GREATER SAGE GROUSE HABITAT SELECTION AT MULTIPLE SPATIAL SCALES IN UTAH

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January – December 2010 Annual Report

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Executive Summary and Project Objectives

During the past 50 years, sage-grouse (*Centrocercus* spp.) populations have declined significantly throughout western North America. Primary factors implicated in this decline include degradation, fragmentation, and loss of sagebrush habitats which are critical for sage-grouse during all phases of their life cycle. More recently, energy (coal, natural gas, and oil) extraction has been highlighted as a potential risk to greater sage-grouse (C. urophasianus; Knick 2003, Holloran 2005, Aldridge and Boyce 2007, Doherty et al. 2008). Given the increased demands currently placed on western rangelands and the potential listing of greater sage-grouse under the ESA of 1973, wildlife biologists are faced with the challenge of identifying and conserving critical habitat.

Many studies, including multiple recent efforts in Utah, have identified small-scale variables (e.g. shrub composition, shrub canopy structure, forb diversity) associated with habitat selection of greater sage-grouse throughout their life cycle (breeding, nesting, brood-rearing, winter, etc). Recent conservation work throughout Utah has resulted in a robust source of data that includes thousands of spatial locations of greater sage-grouse (lek sites, nest sites, brood-rearing locations, winter use areas, etc) collected from multiple populations. As an example, recovery efforts in Strawberry Valley have resulted in more than 2000 flush locations recorded in a GIS. These data also include detailed measurement of small-scale variables at more than 750 locations, including paired random sites. Similar data (at least spatial locations from radio-marked birds) exist from other populations of greater sage-grouse in Utah.

Study of greater sage-grouse habitat selection at larger scales has historically been restricted by technology limitation. Large scale research, however, has become more feasible with recent advances in remote sensing, Geographical Information Systems (GIS), and geostatistics. Recent work in other states at broad spatial scales indicates that optimal sage-grouse habitat varies across heterogeneous landscapes. Yost et al. (2008) found that sage-grouse nesting probabilities were greater in big sagebrush and antelope bitterbrush dominated sites, in particular where riparian systems were in close proximity. Work currently conducted by Petersen et al. show that birds often nest in areas with high structural heterogeneity in plant communities.

Increased plant community heterogeneity is the goal of current efforts in Utah to improve sage-brush habitats via treatment (mechanical, herbicide, fire, etc.). There is, however, a need to improve our understanding of wildlife response to these treatments. Greater sage grouse are commonly targeted with these efforts, yet little work has been done to assess habitat selection across treated (presumably high heterogeneity) landscapes.

Large, landscape-scale studies of greater sage-grouse habitat selection across multiple populations has not occurred in Utah. Research at these broader scales is needed to identify critical habitats that are currently threatened. Moreover, rarely has small-scale habitat selection been linked to large-scale across multiple populations. Given recent work throughout the State and recent advancements in remote sensing, we propose to investigate habitat selection across multiple scales and populations throughout the life cycle of greater sage-grouse.

Objectives of the project are: 1) Characterize optimal habitat (emphasis on nesting and brood-rearing periods) for sage-grouse at multiple spatial scales. 2) Develop probability maps of sage-grouse habitat and assess accuracy (state-wide, regional, population level). This characterization will include assessment of sage-grouse habitat selection in relationship to general habitat heterogeneity and specific treatment types where applicable. 3) Assess the importance of environmental variables in determining sage-grouse habitat selection.Determine which large-scale (GIS) habitat selection variables are correlated with fine-scale variables.

This is a statewide project with primary focus areas being: Diamond and Blue Mountains (northeast Utah), Box Elder County (northwest Utah), Rich County (northern Utah) and Parker Mountain (south-central Utah); these focal areas correspond to Utah's Sage-grouse Hunt Units. The Diamond/Blue Mountain Sage-grouse complex is not currently being studied and this project will include collection of original data in this area. Other areas have been or are currently being studied, and researchers in those areas have agreed to contribute data for this project.

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PROGRESS SUMMARY

This brief report is a summary of our research activities from the commencement of the project in March 2010 to the end of FY 2010. We have made significant progress in putting together a research team that will fulfill the Utah Division of Wildlife Resources (UDWR) contract which began January 2010. Our initial selection of a M.S. student to conduct the work at Diamond Mountain (Sterling Fenwick) was modified since Sterling elected to enter the Marine Corps and subsequently resign his graduate position at BYU. He was replaced by Josh Kaze, an undergraduate student who will complete his B.S. degree in December 2010 and immediately enter graduate school in January 2011. Josh has two years of experience working with both Bison (Antelope Island) and greater sage grouse (Strawberry Valley) and his experience using telemetry and monitoring wildlife will help make this transition relatively seamless. We appreciate Sterling's willingness to serve in the Military and wish him well. Additional progress has also been made selecting a Ph.D. student for the habitat modeling component of the project. Chris Balzotti, a recent graduate from BYU that completed his M.S. degree in ecological modeling, has agreed to work on this project and is planning on entering a Ph.D. program this fall. Additionally, we have been working together with sage-grouse specialists from Utah State University to consolidate data of sage-grouse nesting, brood rearing, and winter habitat use that will be used in ecological modeling and habitat probability mapping. Finally, we appreciate the generous accommodations provided by Mitch Hacking (Two Dog Hunting) who has allowed the field crew to use his hunting lodge on Diamond Mountain. These accommodations have been a tremendous help and benefit.

Trapping and Radio-Marking

Between March and April, we joined UDWR biologists from the North Eastern Region to trap and collar greater sage grouse on Diamond Mountain. Although trapping success was lower than initially anticipated, we were able to capture and radio-mark 30 females (Fig. 1) on and around the primary leks. We weighed, measured, and took a blood sample (DNA repository) from each captured hen prior to radio-marking and then safely released each bird. Following release, we monitored survival, reproductive effort, habitat use, and movement patterns of this sample of radio-marked birds.

Figure 1. Captured and radio-marked female greater sage grouse.

Survival

Grouse survival has been relatively high to date. We have only recorded two mortalities from the original total of 30 birds. This finding is somewhat unusual as most grouse populations experience increased mortality during the breeding and nesting periods. One of these documented mortalities appeared to be mammalian predation–possibly a bobcat based on evidence at the transmitter recovery site (Fig. 2). The other deceased bird was found intact and is currently at the Utah State University Veterinary Diagnostics Laboratory in Nephi for necropsy. We hope to determine if disease played a possible role in the mortality of this bird. The diagnostics laboratory is running tests to determine if the carcass tests positive for a variety of diseases including West Nile Virus.

Figure 2. Transmitter recovery site (puff of feathers in image on left) and associated mammalian track (right).

Nest Initiation and Nest Success

Of the 29 hens that were still alive at the beginning of May, 23 of them initiated nests (79%). Of the females that initiated a nest, 12 (52%) were successful (defined has hatching at least one chick). Based on evidence at predated nests, we suspect ravens (7), mammalian predators (3), and unknown causes (1) were responsible for failed nest attempts (see Fig. 3). The average number of eggs produced from successful nests was 6.6. Although we did detect some extended movements for nesting females, the majority of nests were found within the core area, identified as critical habitat by the NRCS near the main leks on Diamond Mountain. Mean distance to leks will be calculated and described in the next report. Continued efforts are underway to assess recruitment (chick survival to 50 days post hatch) and monitor brood success. We will report all reproductive efforts including observed chick survival and total recruited chicks in the next report.

Figure 3. Successful Greater Sage Grouse nest (image at top left), unsuccessful nest presumably due to ravens (image at top right), and a young chick (image at bottom)

Habitat Sampling

During the reporting period, we commenced habitat sampling at nesting, brood-rearing, and random locations. We have been taking detailed measurements of the vegetative attributes of each site including shrub canopy cover, visual obscurity, percent composition (grasses, forbs, shrubs, etc.), shrub height, and other characteristics. These measurements represent fine-scale habitat conditions and will be paired with GIS-generated attributes at progressively larger scales.

Random sites represent potential available habitat and serve as a reference for comparison with actual nesting and brood-rearing habitat.

Movements

As mentioned previously, the majority of nesting females did not travel long distances from their capture locations. We have, however, noticed increased movements in recent weeks—particularly females with unsuccessful nests. One of the radio-marked females, for example, is now in Colorado more than 10 miles from her capture location on Diamond Mountain. We will continue to monitor movements of radio-marked birds over the next several months.

Future Work

We will continue to monitor habitat use, movement patterns, and survival of radio-marked birds. Collection of micro-site habitat data will occur for nesting and brood-rearing locations as we monitor the fates of remaining broods. We anticipate additional capture and radio-marking of female sage-grouse later this summer and into the early fall period. A Ph.D. student will begin habitat modeling efforts shortly and will help with the completion of the compilation of available data (spatial locations) from around the State.

Conclusion

The project is currently up and running, and should continue to be successful in completing the outcomes described in the UDWR contract. We would like to thank Brian Maxfield, Dave Olsen, Jason Robinson, and other UDWR employees for their extensive help with this project. We would also like to thank the Diamond Mountain Grazers association and other land owners for access to their property and to Mitch Hacking and Two Dog Hunting who have allowed us to use their cabin during the summer. This has made our work more efficient and cost effective.

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Reporting Period:
July 2010 – December 2010

PROGRESS SUMMARY

This is a report of the progress and accomplishments of the Diamond Mountain Sage Grouse project from July to December of 2010. We continued to monitor and flush birds at least once a week through July and August. After August, we significantly reduced our efforts to track radio-collared birds. In September we monitored birds once from the air via a fixed-wing flight and once from the ground. We were assisted by Brian Maxfield and his technician in the late fall; they tracked radio-collared birds twice in October and twice in November. We also spent four nights trapping this fall with little success, only catching two hens. We will resume trapping next spring as soon as conditions allow. We ended the field season with five employees; it proved to be a lot of work to collect habitat data at the nest, brood and random sites. We collected data at a total of 128 sites. We set a goal to collect habitat data at all nesting, brood-rearing, and random sites by August 15th in order to minimize effects of vegetation desiccation and plant senescence. We met our goal, completing all habitat data collection by that date.

Survival

No mortalities occurred from July through October. However, we heard four new mortality signals in November. Combined with the two mortalities in May and June, to date, six of the thirty grouse collared have died (20%). During the first nine months of the mortality year, we lost fewer birds than expected. One of the birds that died in the summer was found in tact and appeared unharmed. A necropsy was performed on that bird and the results were negative for any virus, with the cause of death determined to be natural causes. The necropsy was performed by Utah State Veterinarian Clinic in Nephi, Utah.

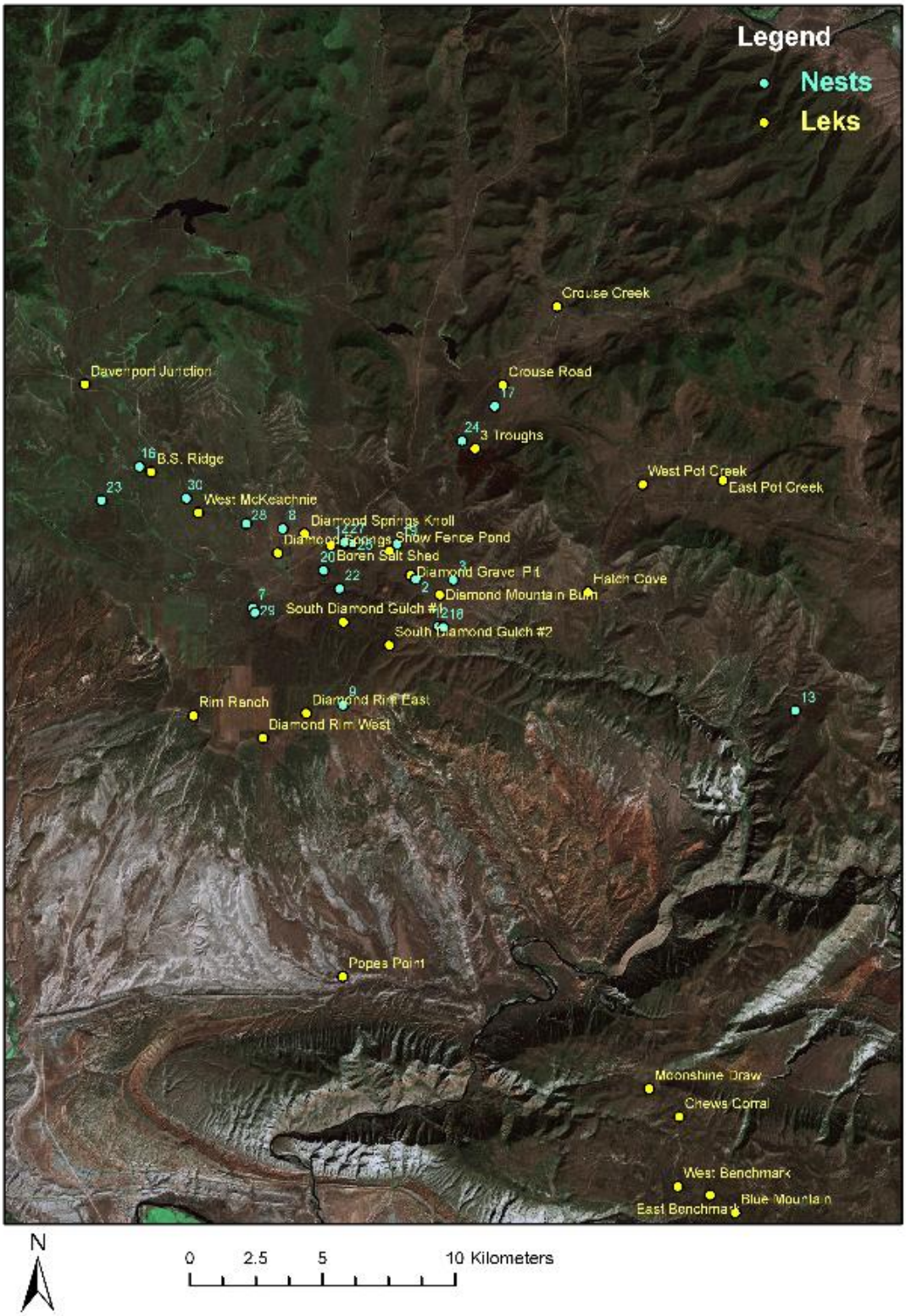
Reproduction and Chick Survival

We monitored and now report 2010 reproductive success. We assessed apparent nest initiation, apparent nest success, and apparent chick survival. Apparent nest initiation rates of radio-collared sage grouse hens in 2010 totaled 21 of 30 or 70%. Of those 21 nests, apparent nest success, defined as hatching at least one egg in the clutch, totaled 12 of 21 or 57%. Nine nests were depredated and the hens did not attempt to renest.

Of the 12 hens that had chicks hatch, we counted 78 hatched eggs at nest sites. No un-hatched or infertile eggs were observed. We counted 27 chicks that survived to 50 days post-hatch (recruitment age). In other words, apparent chick survival totaled 27 of 78 chicks or 35% survival. 35% chick survival is comparable to other studies that have used radio transmitters in Idaho (25%, Burkepile et al. 2002), Utah (41 - 61%, Dahlgren et al. 2010), Nevada/ Oregon (39%, Gregg and Crawford, 2010; 22%, Gregg et al. 2007)

Nesting Proximity to Leks

We recorded 21 nests and mapped them to calculate the average straight-line distance to the nearest lek. The average distance from all nests to the nearest lek was 1.43 km. If bird (#13), that flew almost 8.98 km to nest, were removed, the average distance moved would have been 1.05 km (Fig.1). The next longest distance traveled by a hen to nest was 2.39 km.



(Figure 1: Map of leks and nesting sites for 21 birds, May 2010.)

Habitat Sampling

During the reporting period we commenced habitat sampling at nesting, brood-rearing, and random locations. We took detailed measurements of the vegetative attributes of each site including sagebrush and shrub canopy cover, visual obscurity, percent composition of the herbaceous understory (grasses, forbs, and shrubs), shrub height, and other characteristics. These measurements represent fine-scale habitat conditions and will be paired with GIS-generated attributes at progressively larger scales. Random sites represent potential available habitat and serve as a reference for comparison with actual nesting and brood-rearing habitat.

We sampled habitat at 21 nest sites and 21 random sites. The random sites will be used for a comparison against our nest sites (Fig. 2). We also plan to use the nest site data to look at differences between depredated and successful nests. We monitored successful nesting hens with chicks for seven weeks post-hatch. We completed habitat data assessments at 43 brood-rearing and 43 random sites. We will use those sites to determine whether there were discrepancies between brood-rearing and random sites.

Fig. 2. Habitat sampling at a randomly selected site.

Movements

Summer/early fall

Hens that lost nests grouped up with other non-brooding hens and stayed in groups throughout the summer. The movements of non-brooding hens were more extensive than brooding hens. Hens with broods seemed to move away from nest areas soon after hatching and moved into areas near edges (i.e. pipelines, wetlands, grasslands). After the first movement post hatch, the brooding hens seemed to stay in the same general areas until the chicks were at recruitment (50 days old). At recruitment age we noticed brooding hens and adolescent birds moved away from the general brooding areas.

Further analysis in a GIS will provide more information about movement patterns/distances and habitat preferences for brooding and non-brood rearing hens.

Late fall/early winter

Brian Maxfield and his technicians monitored some of the birds through the fall and early winter. He documented some birds dropping off the rim of Diamond Mountain and a few birds traveling long distances into areas previously unknown to be used by grouse. These are the types of information that could be crucial in determining areas of critical concern for use by sage grouse in the area.

Future Work

We will continue to monitor grouse via flights and from the ground. If we can, we plan to trap as early in the breeding season as possible. We now have access to an ATV with tracks that may allow access earlier than before, thus being able to target females coming to the lek early, when conditions generally do not allow access. Regardless we will resume our trapping efforts in April. We want to deploy another 40 collars in April and May for a total of 70 deployed. If mortalities remain low over the winter months and we deploy another 40 collars, we will have over 60 grouse on air. We are currently looking for technicians to fill summer positions.

Conclusion

The first nine months of the project have been very productive. We were able to radio-collar 30 hens this spring. Although we were a little disappointed with the total number of hens captured in 2010, we are confident we will be able to get 40 collars out in 2011. We were able to collect habitat data at all nest (21) and random (21) sites and all of our brood-rearing (43) and random (43) sites. We have learned a lot about seasonal movements with future analyses still to come.

We have a lot of people to thank for the success this last summer. Thank you to the UDWR, especially Brain Maxfield, Dave Olsen, Jason Robinson, and other UDWR employees for their continual help and assistance. We also thank the Utah BLM for their support of the project and their assistance. We were impressed with the Diamond Mountain Grazers association and other private landowners on the Diamond Mountain Plateau for their incredible willingness to allow us access to their property. This study would not be possible without their help. We would also like to personally thank Mitch Hacking and Brad Horrocks for allowing us to stay at the Two Dog Huntin' Lodge; their contribution cannot be overstated.

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