GREATER SAGE-GROUSE ECOLOGY AND RESPONSE TO NATURAL GAS DEVELOPMENT IN NORTHEASTERN UTAH

2007 Annual Report

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Uinta Basin Adaptive Resource Management Local Working Group

by

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Introduction

Greater sage-grouse (*Centrocercus urophasianus)* are the largest grouse species in North American and are considered sagebrush obligates, relying upon sagebrush (*Artemisia spp.)* for sustenance and shelter. The shrinking distribution of greater sage-grouse and reduced population size has led to several organizations petitioning U.S. Fish and Wildlife Service (USFWS) to list greater sage-grouse for protection under the Endangered Species Act of 1973; however, thus far petitions have not been successful.

To facilitate sage-grouse rangewide conservation efforts, the Western Association of Fish and Wildlife Agencies (WAFWA) under the auspices of the Western Governor's Association (WGA) has promoted the formation of local working groups (LWGs). These local working groups have been charged with identifying risks or threats to sage-grouse populations and then developing and implementing actions plans to mitigate identified risks.

To support LWG efforts in Utah, the Utah Division of Wildlife Resources (UDWR) has entered into a long-term agreement with Utah State University Extension (USUEXT) to facilitate the Utah Community-based Conservation Program (CBCP). The CBCP encompasses the historical range of sage-grouse in Utah as identified in the 2002 Strategic Management Plan for Sage-grouse. The plan, approved by the Utah Wildlife Board on 1 June 2002, mandated the organization of local sage-grouse working groups to develop and implement sage-grouse conservation plans. Currently, there 12 LWGs operating in Utah. The Uintah Basin Adaptive Resource Management (UBARM) is the LWG supporting the communities in northeastern Utah.

Uintah Basin Adaptive Resource Management

Uintah Basin Adaptive Resource Management LWG formed in 2003 to proactively manage greater sage grouse (hereafter sage-grouse) and their habitats in response to increasing concern about the status of local populations. The partnership includes representatives from state and federal agencies, non-governmental organizations, private industry, and landowners.

Local conservation issues identified in the UBARM Strategic Management Plan (http://utahcbcp.org/htm/groups/uintah) include the effects of: home and cabin development, tall structures such as power lines, oil and gas development, roads, drought and weather, hunting pressure, incompatible fire management practices, incompatible livestock grazing, OHV recreation, invasive/noxious weeds, parasites and disease, predation, vegetation management, and Pinyon/Juniper encroachment on sage-grouse.

The group recommended that research is needed to better describe the ecology of populations in the Resource Area. Currently, little is known about these populations for application to management. Additionally, the group recognizes that increased energy development (Figure 1) may constitute a threat to sage-grouse populations if not properly managed. The UBARM believes research will be important quantify the effect of oil and

gas development on sage-grouse. This information will be needed to develop, implement, and evaluate measures that may be implemented to mitigate potential impacts.

Sage-grouse and Energy Development

Recently, there has been increasing concern about the potential negative effects of energy development on sage-grouse (Lyon and Anderson 2003, Connelly et al. 2004, Holloran 2005, ALL Consulting 2007). Sage-grouse may be especially sensitive to energy development because they require large areas of sagebrush and a diversity of sagebrush habitat to complete their life cycle (Braun et al. 2002, Connelly et al. 2004).

Energy development requires a large infrastructure including wells, well pads, holding tanks, and large networks of roads, pipelines, and power lines; hence, the effect of energy development on sage-grouse populations could be substantial. Negative effects of energy development may include: direct mortality (deaths due to traffic and collisions with infrastructure), changes in habitat use and breeding success (Lyon and Anderson 2003, Naugle et al. 2006), and the spread of weeds and predators via roads (Gelbard and Belnap 2003).

Additionally, the amount of habitat available to sage-grouse inhabiting areas experiencing rapid energy development may be reduced directly by conversion of sagebrush to well pads and roads and indirectly by sage-grouse avoidance of structures associated with energy development such as wells (Connelly et al. 2004, Pitman et al. 2005, Beck 2006). The magnitude of indirect habitat loss as well as factors influencing indirect habitat loss is poorly understood.

Seep Ridge located in the UBARM Resource Area has experienced increased energy development recently and development is expected to increase dramatically within the next five years. The area also supports a small population of sage-grouse. No information on the productivity, seasonal habitat use, or migration patterns of this population has been published.

Purpose

The purpose of the study is to describe the ecology of the Seep Ridge sage-grouse population and document their response to energy development. Research will aide in effective management of the sage-grouse population by identifying critical use areas and measures that can be implemented to mitigate potential negative effects. Identification of critical habitat, including nesting and early brood rearing areas, may allow managers to protect these areas from high levels of development. Additionally, we will attempt to identify factors limiting the population and recommend potential mitigation projects.

Study Objectives

The study objectives are:

1) To describe the ecology of the Seep Ridge sage-grouse population, including information on population size, seasonal habitat use, habitat quality at nesting and brood rearing sites, and productivity.

2) To investigate the role of energy development in lek attendance.

3) To identify measures that may be implemented to mitigate identified potential adverse effects of energy development on sage-grouse.

Study Area

The study area is located south of the White River, east of the Green River, and west of Bitter Creek in northeastern Utah (Figure 2). The study area encompasses East Bench, Middle Bench, Agency Draw, and Willow Creek. East Bench and Middle Bench consist of rolling hills dominated by Wyoming big sage (*Artemisia tridentata wyomingensis)* and contain some stands of pinyon (*Pinus edulis*) and Utah juniper (*Juniperus utahensis*). Both areas have relatively low shrub, forb, and grass cover. Agency Draw is dominated by black sage (*Artemisia nova).* Willow Creek consists of previously cultivated alfalfa fields and a deep wash lined with greasewood (*Sarcobatus vermiculatus)* and salt cedar (*Tamarix ramosissima*).

There are three known active leks in the area. Two leks (Sand Wash Rim and East Bench 16) are located on East Bench and the third lek (Middle Bench Guzzler) is located on Middle Bench. Strutting birds on the Sand Wash Rim lek have been observed since 1983 and the East Bench 16 lek has been active since 2004. Birds strutting on the East Bench 16 lek may have previously strutted on two currently inactive leks: the East Bench lek (active 1983-1994; 2004) and the East Bench NE lek (active 1999-2001) (B. Maxfield, Utah Division of Wildlife, unpublished data). The number of males counted on the East Bench leks have steadily declined throughout the past few decades. The Middle Bench Guzzler lek was discovered 2005 and the location was confirmed in 2007.

Historically, sage-grouse lekked on the Book Cliffs and the two populations may have mixed. However, the last known lek in the area became inactive in 1997. Outside of the Book Cliffs, the nearest known populations of sage-grouse are located near Evacuation Creek on the border of Utah and Colorado and on the Tavaputs Plateau, south of the Book Cliffs.

Energy Development

Energy development has occurred in the study area since the 1950s, but is escalating. Proposed energy development in two Bureau of Land Management (BLM) project areas has the potential to directly impact sage-grouse (Figure 3).

The southern portion of the Greater Natural Buttes Project Area coincides with sage-grouse lekking, nesting, and brood rearing areas located in the 2007 field season. In 2006, the BLM began preparing an Environmental Impact Statement (EIS) to address a

development plan proposed by Kerr-McGee Oil and Gas Onshore LP. The company proposes to construct 3,496 natural gas wells in the 162,911 acre project area over a ten year period (Bureau of Land Management 2006). Approximately 1,077 natural gas and 20 oil wells are currently present in the area.

The northern portion of the Big Pack Project Area also encompasses sage-grouse lekking, nesting, and brood rearing habitat. Currently the BLM is preparing another Environmental Assessment addressing Enduring Resources' LLC plan to construct 55 natural gas wells from 30 well pads in the project area (Bureau of Land Management, 2007). The proposal also includes plans to construct 11.2 miles of roads and 9.7 miles of surface gas lines.

Methods

Sage-grouse Ecology

Lek survey

Attendance of both male and female sage-grouse was recorded at two known leks on East Bench and one lek on Middle Bench twice a week from February to April. A lek route was established according to guidelines as listed in Monitoring of Greater Sage-grouse Habitats and Populations (Connelly et al. 2003). The leks were counted in 1.5 hours and counts began 0.5 hours before sunrise. Sage-grouse were counted three times before moving to the next lek, and the highest number of both males and females were recorded.

Population size estimation methods follow Connelly et al. 2003. Maximum male attendance is assumed to represent 75% of males and females are assumed to follow a 2:1 ratio to males.

Searches for new leks occurred from March through late April via driving surveys. Driving surveys were completed and the majority of roads within the study area and observers exited the vehicle every kilometer to listen for displaying sage-grouse (Connelly et al. 2003).

Lek trend analysis

In order to determine if energy development negatively affects sage-grouse trends in male sage-grouse/lek in study were compared to trends in undisturbed lek complexes (Figure 4). Leks located on Blue Mountain, Diamond Mountain, and leks from the Three Corners area were considered undisturbed. Leks were considered inactive and removed from analysis if no birds were observed in three consecutive lek counts. Trends were analyzed using generalized linear model repeated measures

Capture and radio-telemetry

Grouse were located via spotlighting roost sites in the study area and were captured with long-handled hoop nets and were placed in a small sack to minimize stress. Each bird was fitted with an ATS A4060 necklace-mounted, battery-powered radio-transmitter. The sex and age of each captured bird was determined according to mass and plumage characteristics (Beck et al. 1975). All adult and yearling sage-grouse were located at least once a week April - August. Female sage-grouse on nests, suspected to be initiating nests, or with broods were located 2-3 times a week. Throughout the fall and winter sage-grouse were located once a month weather permitting. At each grouse location the UTM coordinates, habitat type, identification number of visible wells within 2.5 km, slope, aspect, and weather information was recorded.

Habitat assessment

A variation of the line intercept method was used to estimate shrub canopy cover at all sage-grouse seasonal habitats (Connelly et al. 2003). At nests, a 15-meter tape (centered at the nest) was stretched out in 4 directions radiating away from the nest in each cardinal direction (North, South, East, West). At brood rearing sites canopy cover measurements occurred along 10-meter tapes aligned in the same manner centered as close as possible to the bird's former location. At each transect, the amount of live shrub canopy directly below the tape was measured. Gaps larger than 5 cm were excluded from canopy cover measurements while gaps less than 5 cm were included in measurements. To estimate canopy cover, the total amount of canopy below the tape was summed, and then divided by the total length of the tape.

Herbaceous cover was measured with a 20X50 cm Daubenmire frame at all sites (Connelly et al. 2003). Daubenmire frames measurements occurred every 2.5m along each line intercept transect. An estimate of the percent cover of both grasses and forbs were recorded by species. Litter, rock, and bare ground cover were also estimated. A Robel Pole was used to measure visual obstruction into brood sites, nest sites, and control sites (Robel et al. 1970). Robel Pole measurements out of the nest were also recorded.

At brood rearing sites, insect abundance was also be assessed via pit fall traps (Morrill, 1975) which collect ants and beetles, insects believed to be an especially important aspect of chick survival (Holloran and Anderson 2004).

Results

Lek survey

Five leks were surveyed in the study area and three were active. We counted 27 males attending these leks. This count is an average for lek counts conducted since 2000. From

this count we estimated that the population consists of approximately 120 birds. The location of the Middle Bench Guzzler lek was confirmed, but no new leks were located.

Lek trend analysis

This work is currently being conducted and will be completed in early 2008.

Capture and radio-telemetry

Eleven sage-grouse were captured and fitted with radio-collars from 25 March – 18 April. Two males were captured from the East Bench 16 lek, one male and one hen were captured from the Middle Bench Guzzler lek, and 6 males and one female were captured from the Sand Wash Rim lek. All of the birds were adults. Two males and two females were weighed and their average weights were 2500g and 1690g, respectively.

Nesting

Two hens (100%) initiated nests and one nest hatched successfully. The unsuccessful nest was depredated approximately five days after it was initiated and the predator responsible appeared to be mammalian. The successful nest was initiated approximately 15 April and hatched 9 May. All six eggs hatched successfully.

Both nests were initiated under big sagebrush. Habitat measurements were recorded at the successful nest. Shrub cover was 16.2%, forb cover was 7.8 %, and grass cover was 11.3 %. The nest shrub height was 73 cm.

Arthropods

Arthropod samples collected in the 2007 field season are currently being analyzed.

Brood survival and habitat use

East Bench and Middle Bench were identified as key early brood rearing areas and the land adjacent to Willow Creek was identified as key late brood rearing habitat. One hen nested successfully and raised one of six (16.7%) chicks to 50 days. The hen moved approximately 14 km from East Bench to Willow Creek between 9 June and 14 June and remained there throughout the summer and early fall.

Shrub cover at the early brood rearing habitat (East Bench) was 14.6%. Grass cover and forb cover at these sites was 8.0% and 3.7%, respectively. Shrub cover at late brood rearing sites (Willow Creek) was 4.6%. Forb cover was 25.3 % and grass cover was 0.4 %.

Shrub cover use at late brood rearing sites appears to be temperature dependent. Below 90° F broods were observed foraging in fields with no shrub cover. Above 90° F broods

were found under greasewood, salt cedar, or other tall shrubs. This trend was also apparent in males and broodless hens.

Broodless hen and male habitat use

The broodless hen moved from Middle Bench to Willow Creek approximately 15 June. The hen was observed flocking with broodless hens, broods, and males in this area. Males migrated to summer range habitat between 22 May and 21 June and used two distinct areas during the summer (i.e., Willow Creek and Agency Draw).

Male and broodless hen use of shrub cover also appears to be temperature dependent. At Willow Creek, adults were found in the shade of the creek banks, cottonwoods, and tall shrubs during the hottest portion of the day. At Agency Draw sites birds were observed in the shade of greasewood and rock ledges.

Most of the grouse began migrating back to East and Middle Bench in September, however, as of November, males were observed using Agency Draw.

Mortality

One female and six males (63.6%) died between 11 May and 10 November, 2007. The majority of these mortalities (71.4%) occurred in the fall between 1 September and 30 November. Drought and subsequent poor forage quality may have contributed to the high death rate observed in the fall.

Golden Eagles were likely responsible for at least two mortalities. The direct cause for mortality was difficult to discern in the other mortalities. However, teeth marks were found on many of the collars and a coyote was observed near one of the carcasses. One carcass was found intact, but decomposition precluded West Nile virus testing. Additionally, a juvenile grouse was found dying on the side of a road in the study area. The bird was tested for West Nile virus, but results were negative.

2008 Work Plan

Population ecology research will continue with some changes to the capture methodology and lek searches will expand into the Book Cliffs. Additional objectives to be addressed in the 2008 field season are:

1) To estimate indirect habitat loss, we will investigate the effect of traffic volume on sage-grouse road avoidance and determine if sage-grouse avoid wells.

2) To determine if the population is divergent from other populations and if inbreeding is of conservation concern.

Sage-grouse Ecology

Capture and radio-telemetry

During the 2008 field season we will attempt to maintain a total of 15 female and 10 male radio-collared sage-grouse and will collect morphological measurements and blood samples from clipped toenails. Morphology measurements collected with include: culmen length, culmen width, tarsus length, tail length and the lengths of primaries P10, P9, and P1 (according to Pyle et al. 1987). Additionally, chick transmitters will be used according to methodology described in Burkepile et al. 2002 in the 2008 field season.

Indirect Habitat Loss

Locations of radio-collared sage-grouse will be plotted on a map of natural gas wells and roads. We will calculate the proportion of habitat within 500m and 1000m of wells and roads and then determine if habitat use is equal to availability. A chi-square test will be used to determine if sage-grouse avoid natural gas wells and roads.

To determine if traffic volume is an important factor in road avoidance traffic counters will be put out on the East Bench and Willow Creek roads. Regression analysis will be used to assess the role of traffic volume on the distance that sage-grouse avoid wells.

Genetics

MtDNA analysis will be used to determine if the study population is divergent from other sage-grouse populations. MtDNA sequence data exists for the Strawberry Valley, Diamond Mountain, and Blue Mountain populations (Oyler et al. 2005). Additional blood samples may be obtained from sage-grouse populations near the study site including the Anthro Mountain, Tavaputs Plateau, and Deadman Bench populations (Figure 4).

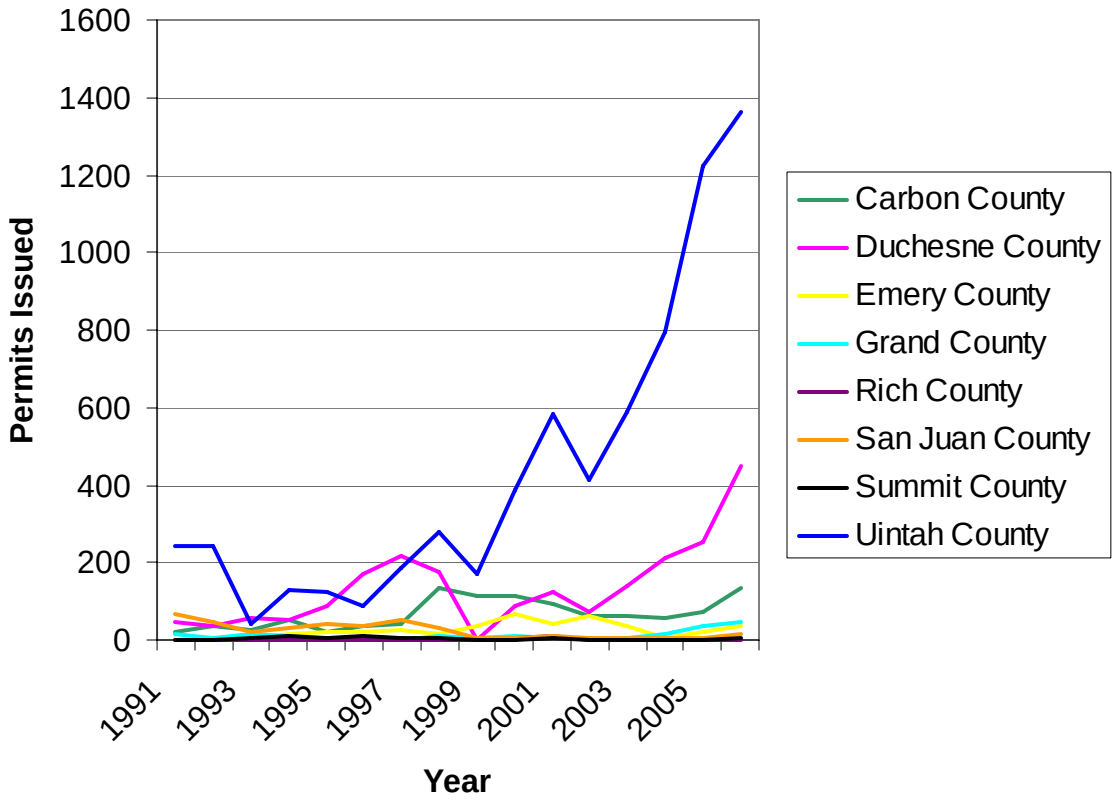

Figure 1. Permits issued to drill in Utah from 1991-2006 (Utah Division of Oil, Gas and Mining data, http://www.ogm.utah.gov/oilgas/STATISTICS/permits/1APD.htm). Only counties issuing 10 permits in at least one year from 1991-2006 are included.

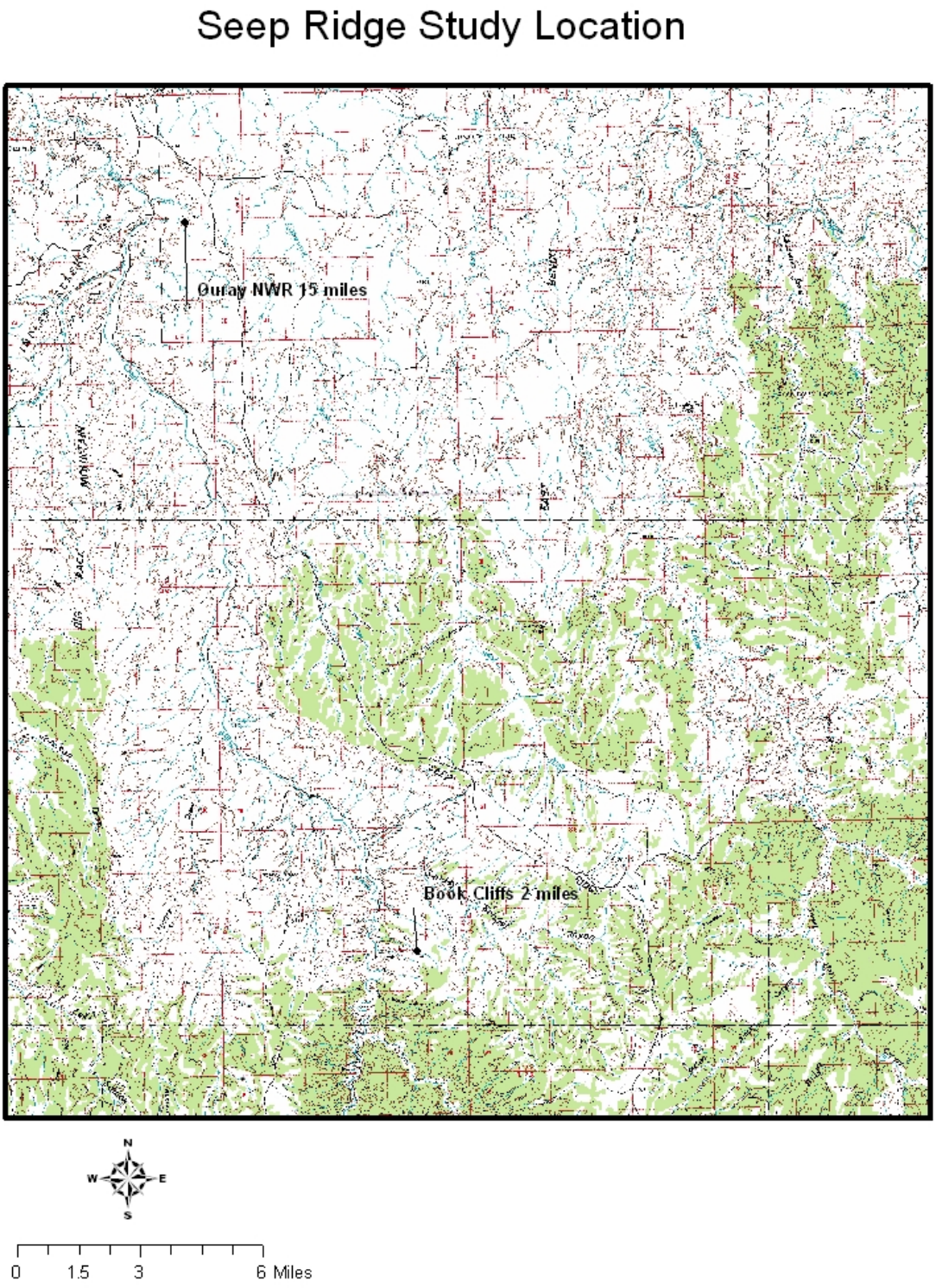

Figure 2. The Seep Ridge Study Area.

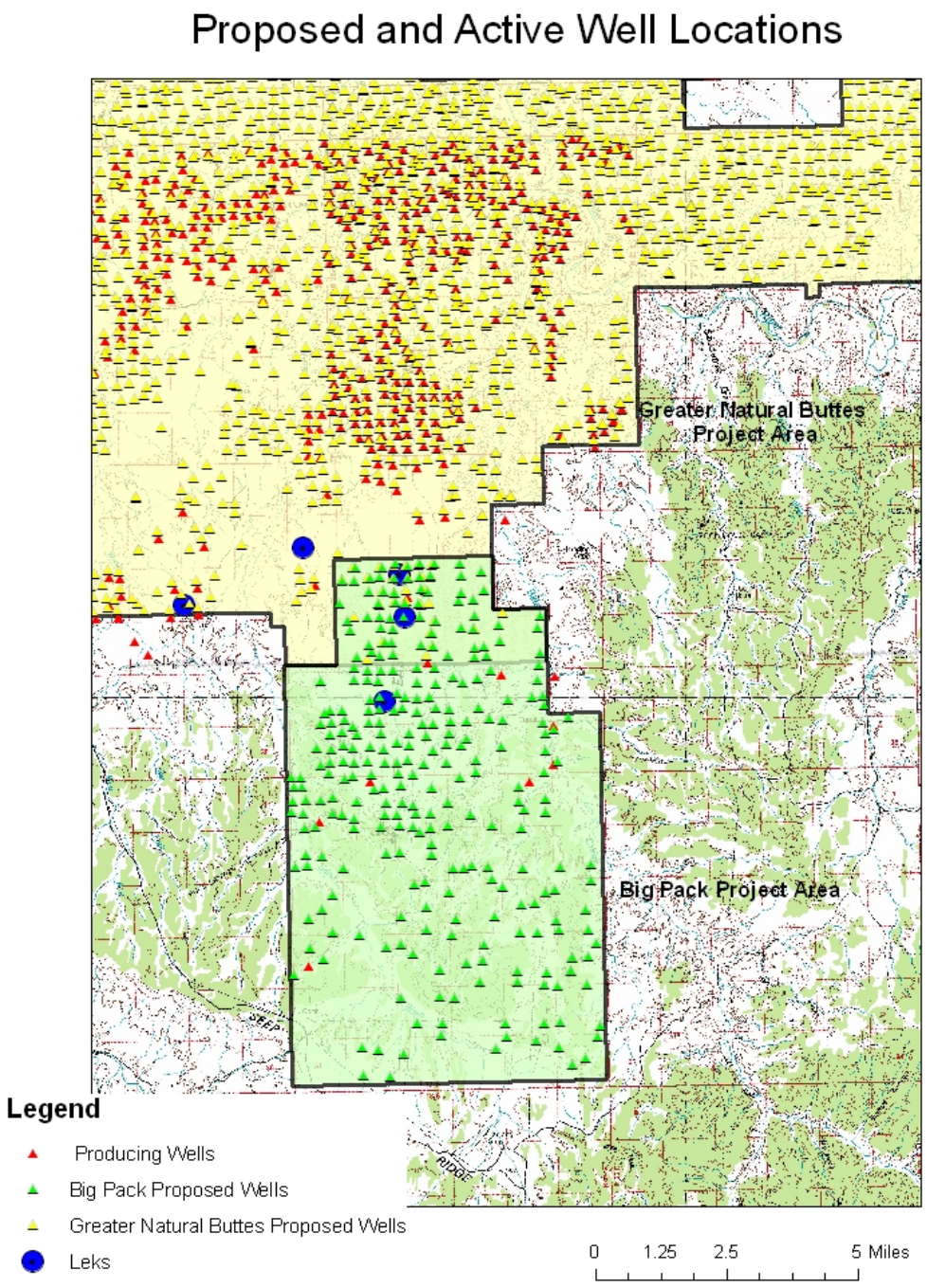

Figure 3. Locations of active wells and proposed wells in relation to leks.

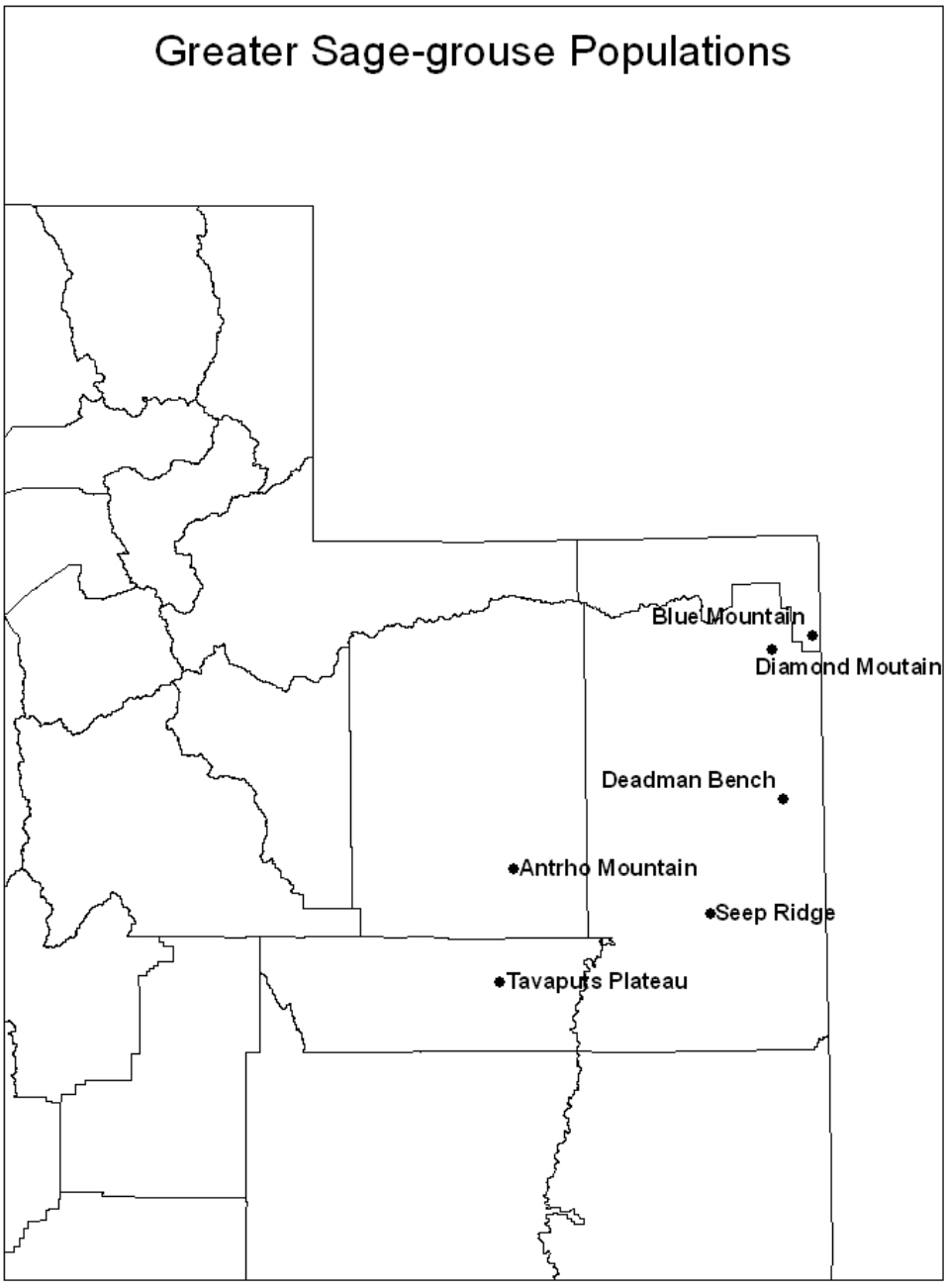

Figure 4. Map of proposed genetic sampling sites in northeastern Utah.

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