2008 ANNUAL REPORT

ECOLOGY OF GREATER SAGE-GROUSE POPULATIONS INHABITING WILDCAT KNOLLS AND HORN MOUNTAINS, SOUTHCENTRAL UTAH

Photo courtesy of Chris Perkins

Prepared by

Chris Perkins
Graduate Research Assistant

Terry A. Messmer Principle Investigator
Todd A. Black Conservation Extension Specialist
Department of Wildland Resources
Utah State University, Logan Utah 84322-5230

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Cooperators

Castle Country Adaptive Resources Management
Sage-grouse Local Working Group

Utah Division of Wildlife Resources

U. S. Forest Service
Ferron District

Canyon Fuel Company, LLC
SUFCO Mine

Prepared by

Chris Perkins
Graduate Research Assistant

Terry A. Messmer, Principle Investigator
Todd A. Black Community-Based Conservation Extension Specialist
Jack H. Berryman Institute
Department of Wildland Resources
Utah State University, Logan Utah 84322-5230

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The photo on the front cover is a view of the southern end of South Horn Mountain. "This is the end of the Road" for grouse habitat on South Horn. Photo by: Chris Perkins

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Introduction

Greater sage-grouse (*Centrocercus urophasianus*) inhabit sagebrush ecosystems throughout the western North America (Patterson 1952, Schroeder et al. 2004). This species once inhabited sagebrush ecosystems in 12 states and 3 provinces (Connelly et al. 2004). Breeding populations have declined 17% rangewide in the past 50 years (Connelly and Braun 1997). Greater sage-grouse population declines have been largely attributed to habitat loss, degradation, and fragmentation (Braun et al. 1977, Connelly and Braun 1997, Braun 1998, Connelly et al. 2004).

In Utah, greater sage-grouse currently inhabit < 50 % of their historic range (Beck et al. 2003). To mitigate these declines, local working groups have been organized across the state to identify threats to extinction and actions to be implemented to improve sage-grouse numbers and habitat (Utah Division of Wildlife Resources [UDWR] 2002).

Castle Country Adaptive Management Local Working Group (CCARM)

The Castle Country Adaptive Management Local Working Group (CCARM) was formed in 2006 to address concerns regarding local sage-grouse populations in Carbon and Emery Counties (Fig. 1). Currently, little is known about greater sage-grouse ecology and populations on the Wildcat Knolls and Horn Mountain. Previous data collection efforts have been limited to monitoring male attendance on the Wildcat Knolls, South Horn, North Horn, and Barewire Pond leks since 1991. However these counts have been inconsistent because of limited accessibility during the early spring months.

Project Purpose

The purpose of this research is to obtain a better estimate of sage-grouse lek attendance, distribution, habitat-use patterns, and the factors affecting production, and survival. This research will provide CCARM, Canyon Fuel Company (CFC), the U.S. Forest Service, (USFS), and the UDWR with information to guide management actions to enhance habitat conditions for the greater sage-grouse populations that inhabit the Wildcat Knolls and Horn Mountain.

Study Objectives

The objectives of this study are:

1) To document sage-grouse seasonal distributions and habitat use on the Horn Mountain and Wildcat Knolls.

2) To determine the factors that may be limiting sage-grouse populations on Horn Mountain and Wildcat Knolls.

3) To document sage-grouse, vegetation, and arthropod responses to habitat improvement projects implemented on Wildcat Knolls in 2008.

Study Area

The study area is located in Carbon and Emery counties on the Wildcat Knolls and Horn Mountains located on the south end of the Manti Mountains (Wasatch Plateau) (Fig. 1). The Wildcat Knolls lek is located about 24 km southwest of the Horn Mountain leks.

Ranging from 2500-2900 meters in elevation, the Wildcat Knolls is characterized by Mountain big sagebrush (*Artemisia Nut. ssp. vaseyana*) and black sagebrush (*Artemisia nova)* vegetation community. Annual precipitation averages about 40 cm/year (Gooseberry Ranger Station, approximately 35k away). Other species in the plant community are: serviceberry (*Amelanchier alnifolia*), black sagebrush, snowberry (*Symphoricarpus albus*), woods rose (*Rosa woodsii*), and antelope bitterbrush (*Purshia tridentata)*. Serviceberry occurs in areas with wetter and deeper soils. Mountain big sagebrush is primarily found in the drainage corridors, while black sagebrush, dwarf rabbit brush (*Chrysothamnus depressus)*, and low rabbit brush (*Chrysothamnus visidiflorus)* occur on drier areas. Herbaceous vegetation is diverse, dominate grass species include mutton bluegrass (*Poa fendleriana*), letterman needlegrass (*Achnatherum lettermanii*), and Salina wildrye (*Leymus salinus*). One of the more abundant forbs is goosefoot (*Chenopodium spp.).* Plant community structure on the Horn Mountain is similar to Wildcat Knolls, except that mountain brush communities are more abundant, including: mountain mahogany (*Cercocarpus* montanus) and scattered pinyon pine (*Pinus edulis)*.

Methods

Lek Surveys

Currently lek counts were conducted using UDWR standard protocols (Connelly et al. 2003). Lek counts began in late March and continued to the end of April. Lek counts were started one half hour before sunrise, under light or no wind, and partly cloudy to clear skies. A location near the lek with good visibility that will not disturb the birds was selected for observation. The time the counts were started was recorded, and all birds present on the lek were counted from right to left. We then waited another 10 minutes and repeated the count. We waited another 10 minutes and counted the birds a third time. The highest number of males observed during each counting period was recorded. These counts will be used to provide a measure of relative abundance of the population.

Radio Telemetry

Highest concentrations of sage-grouse on the Wildcat Knoll site have been observed in January (K. Albrecht, USFS personal communication). As the early spring lekking season begins, densities of sage-grouse decrease. Elevation and accessibility during early spring months have made it difficult for local managers to monitor sage-grouse movements that time of year.

To document early spring movements, initial trapping began in January 2008. Sage-grouse were located by spotlighting with binoculars from the back of an ATV and captured with a long handled net (Wakkinen et al. 1992). Age (adult or juvenile) and sex were assigned at the time of capture site based on primary feather characteristics (Dalke et al. 1963). Adult birds were fitted with Holohil Systems Ltd. (www.holohil.com) necklace style radio transmitters. This type of transmitter has a 36 month battery life (24 hours on), and weighs 17.7 grams. A GPS unit was used to record the location of each capture site. Over the 2 year period of 2008 and 2009 we are proposing to capture up to 30 hens and 10 cocks.

Monitoring hens to determine nest initiation rates began in April 2008. Radio-collared hens were monitored to evaluate nest site selection, nest success, brood survival and habitat use. Additionally, we monitored movements of all radio-collared birds to determine seasonal habitat use, survival, and causes of mortality. All nests were monitored every three days from the time they are located until their fate was determined (i.e., predated, abandoned, or successfully hatched). Unsuccessful nests were examined to determine depredation factors using eggshells, scat, tracks, or hairs. Females with broods were relocated 3 times/week from May-August. Males and females without broods were relocated weekly. Adult mortalities were also examined to determine depredating species (Zablan et al. 2003). Radio-collard cocks and hens were monitored by aircraft during the winter (December-March) to determine winter areas and potential lek sites**.**

Habitat Monitoring

Vegetation attributes were monitored on Wildcat Knolls and Horn Mountain to: 1) document condition and trend of habitat; 2) evaluate sage-grouse response to habitat treatments; 3) assess the success of a habitat restoration program; and, 4) evaluate the potential of the habitat to support an existing or reintroduced population (Connelly et al. 2003). Vegetation was measured at nest site and all other telemetry location sites.

At each nest site, vegetation measurements were recorded along 15 meter line transects in four directions (every 90 degrees starting with a randomly chosen direction). We measured species-specific shrub canopy coverage using the line-intercept method (Canfield 1941).

The amount of live shrub canopy intersecting an imaginary vertical plane on the line was measured. Gaps in the foliage less than 5 cm were counted as continuous; gaps greater than 5 cm were not counted on the line as continuous shrub cover. The amount of shrub intersecting the line was summed and then divided by the length of the line to determine total shrub canopy cover (Connelly et al. 2003). The use of this method allows direct comparison with data from many other studies (Lyon 2000, Connelly et al. 2003). Shrub height was recorded by selecting the tallest live part of each shrub along the transect (Connelly et al. 2003). The percentage of ground vegetation was measured using 20 X 50-cm Daubenmire (1959) frames placed every three meters to quantify herbaceous cover, species present, rock, litter, and bare ground.

At each nest site, visual obstruction (vertical cover) between the nest and four meters from the nest was measured using a Robel pole (Robel et al. 1970, Connelly et al. 2003) with painted 10 cm increments. Two measurements were recorded: Robel In (a measure of predator obstruction) and Robel Out (a measure of hen's obstruction), this measure is taken on all four line transects at each nest site. Nest shrub height, nest shrub width, and grass height were also measured at each nest location to evaluate nesting cover (Connelly et al. 2003). Vegetation sampling was also done at random locations related to nest and brood sites. For each nest and brood site, a random point was selected within 500 meters.

Arthropod Sampling

Evaluating arthropod abundance at brood site locations is important in assessing sage-grouse habitat. Insects play an important role in the early brood-rearing habitat (Patterson 1952). Sage-grouse chicks depend highly on insects in their diet for survival and normal growth, especially in the first three weeks of hatching (Johnson and Boyce 1990).

To assess insect abundance in brooding habitat, we used pitfall traps (Morrill 1975, Connelly et al. 2003). Hens with broods were located 3 times/week for 7 weeks after hatching. Each week, one location from each hen with a brood was randomly selected to evaluate insect abundance and diversity. After vegetation measurements were recorded at the brood site location, 8 pitfall traps were placed flush with the ground along each of the four line intercept vegetation transects. Pitfall traps were placed at 5 and 10 m from center. Pitfall traps were filled with a 50/50 solution of water and antifreeze. All traps are open for 48 hours, after which the insects were collected and preserved for later analysis. Preserved insects ware placed in a 70% ethylene glycol solution (Pedigo and Buntin 1993) or frozen for future evaluation and identification. Insects will be quantified for presence each taxa to determine relative abundance for each at different locations from May to June (Connelly et al. 2003).

Sage-grouse Habitat Treatments

In 2007, several areas on the Wildcat Knolls were selected by the USFS as potential sites for habitat projects. These sites were selected for management based their potential enhancing sage-grouse production. The current vegetation on the sites did not

approximate guidelines published for greater sage-grouse breeding habitat (Connelly et al. 2000).

The USFS selected 2 mechanical methods (dixie harrow and disking) to treat the areas. Each treatment plot was paired with a control. We collected baseline vegetation data in August 2008 on 1 of the proposed dixie harrow treatment, 1 disc treatment, and 1 control plot for each. The treatments were implemented in the fall of 2008.

With in each plot, we established four 20 m permanent line transects. Similar methods (line intercept and Daubenmire frames) used in evaluating brood site habitat were used to measuring shrub cover, herbaceous ground cover, bare ground, litter, and insect abundance . For each transect pitfall traps were placed every other meter starting at 2 meters (10 total per transect).

Both treatment and control sites were assessed for sage-grouse use using pellet count transects. Pellet count transects were established within 100 meters of each permanent vegetation transect. The pellet line transect was walked perpendicular to the treatment type and the observer recorded the pellet type (cecal or regular pellet), and number of pellets or cecal droppings per cluster. Roost piles are counted separately and equal one cluster occurrence (Dahlgren 2005). Sage-grouse use surveys will be repeated post-treatment in 2009.

Anticipated Benefits

The basic ecology and response of greater sage-grouse to current land uses on the Wildcat Knolls and Horn Mountain regions are largely unknown. Currently, local working groups are evaluating ways to maintain and enhance greater sage-grouse habitat. The results from this study will provide CCARM, local managers, and agencies with critical information on sage-grouse ecology in the region, including population estimates, distribution, annual habitat use, and habitat conditions. This study will also provide critical breeding locations and information on how current land uses affect greater sage-grouse ecology.

2008 Results

Lek Surveys

Currently, there are 3 active leks within the two study sites. On the Wildcat Knolls Lek, peak male attendance of 17 was recorded in 2008. In 2008, two leks were monitored on the Horn Mountain (Barewire pond lek and South Horn Lek). Peak male attendance in 2008 for the Barewire pond lek was 3, and for the South Horn lek was 17.

Radio Telemetry

In 2008, between 26 April and 6 August, we captured and placed radio-collars on 18 greater sage-grouse (9 female and 9 male). The females included 3 adults, 4 juveniles, and 2 chicks (caught in August) weighing 800-1475 g. The males consisted of 8 adults and 1 chick. The weights ranged from 800-2700 g.

Sage-grouse were captured in the areas near the leks. Grouse caught latter in the summer, were caught among groups of brooding hens. One adult hen was caught on the Wildcat Knolls on 14 July. At the time of capture she had a brood of 4 chicks. She successfully reared four chicks into August. At this time one of her male chicks was caught and fitted with a radio collared.

Of the eighteen sage-grouse captured, 12 of them were caught on the Wildcat Knolls (6 female and 6 male). On the Horn Mountain we captured 3 juvenile females and 3 adult male grouse.

Nesting

Wildcat Knolls- Three out of the 6 hens captured on the Wildcat Knolls study area were caught during the pre-nesting period. All of these hens initiated nests. Two of the three nests were depredated within about a week of initiation, with coyotes being the suspect predator species. The third hen lost her brood within a few days of hatching. The fate of the chicks from this hen is unknown.

Horn Mountain- Of the three hens monitored on the Horn Mountain, two were caught during the pre-nesting period. Only one of these hens initiated a nest. This nest contained 7 eggs at the time it was depredated, again possibly by a coyote.

Overall survival

Of the 18 total birds captured, two mortalities occurred between 22 April and August 6. Both of the mortalities were female, one of which was an adult female predated by a raptor on Wildcat Knolls. The other mortality was a juvenile hen predated on Horn Mountain by an unknown mammalian predator. On January 13, 2009, we were able to identify 4 additional mortalities using arial telemetry on the Wildcat site. Three of which were adult males, and one was a chick collared last August. The cause of these mortalities is yet to be determined due to winter conditions on the Wildcat site.

Movements

Grouse movements on the two study sites differed. On Horn Mountain some marked individuals moved up to 14.5 km (9 miles) within a two day period just after the lekking

period. These birds moved from the South Horn lek to the North Horn area (Figs. 2 and 3).

Radio-marked sage-grouse movements on the Wildcat site tended to be less pronounced. None of radio collared birds moved more than 3.2 km (2 miles) from the main lek between 22 April and 06 August (Figs. 3 and 4).

Habitat Monitoring

The 2008 vegetation data has been entered into a spread sheet and is currently being analyzed.

Arthropod Sampling

The 2008 arthropod samples are currently being sorted. Upon completing the sorting these data will be analyzed and compared.

2009 Plan of Work

In 2009, we will attempt to capture and place radio-collars on an additional 15 birds. We will monitor bird survival and habitat use. Vegetation attributes, arthropod abundance, and sage-grouse response to management actions also will be monitored. We will complete data analysis comparing use and random sites in late 2009.

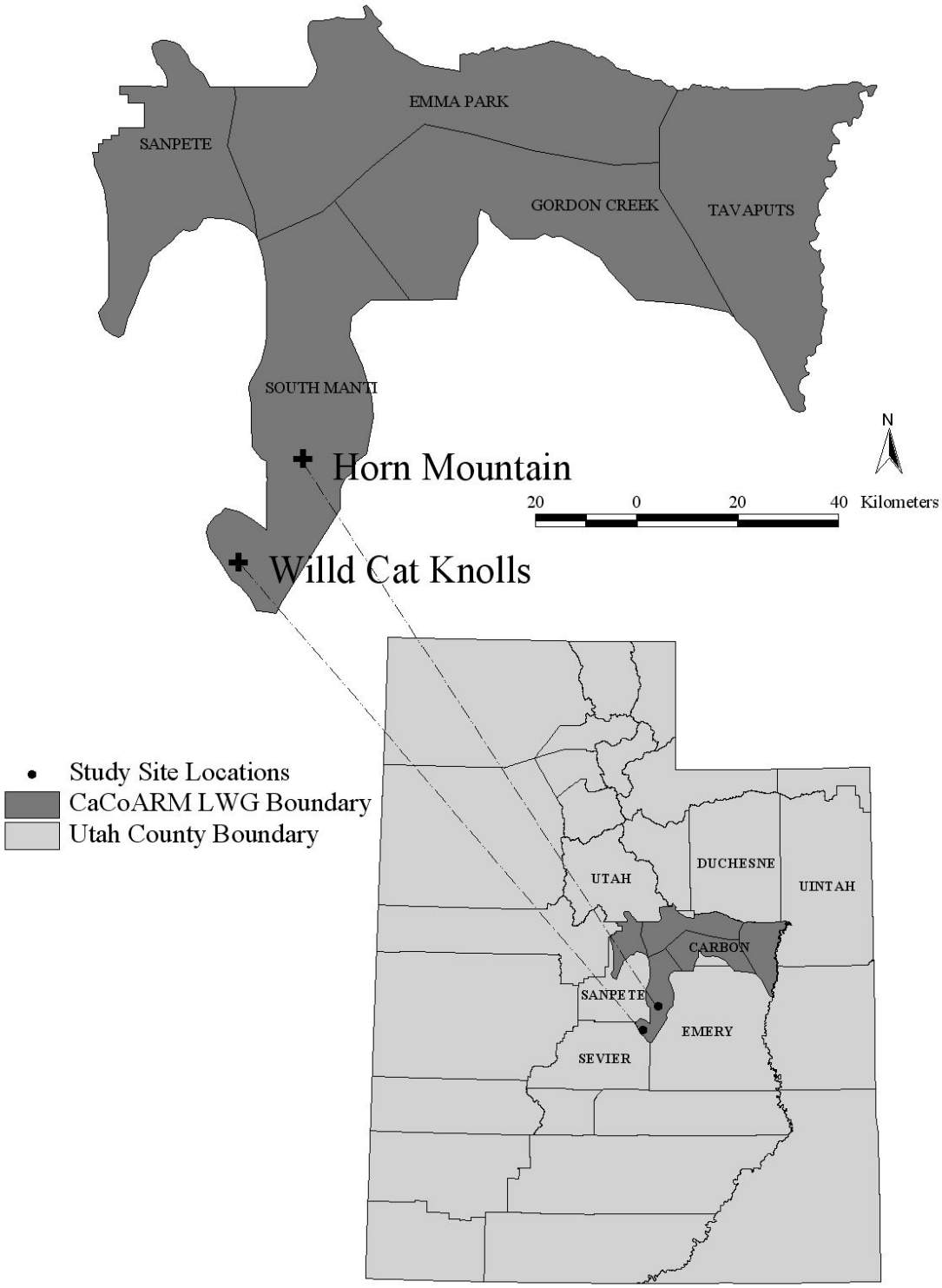

Fig. 1. Wildcat Knolls and Horn Mountain study locations in Utah.

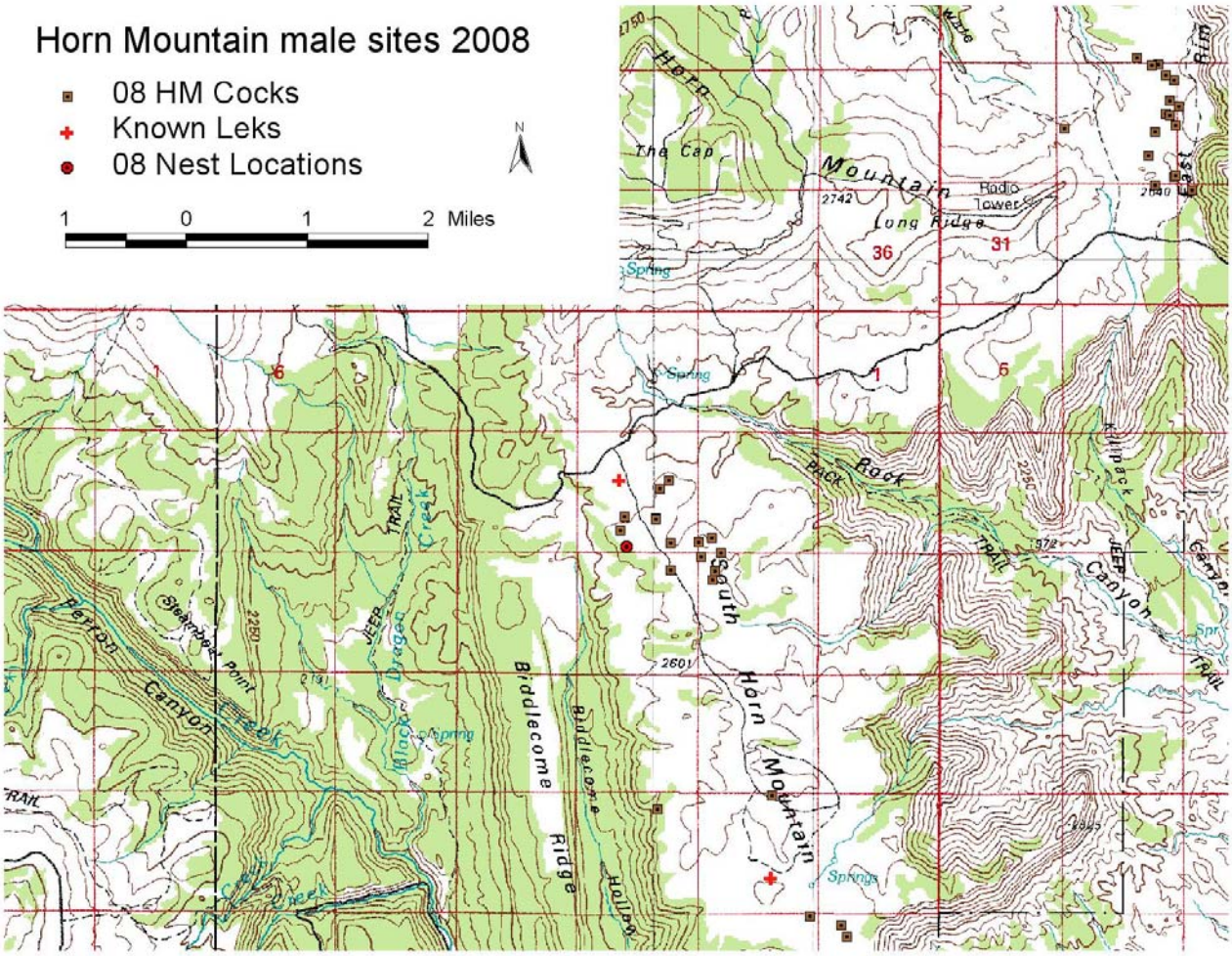

Fig. 2. Horn Mountain Greater sage-grouse male telemetry locations, 2008.

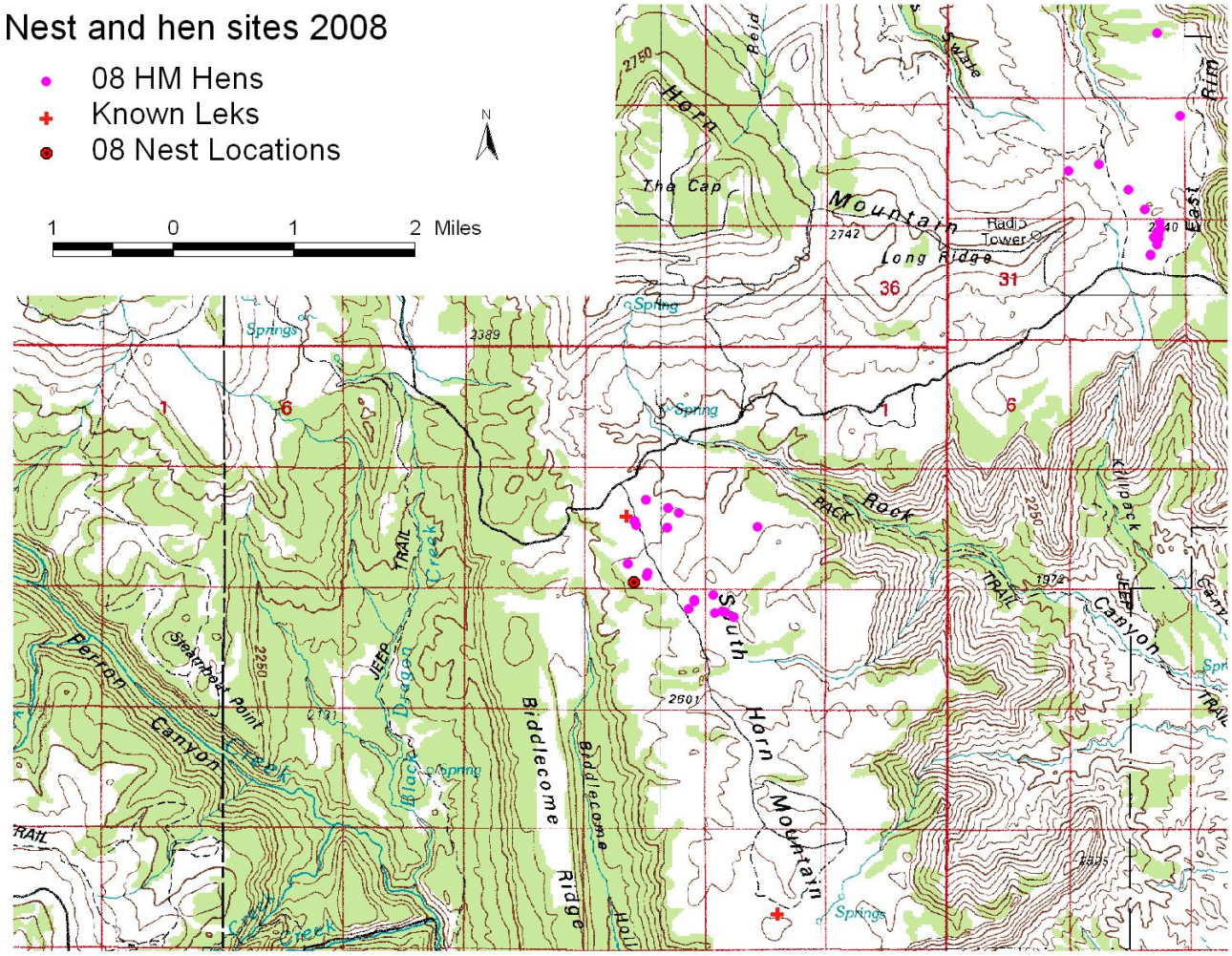

Fig. 3. Horn Mountain female greater sage-grouse telemetry locations, 2008.

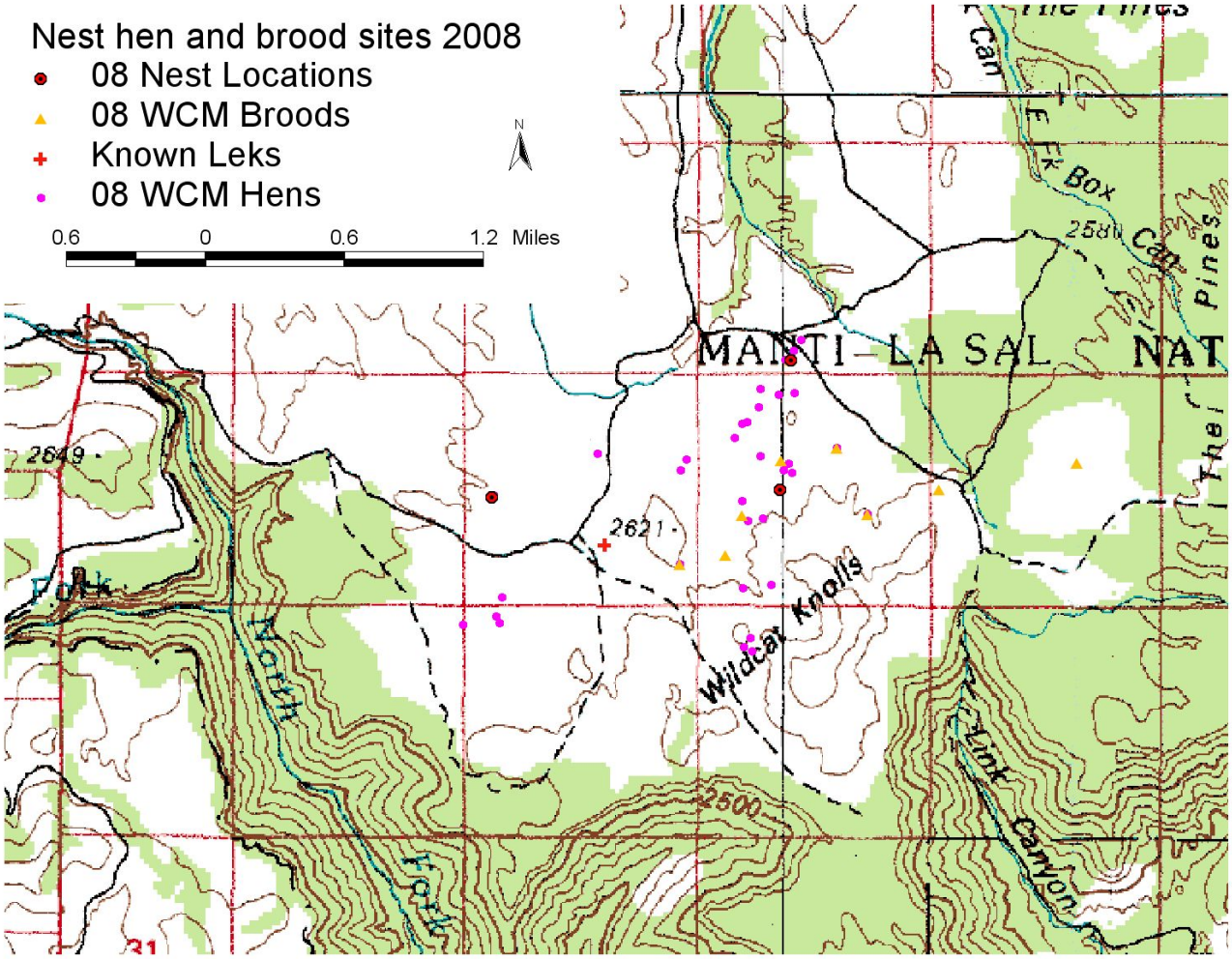

Fig. 4. Wildcat Knolls nesting and female greater sage-grouse locations, 2008.

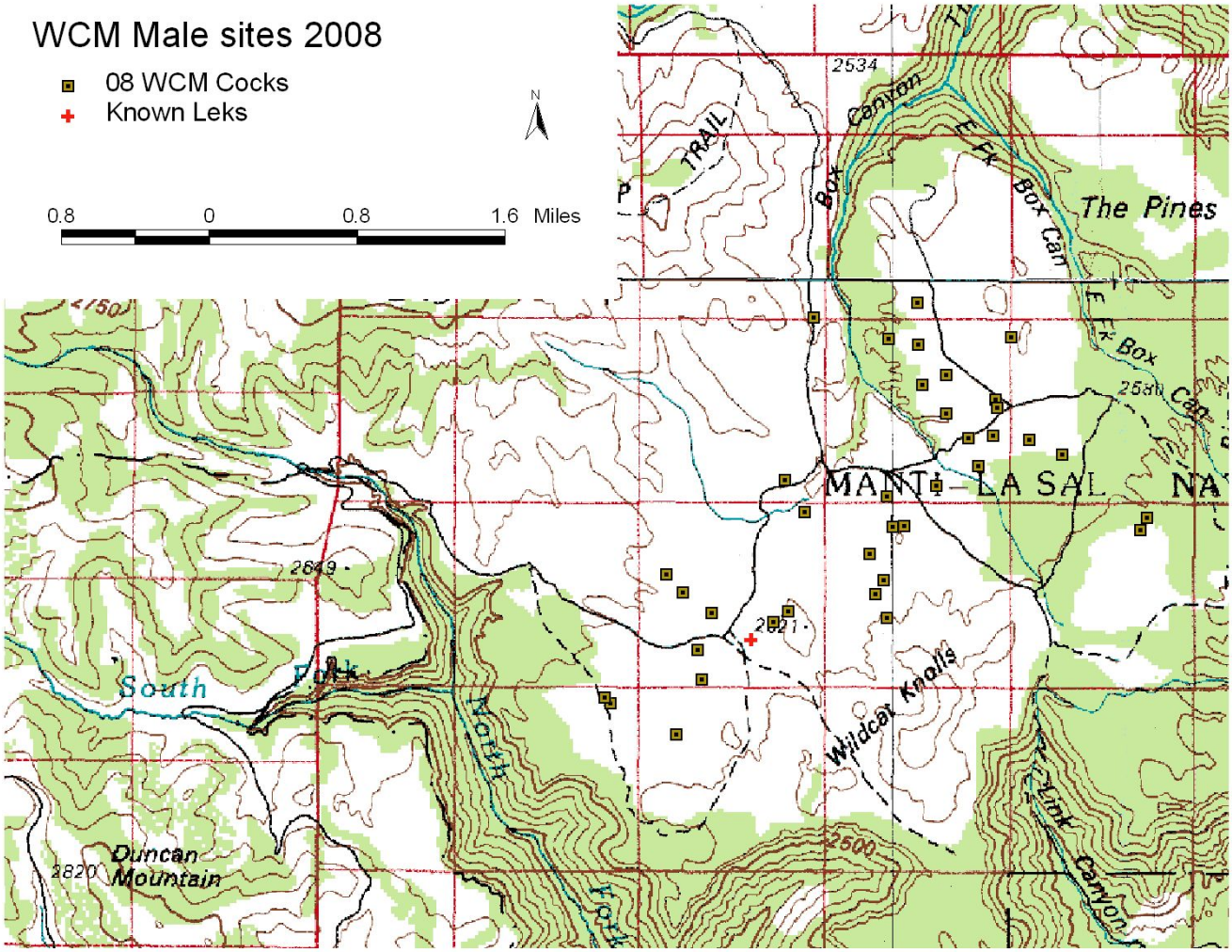

Fig. 5. Wildcat Knolls male Greater sage-grouse telemetry locations, 2008.

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