Greater Sage-grouse Responses to Livestock Grazing in Semi-Arid Sagebrush Rangelands

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Background

Grazing by domestic livestock remains the predominant anthropogenic land-use across the sagebrush ecosystem in North America, occurring on 87% of remaining greater sage-grouse habitat. However, little research has been conducted to evaluate sage-grouse responses to grazing.

Both sage-grouse and livestock consume grasses and forbs during spring, but the question remains as to how grazing affects sage-grouse vital rates and habitat selection. Our working hypothesis is that the effects are contingent on how grazing is managed. Evaluation of this hypothesis depends on the ability to monitor phenological phases of herbaceous vegetation across large landscapes.

We are proposing to measure changes in plant phenology in response to season and livestock grazing at the scale of the pasture using the Normalized Difference Vegetation Index (NDVI; Tucker 1979). NDVI is a satellite-derived index of photosynthetic biomass, typically scaled from 0-1. It has been used to map plant phenology across climatic regimes, track avian migration, and to index forage quality for ungulates. We will access NDVI data to study differences in green-up rates on each study area relative to grazing management and annual climatic conditions. Changes in the study area NDVI will be correlated with livestock stocking rates, frequency of use, rest periods, temperature, precipitation, sage-grouse nest initiation rates, nest hatch dates, brood movements, and brood success rates. We will then evaluate the relationship between observed differences in NDVI on each study area and sage-grouse vital rates and daily/seasonal movements.

The purpose of this study is to evaluate the response of sage-grouse broods to livestock grazing, and then validates models of sagebrush treatment areas on Deseret Land and Livestock to determine resource selection of sage-grouse broods. While research reported in peer-reviewed literature demonstrates the potential for negative impacts of sagebrush reduction treatments, to increase livestock forage, on sage-grouse habitat, few studies have linked livestock grazing at the landscape level to vital rates for ground-nesting tetraonids such as the sage-grouse. If we can parameterize sage-grouse vital rates under different grazing scenarios, this may have implications for grazing policy west-wide.

Study Area

The study area is located in Rich County, Utah, in the western United States. Rich County is located in northeastern Utah and constitutes the southwestern portion of the Wyoming Basin

Sage-grouse Management Zone II. The research will be conducted on 2 study sites within Rich County. The first study site is Deseret Land and Livestock (DLL), a 200,000 acre privately owned ranch comprised of roughly 160,000 acres of private lands and 40,000 acres federal BLM grazing allotments located in the lower elevations. The DLL study area is managed as a cohesive unit and land managers there have used rotational prescribed grazing practices since 1979. The DLL constitutes a landscape allotment. The second study area known as the Three Creek Allotment (3C) is a 146,000 acre collection of 29 individual BLM and USFS grazing allotments and private lands that are generally managed under season-long grazing practices.

Technicians

For the 2019 field season, we hired four technicians to help with the field work. They are Elizabeth Eney from Kansas, Olivia Wilkes from Alabama, Stewart Sloan from Louisiana, and Noah Cable from Ohio. Though none of them have previously worked with sage-grouse they are all competent field technicians and willing in the field. Elizabeth and Olivia are covering the Three Creeks study area while Stewart and Noah are covering birds on Deseret Land and Livestock. I (Hailey) am covering birds that leave the study areas but stay relatively close and will help the technicians as needed with finding birds or doing vegetation surveys.

All technicians have been made aware of land use rules and understand that we are guests in many of the areas we traverse. The first two days the technicians arrive they are trained on telemetry use and practice by locating radio-collars previously hidden in bushes. By doing this they become familiar with the techniques used to locate sage-grouse and the best way to minimize flushing off the nest. With our first nests hatching this past week everyone has been trained on vegetation surveys.

The second day of training is spent teaching operational protocol for trucks and ATV's. Safety is our utmost priority as well as proper use and maintenance of field vehicles. This safety training includes how to load and unload an ATV from the back of a truck safely, hill ascending and descending, rollover and approach angles, maneuverability and proper gear selection and speed.

Equipment

For the 2019 field season, nine recovered GPS transmitters were refurbished and 50 VHF collars were purchased. As per protocol any transmitters that are recovered this season will be sent back to the manufacturer to be refurbished before being re-deployed the next season. These transmitters are then placed on areas where the population needs to be augmented.

Trapping

The 2019 trapping season threw us a hard curve ball with residual snow and cold temperatures preventing melting. Our trapping season began April 17 and ran through April 27th. Just ten days! We worked tirelessly to catch as many birds as possible. In those ten days we trapped and radio-marked 41 female sage-grouse. Trapping ended abruptly on the 27th as the leks were empty of almost all birds, where attendance had been high just days before. We believe with the late snow pack that breeding was delayed and we were fortunate to catch peak lek attendance before

dispersal and nesting started. With all combined birds from 2018-2019 we have radio-marked 51 females between the two study areas.

Nesting and Brooding

The second curve ball of the season has been an extremely wet spring. This made monitoring the radio-marked birds almost impossible. We have spent weeks searching for birds that are missing. Given their fast dispersal from the leks and continuous inclement weather, we had been unable to relocate 20 radio-marked birds. However, two recent (last one on June 13) radio-telemetry flights provide courtesy of the Utah Division of Wildlife Resources has reduced the missing birds to 5 (2 on DLL and 3 on 3C).

Prior to the flights there were 9 (7 on 3C, 2 on DLL) females that are currently nesting with 5 (3 on 3C, 2 on DLL) additional hens that have already successfully hatched and are brooding. We have had one predated nest on DLL.

Mortality

This season we have had two mortalities; 1 GPS and 1VHF both deployed this year. We have recovered several other radio-transmitters from females that died over the winter as well.

Grouse Movements

We have seen some interesting movement with radio-marked sage-grouse this season. Marked birds on 3C have stayed in the lower areas for nesting and their general movements while marked birds on DLL have taken to the hills on the west side. Many of the birds we are monitoring are high up in elevation. Even though temperatures are still cool, vegetation is just starting to grow and snow drifts are still plentiful. Most of these birds aren't nesting and are often found with other sage-grouse. An interesting year for sure.

One radio-marked female (Figure 1) trapped and marked on DLL has moved off of the study area crossed through the 3C area and is now making smaller more local movements north of the Sage Junction.

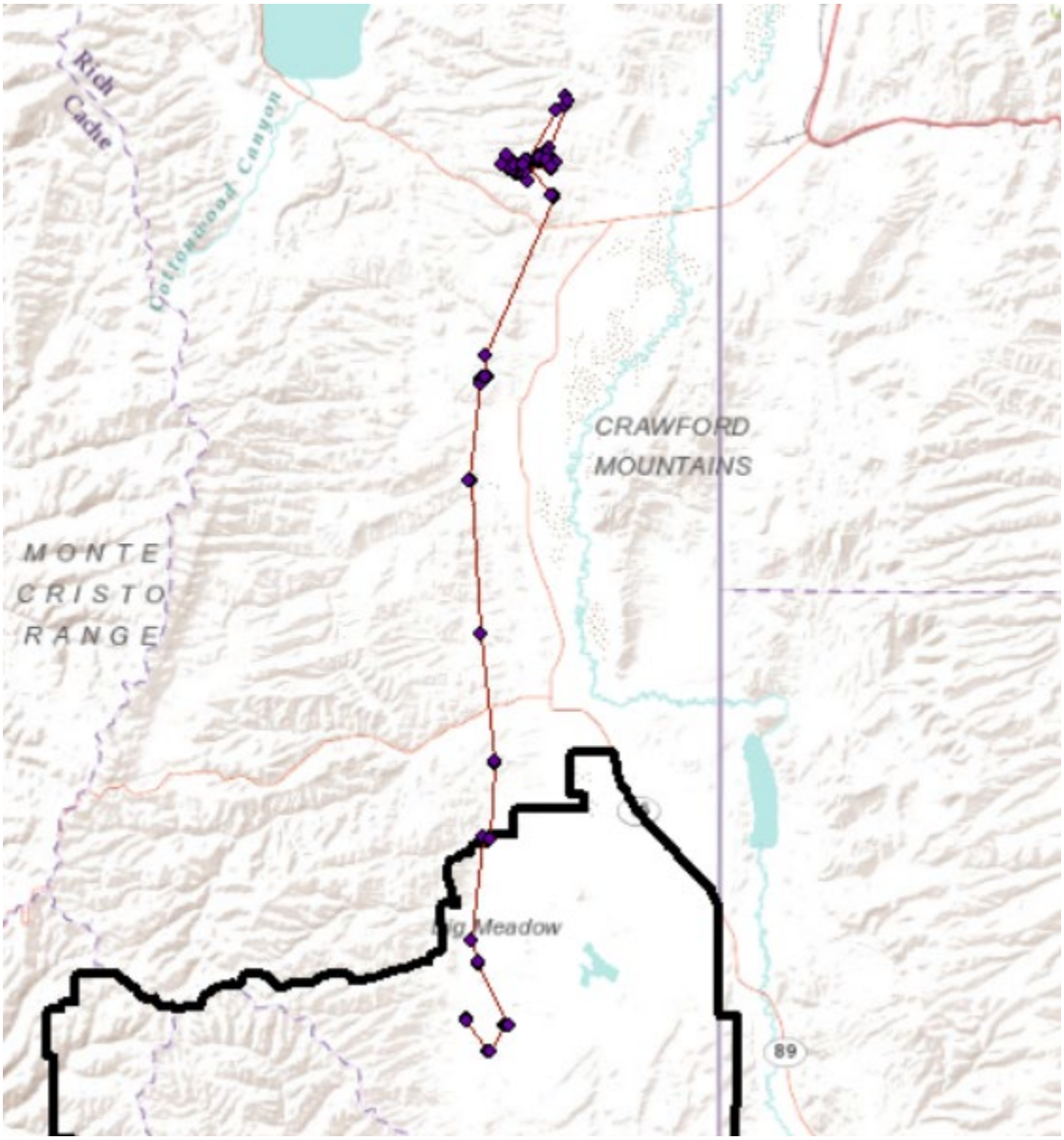

Figure 1: Female sage-grouse trapped and GPS collared April 27, 2019 on Deseret Land and Livestock. She has moved roughly 30 miles to the north across Highway 30.

Rich County Collaborators

We are extremely appreciative of the continued investment in this research. I have really enjoyed getting to know many of you and am very grateful for the chance I get to work with such dedicated individuals.

Please contact us if you have any questions concerning the work we are conducting, or anything you are observing that you think is interesting, we are always willing to come check things out.