David Little Livestock
Range Management Endowment
AT THE UNIVERSITY OF IDAHO

2020 Project Progress Report:
Mesic Meadow Habitat Responses to Variation in Grazing Management Practices: Balancing the Habitat Requirements of Greater Sage-Grouse with Livestock Production

PERSONNEL:
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PRELIMINARY RESULTS for 2020:

BACKGROUND:

In the arid Western United States, mesic meadow systems serve as vital sources of water and forage for ranching operations and wildlife species. Because mesic areas comprise a small portion of the landscape (Donnelly et al. 2016), management influencing these systems has become a focal point among diverse stakeholders, including the livestock industry, land management agencies, and conservationists. Greater sage-grouse (*Centrocercus urophasianus*), an Idaho Species of Greatest Conservation Need (Idaho Department of Fish and Game 2017), rely upon dietary forbs that occur in mesic meadows during late brood-rearing stages (Schreiber et al. 2015). Because late brood-rearing occurs during summer months (Boyd et al. 2014), sage-grouse often co-occur in mesic meadows with grazing livestock. Given the broad importance of mesic systems, identifying management techniques that provide grazing opportunity while supporting the habitat needs of wildlife is crucial. To accommodate both sage-grouse and livestock needs, our project will address the viability and effects of multiple grazing strategies on mesic meadows in south-central Idaho.

Vegetation communities have been documented to respond to grazing when implemented as a management tool (Boyd et al. 2014; Rosenthal et al. 2012). Additionally, livestock grazing has been shown to be both compatible and mutually beneficial for coexisting livestock and wildlife, even when similar resources are required (Young et al. 2018). Understanding how livestock grazing influences wildlife habitat within mesic meadows is critical to understanding how livestock may influence sage-grouse habitat, and calls for research to evaluate the intricacies of this relationship have been put forward (Pennington et al. 2016). To evaluate grazing effects on sage-grouse habitat, we evaluated the influences of grazing timing and intensity on habitat characteristics such as foliar and canopy cover, abundance of preferred forbs, and vegetation structure. To determine the viability of grazing strategies for producers, we tracked the gains in weight of livestock, determined herbaceous biomass production, and analyzed forage samples for nutrient quality. This work will address the needs of the livestock industry, inform citizens about the practical and sustainable use of grazing as a management tool, and advance the scientific community's understanding of ecological processes and responses to livestock grazing in mesic meadow habitats.

HYPOTHESIS or OBJECTIVES:

Our hypotheses and objectives were designed to evaluate vegetation responses of experimental pastures within mesic meadows to multiple short-duration and continuous grazing strategies. For this study, short-duration gazing took place for only a portion of the growing season (<1 month). Continuous grazing took place for the majority of the growing season (>2.5 months).

H_1: Soil moisture will vary as a function of grazing management in mesic meadows because stocking rates and timing of grazing will affect variation in soil compaction and litter accumulation. We predict that soil moisture values will differ

between short-duration grazing trials with different utilization rates, and short-duration will differ from continuous grazing.
H_2: Plant community composition is a function of grazing treatment because differences in timing and intensity of grazing, as well as the interaction between these variables, will disproportionately reduce grass cover, creating variation in the establishment and growth of other functional groups; therefore, plant community composition will be unique across short-duration and continuous grazing.
H_3: The performance and growth of yearling cattle will not be affected in short-duration grazing trials because individual diets will be similar due to limited amount of time for individuals to preferentially select the most palatable vegetation; therefore, we predict that yearling cattle performance and growth measurements will be similar among all short-duration grazing treatments.

PROCEDURES:

This study took place at Rinker Rock Creek Ranch (RRCR), the Wood River Ranch (WRR), and the Crichton Creek LTD partnership (CCLP) in Blaine and Camas Counties, Idaho. The RRCR is a biological field station operated by the University of Idaho. The WRR and CCLP are privately owned operations where the dominant land use is cattle grazing. Short-duration grazing took place May-August, and continuous grazing took place July-September in 2019 and 2020. The CCLP was not sampled in 2020.

We established 15 pastures (approximately 1.7 hectares each) for short-duration grazing at RRCR. We used yearling heifers from the University of Idaho's Nancy M. Cummings Research, Extension, and Education Center to stock pastures in 2019. Yearling heifers supplied by Prescott Cattle were used to stock pastures in 2020. Heifers grazed six pastures in June (early season; 16 days) and six pastures in August (late-season; 16 days) at moderate (30-40%) and high (70-80%) relative utilization levels (n = 3 pastures per treatment). Three pastures provided un-grazed controls. Grazing trials began at roughly (< 4 days) the same time during both years of the experiment with a slight variation to standardize grazing timing with plant phenology between years. Three previously established wet meadow pastures, one at each study site, were included in our sampling to evaluate the effects of continuous grazing. These pastures encompassed both mesic meadows and adjacent uplands. Continuous grazing pastures were stocked with cow-calf pairs in the first week of July. Cow-calf pairs grazed continuously to achieve an overall (60%) utilization.

Measurements on plant community and heifer performance occurred during pre-grazing and post-grazing sampling periods (< 7 days). Plant community measurements were also evaluated in September to assess vegetation regrowth in short-duration grazing pastures. Sampling on continuous grazing pastures took place before grazing (< 7 days) and during the regrowth period. Measurements of plant community composition, foliar cover, the average height of vegetation by species, biomass, and soil moisture occurred along vegetation transects. Transect (n = 4 per pasture; n = 5 at WRR) locations were randomly placed within stratified plant community cover types in each pasture. We used Vegetation biomass collected before grazing to determine heifer stocking requirements to achieve desired utilization. A modified utilization gauge was employed during and after grazing to ensure target utilization rates were achieved (Aldon and Francis 1984, Sprinkle and Arispe 2017).

ACCOMPLISHMENTS or RESULTS:

In experimental short-duration grazing pastures, grazing took place during June 4-20 and July 30-August 15 in 2019. In 2020, short-duration pasture grazing occurred from June 2-18 and July 28-August 13. Continuous grazing pastures were stocked during the first week of July and lasted into September during 2019 and 2020. Biomass responses to grazing varied by treatment and by year (Figure 1). Soil moisture values declined during sampling seasons and tended to be higher in 2019 than in 2020 (Figure 2). Sage-grouse preferred forb cover increased in pastures treated with early-season high-intensity, early-season moderate-intensity, and late-season high-intensity grazing from 2019 to 2020 (Figure 3). Sage-grouse preferred forb cover decreased in pastures treated with continuous, late-season moderate-intensity, or no (control) grazing from 2019 to 2020 (Figure 3). The average daily gains of heifers varied by treatment and by year in 2019 and 2020 (Figure 4). Current results are preliminary and subject to change.

PUBLICATIONS or OUTPUTS:

See table to find a list of outputs from this project (Table 1).

LITERATURE CITED:

Aldon, E. F., and R. E. Francis. 1984. A modified utilization gauge for western range grasses. USDA-USFS, Rocky Mountain Forest and Range Experiment Station, Research Note RM-438, Ft. Collins, CO. <https://www.fs.fed.us/rm/pubs_rm/rm_rn438.pdf>. Accessed 28 Oct 2020.

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Donnelly, J. P., D. E. Naugle, C. A. Hagen, and J. D. Maestas. 2016. Public lands and private waters : scarce mesic resources structure land tenure and sage- grouse distributions. Ecosphere 7:1–15.

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Rosenthal, G., J. Schrautzer, and C. Eichberg. 2012. Low-intensity grazing with domestic herbivores: A tool for maintaining and restoring plant diversity in temperate Europe. Tuexenia 32:167–205.

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Sprinkle, J. (Author), and S. A. (Director) Arispe. 2017. Developing Your Own Utilization Curve. [4:56 min video; Cattle Producer's Handbook]. Ontario, Oregon. Oregon State University Extension Service. <https://media.oregonstate.edu/media/t/0_25gnl4to>. Accessed 28 Oct 2020.

Young, T. P., L. M. Porensky, C. Riginos, K. E. Veblen, W. O. Odadi, D. M. Kimuyu, G. K. Charles, and H. S. Young. 2018. Relationships Between Cattle and Biodiversity in Multiuse Landscape Revealed by Kenya Long-Term Exclosure Experiment. Rangeland Ecology & Management 281–291.

Table 1. List of publications and outputs from research.

Publications and Outputs:
Johnson, T.N., K. Randall, and M. Ellison. 2020. Mesic meadow response to grazing utilization in south-central Idaho. Annual Meeting of the Society for Range Management, Idaho Chapter, Virtual Meeting.
"Grazing wet meadows at Rinker Rock Creek Ranch" by Heather Smith Thomas, *Ag Proud Idaho* Aug 2020 Vol. 2 (8): 23-24.
Randall, K.J., Ellison, M.J., and T.N. Johnson. 2020. Mesic meadow habitat responses to variation in grazing management: balancing sage-grouse habitat with livestock production. Idaho Chapter of the Wildlife Society Annual Meeting. Moscow, Idaho.
Randall, K.J., Ellison, M.J., and T.N. Johnson. 2020. Mesic meadow habitat responses to variation in grazing management: balancing sage-grouse habitat with livestock production. Society for Range Management National Meeting. Denver, Colorado.
Randall, K.J., Ellison, M.J., and T.N. Johnson. 2020. Mesic meadow habitat responses to variation in grazing management: balancing sage-grouse habitat with livestock production. Annual Rinker Rock Creek Ranch Research Webinar, Virtual Meeting.
Randall, K.J., Ellison, M.J., and T.N. Johnson. 2019. Mesic meadow habitat responses to variation in grazing management: balancing sage-grouse habitat with livestock production. Idaho Chapter of the Wildlife Society Annual Meeting. Boise, Idaho.
Randall, K.J., Ellison, M.J., and T.N. Johnson. 2019. Mesic meadow habitat responses to variation in grazing management: balancing sage-grouse habitat with livestock production. Annual Rinker Rock Creek Ranch Research Webinar, Virtual Meeting.

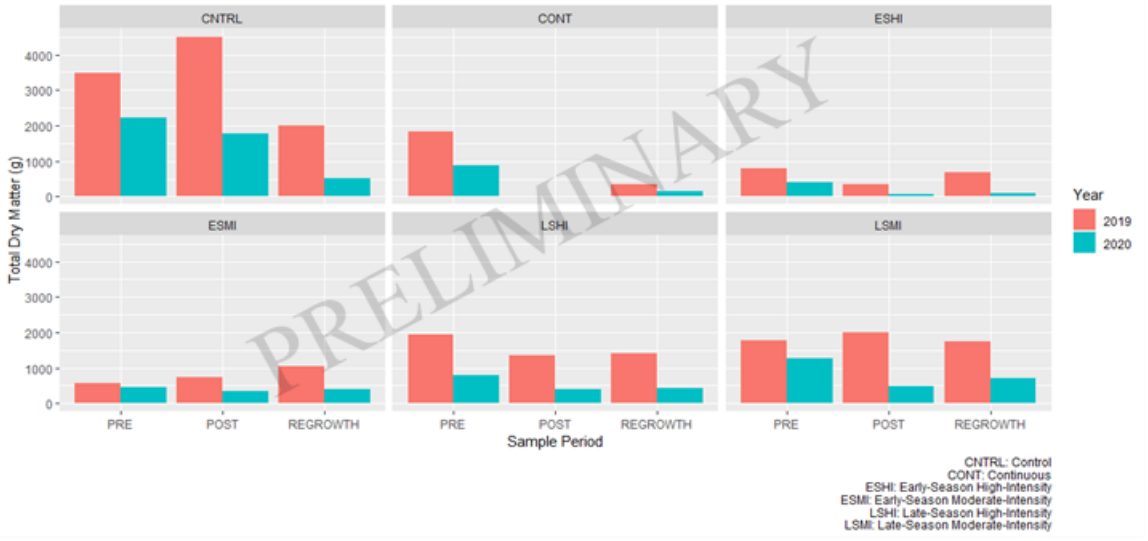

Figure 1. Total dry matter (g) within each grazing treatment from pre-grazing, post-grazing, and during the regrowth sampling period at Rock Creek Ranch and the Wood River Ranch in Blaine County, Idaho, and the Crichton Creek LTD Partnership in Camas County, Idaho in 2019 and 2020. Data is an average of the three pastures under each grazing management strategy.

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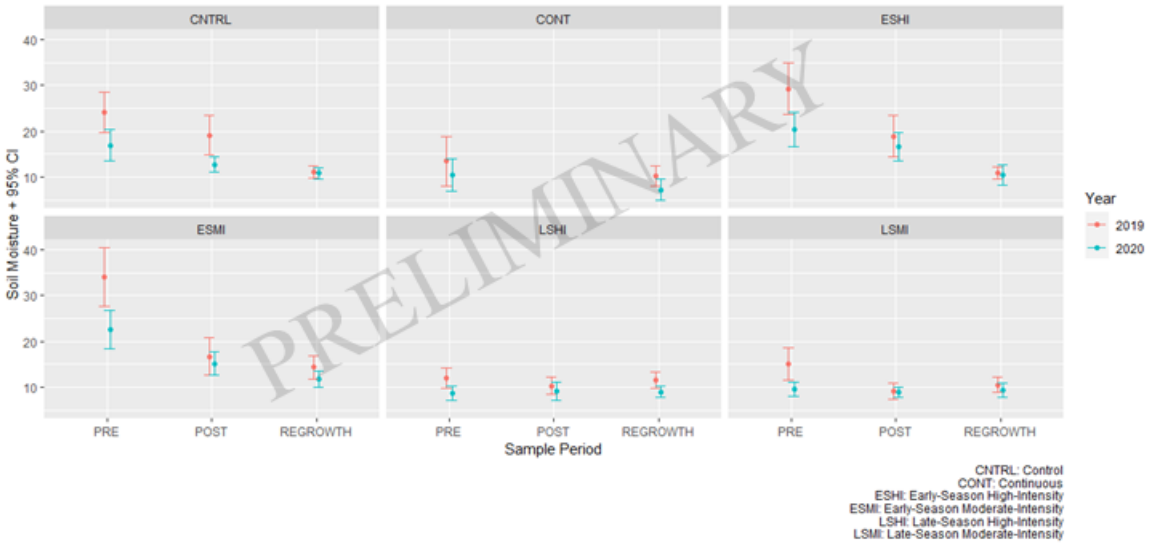

Figure 2. Soil moisture (± 95% CI) within each grazing treatment from pre-grazing, post-grazing, and during the regrowth sampling period at Rock Creek Ranch and the Wood River Ranch in Blaine County, Idaho, and the Crichton Creek LTD Partnership in Camas County, Idaho in 2019 and 2020. Data is an average of the three pastures under each grazing management strategy.

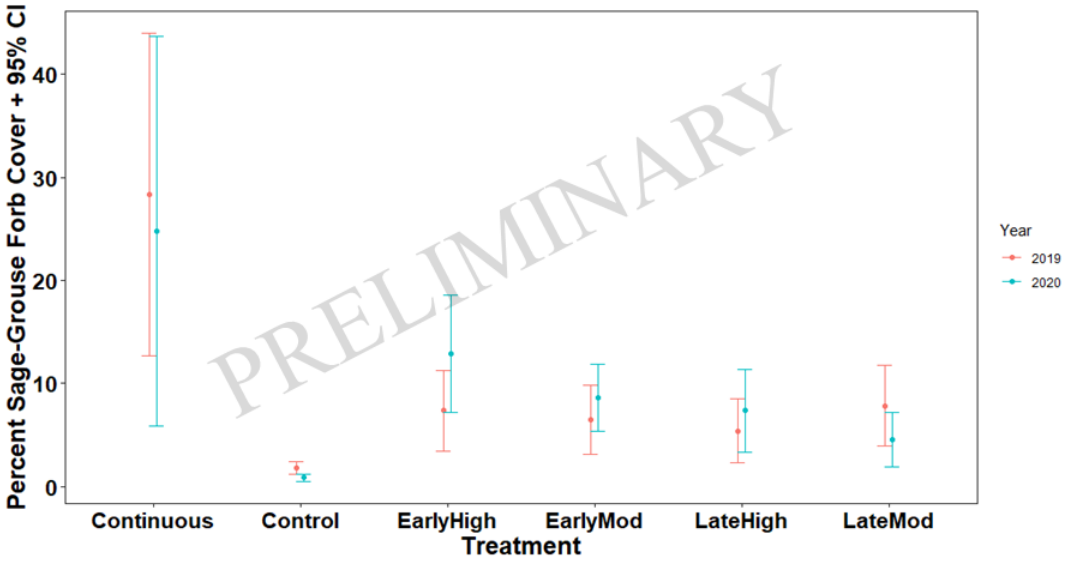

Figure 3. Percent foliar cover (± 95% CI) of sage-grouse preferred forbs within each grazing treatment at Rock Creek Ranch and the Wood River Ranch in Blaine County, Idaho, and the Crichton Creek LTD Partnership in Camas County, Idaho in 2019 and 2020. Data is an average of three pastures under each grazing strategy throughout the sampling periods.

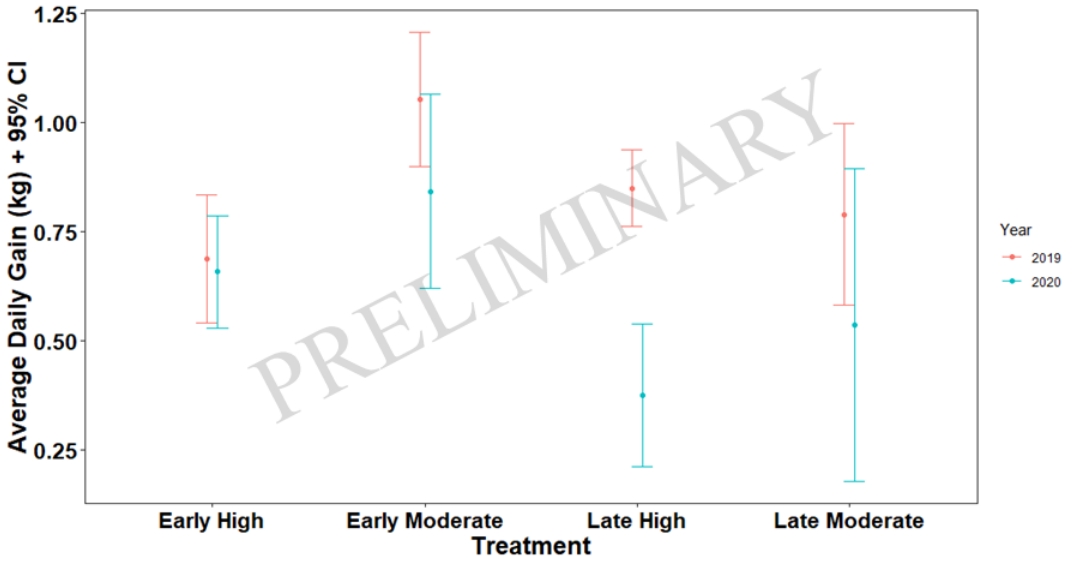

Figure 4. Average daily gains (± 95% CI) in kilograms of yearling heifers within short-duration grazing trials at Rock Creek Ranch and the Wood River Ranch in Blaine County, Idaho, and the Crichton Creek LTD Partnership in Camas County, Idaho in 2019 and 2020. Data are averaged across all heifers subjected to each specific grazing trial.