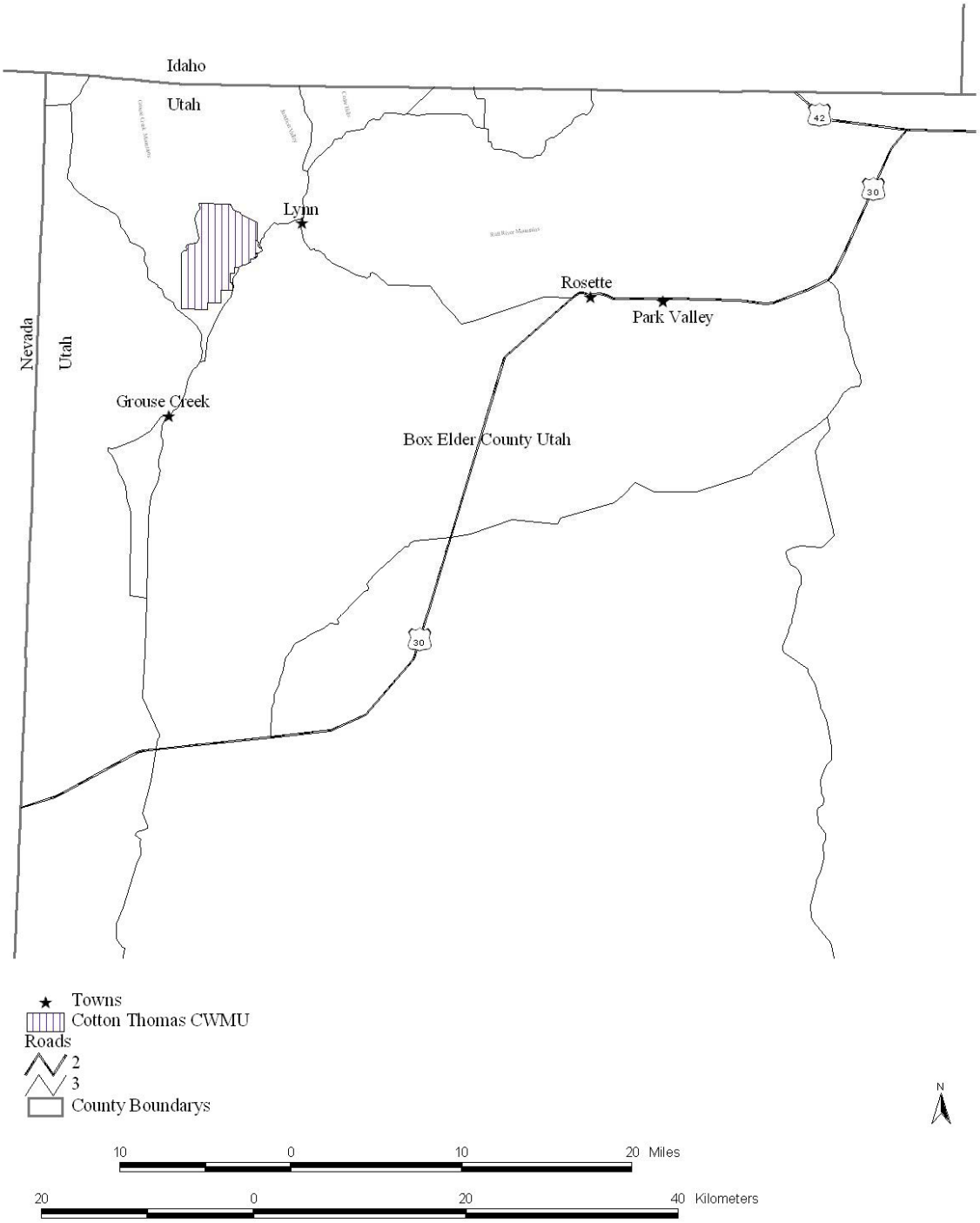

Figure 1. The study area in western Box Elder County, Utah.

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