Using Global Positioning System Collars To Assess the Impact of Livestock Grazing on the Greater Sage-Grouse

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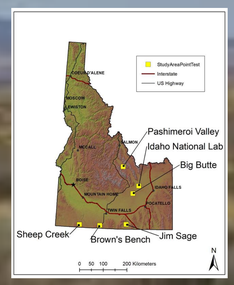
Background

- Domestic livestock grazing is one of the most common management practices employed on rangelands in the western United States
- The impacts of this practice on native wildlife species like the Greater Sage-Grouse (*Centrocercus urophasianus*) are not well understood
- Current estimations of livestock use rely largely upon infield measurements which can be time consuming, expensive, and subject to human error
- Estimates of utilization from GPS sensors have the potential to augment infield measurements by providing a wider spatial and temporal scale in an efficient, accurate, and cost-effective manner

Objective: Our goal is to use the locations taken from the GPS collars to develop an estimate of grazing intensity. We will then compare our estimates of grazing with known sage grouse nest locations and fates to determine if there is a correlation between the two. Our estimate of intensity assumes use based on occurrence. This estimate includes all types of domestic livestock activity (including walking, grazing, loafing) as each activity has the potential to alter the landscape in some way and, therefore, potentially impact sage grouse demographics



Study Areas

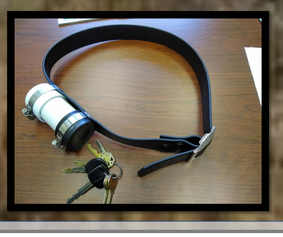
- In 2019, GPS collars were distributed between two pastures at the Pahsimeroi Valley field site associated with the ongoing Idaho Grouse and Grazing project
- In 2020, GPS collars will be deployed at the 2019 site as well as several new Idaho Grouse and Grazing sites in Central and Southern Idaho

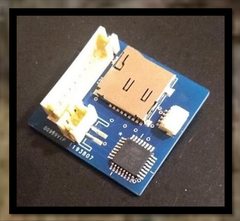
Methods

- Low-cost collars (Karl et al., 2019) take a location at 10-minute intervals and store the data on an internal SD card for retrieval at the end of the grazing period
- Cropped a 30x30m raster to the extent of the pasture, overlaid the collar locations, and summed and relativized the number of fixes occurring in each cell
- We then randomly dropped a single collar and all its associated points, summed and relativized all points in the new raster, and subtracted the relativized frequencies in each cell from the original raster to generate a percent difference
- Sage grouse nest locations will be plotted over our heat maps of estimated grazing intensity to determine if there is any correlation between grazing intensity and sage grouse nest site selection and fate

Preliminary Results

- Initial results suggest that the greater the proportion of collared animals in a herd, the more information you will have to assess the herd's activity as a whole
- This means that each additional GPS collar is useful in providing information about livestock distribution and generating an estimate of grazing intensity
- The proportion of collars necessary to obtain an accurate assessment of the entire herd's activity is dependent upon the size of the pasture
- Smaller pastures require fewer collars
- Collaring only a small percentage of a herd could provide insufficient information potentially leading to inaccurate or incomplete conclusions





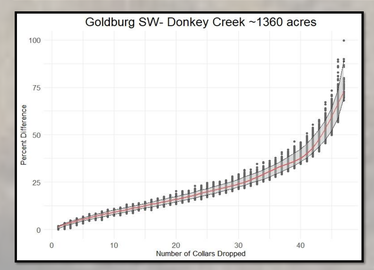
Collar Photos: Jason Karl
Background Photo: the Sage Grouse Initiative

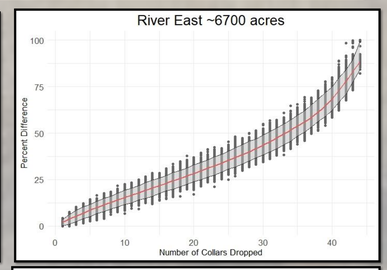
Percent Difference is better described as the sum of the absolute relativized differences between the complete raster containing points from all collars and each subsequent "dropped collar" raster

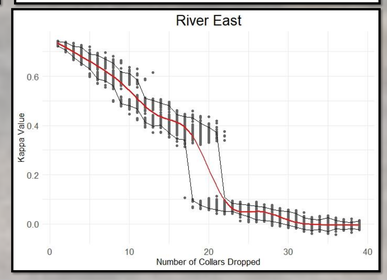
The Kappa method was conducted to determine if the results were congruent with those obtained from the percent difference method. Both results suggest that a greater proportion of collared individuals is important getting the complete picture, particularly in larger pastures

How many collars do we need?

Two different approaches to answering that question







What are the implications for Sage Grouse?

The loss of information as a result of fewer collars could lead land managers to miss patterns or incorrectly identify areas of use, the consequence of this being that we could make incorrect or incomplete conclusions about the impact of livestock grazing on the Greater Sage Grouse