FIELD DATA COLLECTION ON A COLLABORATIVE VIRTUAL FENCE PROJECT EAGLE COUNTY

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PROJECT INTRODUCTION

Virtual fencing, or Vence, uses auditory signals to warn cattle that they are close to the virtual barrier. If they continue to advance an electric shock warns them to turn around. The fencing lines are manually created from the landowner and can be adjusted as needed. The collars have GPS units in them that are linked to base stations that are located to cover the largest amount of spatial range. The Eagle County Conservation district partnered with the NRCS and CSU Extension to write a grant to implement Vence technology among 7 producers in Eagle County.

This project is studying the claims of virtual fencing in a rangeland application. Virtual fencing has been studied in experimental forms, but this is one of the first attempts to apply the technology in mountainous terrain. The rugged terrain of Colorado makes this study important to establish the physical limitations of virtual fencing.

The grant's goals were to assess the benefits of virtual fencing on rangeland, use the information collected to create effective Vence implementation guidelines and propose amendments to NRCS standards of grazing conservation practices. A protocol was created to collect data on the environment to analyze how the habitat has changed while using virtual fencing on the rangeland.

INTERNSHIP GOALS

As an intern of the study my personal goals were:
- Become proficient in defining how virtual fencing works, as it is new technology
- Learn how to effectively collect data through a protocol, obtaining accurate and usable results
- Practice networking with landowners, so they feel comfortable with our data collection on lands they manage.

HOW DOES THIS APPLY TO YOUR EDUCATION

Learning the reason for each collection method in the protocol helped me get a picture of what factors go into understanding an ecosystem. Being able to capture the background of an ecosystem helps us determine its quality. I got a visual experience of different rangeland habitats and I got to personally see how the quality of the habitat effected its range potential.

I gained hands-on valuable experience with field data collection. Field data collection is an ideal career of mine. To be able to obtain so much experience in this fantastic project equipped me with the tools to continue this line of work in the future.

WHAT YOU DID

I collected data with two field techs hired from the Eagle County Conservation District (ECCD). Random points were assigned on BLM allotments that used virtual fencing based on distance from water and soil maps. The protocol was adapted to our needs based on NRCS's National Resource Inventory Protocol. Below is the protocol we would follow at each plot:

Cover using Line Point Intercept – At each meter along two 50m transects we dropped a pin and recorded the functional group of each layer of vegetation it intercepted. At every 5m we would record the height of the tallest vegetation within 1 ft diameter.

Soil and Site Verification - We would determine the soil texture, color, and rock fragments at predetermined depths, digging to 1m down. This was to be able to verify the ecological site and reduce noise in analysis. We also recorded the slope, slope shape, and dominant plant species.

Infiltration - Using a large metal ring. We recorded the permeability of the soil by noting the time water would take to fully absorb. We would repeat to get a picture of what infiltration was like before and after rainfall.

Utilization using Key Species – At 50 points along a transect, we would use a pre-determined category for how much the grass had been grazed by an herbivore, to derive an average per plot. Too much grazing and the grass is unable to grow back. Too little grazing and the allotment is not being utilized to it's full rangeland potential.

Biomass - At random points along the transect we clipped all the herbaceous vegetation within a 4.8 square foot circular plot. We recorded the utilization and toxic percentage by volume. This is to determine the plot's production potential.

Dung - Using a 1.5m belt transect and a 1m quadrant we collected the frequency and density of different herbivore dung; cow, horse, elk, and sheep, deer and pronghorn. This helps us estimate which kinds of herbivores are in the plot and the quantity.

Plant Census – We would record the species of plants within the plot to find its diversity.

Figure 1 (left) Cover using LPI. *Figure 2* (right) Dung Quadrant

WHAT YOU LEARNED

I learned that to remove human bias in data collection we must place heavy importance in randomness. To effectively remove bias the protocol must be fine-tuned so every plot can be recorded in the same manner. It was also helpful to learn the reasoning behind the data collected, because it made the time and effort spent feel worth it.

I experienced how CSU Extension uses the knowledge and materials from the university and cultivates healthy communities throughout Colorado. The Eagle County extension encourages the community to become stewards of the environment through informed decisions on land management.

The Colorado Section of the Society for Range Management and ECCD held a Field Day at the Luark Ranch to demonstrate conservation practices on rangeland. There I learned one of the most valuable lessons from this internship; how important a stable ecosystem is for ranchers. Ranchers' livelihoods rely on the ecosystem and any imbalances from climate change impact them significantly. Ranchers also have a clear sense of how their land is changing, so hearing their opinion on how to create solutions is critical to creating a resilient ecosystem.

Figure 3 (left) hole for soil verification. *Figure 4* (right) biomass.

NEXT STEPS

As this was the first year of a three-year project, the project will continue to collect vegetation data and the collar's GPS coordinates for the next two grazing seasons.

After the three years, the data will be compared to controls to determine if virtual fencing is effective at containment and vegetation improvement. That will be used to create Vence implementation guidelines and adjust NRCS standards of grazing conservation.

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