What is the optimal method for tracking large animals in the wild?

Background

Wildlife tracking is an increasingly important avenue for improvement, especially with the decline of many large animal species in recent decades. Scientists use a variety of methods like UAV tracking, GPS tracking, infrared, and VHF radio to get an idea of the populations of certain species. “Optimal” method describes the strategy that exhibits the highest accuracy, least impact on wildlife, and best cost-benefit for organizations. We will be focusing on three of these methods: UAV tracking, GPS tracking, and VHF radio. UAV tracking involves sending unmanned aerial craft to collect photos and data over a large swath of land. They also utilize tags which ping the craft when it is detected. GPS involves attaching items like collars to animals which can transmit and send data to a remote scientist. VHF is similar to GPS in terms of tagging animals and relies on a scientist with radio equipment to successfully detect them.

Objectives and Hypothesis

Objectives

- Are large animals impacted by these methods?
- Which method is the most accurate for tracking position and movement?
- How is the impact, accuracy, and cost balanced for each tracking strategy?

Hypothesis

- The UAV tracking method will yield the most optimal balance of animal impact, cost, and accuracy.

Methods

This study will occur in the Great Plains region of the Midwest to analyze buffalo populations with each of the three methods. An 10x10 mi plot frequented during herd migration will be selected and data will be gathered over a three-day period at this location. A partnership with local biologists will be established in order to utilize each method effectively.

Each method will be analyzed similarly. VHF will be analyzed by tracking each tagged buffalo’s location three times each day for three hours (1 ping each hour per 3 consecutive hours). This data will be recorded and compared with the true location data by scientists near the tagged animals. GPS is a more continuous process and the animal's path/location will be recorded and tracked for a three-hour period each day. Buffalo location will simultaneously be verified by individuals at the site. UAV will be conducted utilizing an aerial craft capable of detecting tags on the surface. This will be conducted at the same frequency as the VHF method. The location data and buffalo movement/positions will be compared with the true data from scientists nearby the animals. We will also note any behavioral oddities as a result of the use of each method.

Analysis

Analysis of this data will involve comparing location data from each three methods with scientists on sight simultaneously gathering the exact positions of the buffalo. We will analyze the differences between true movement and method-calculated movement in order to acquire a percentage difference between the data sets. This procedure will give us a solid comparison of the accuracy of each method and its best usage. Concerning behaviors and known negatives of each method will be weighed against the accuracy and financial burden of each tracking strategy.

Image 1. American Bison receiving a standard ear tag by a wildlife researcher.

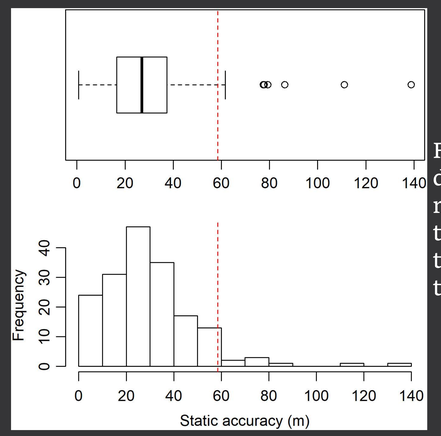

Figure 2. Histogram and boxplot describing the accuracy of VHF radio identification between two tagged locations when compared to known position of VHF radio tags (Roberts *et al.,* 2020)

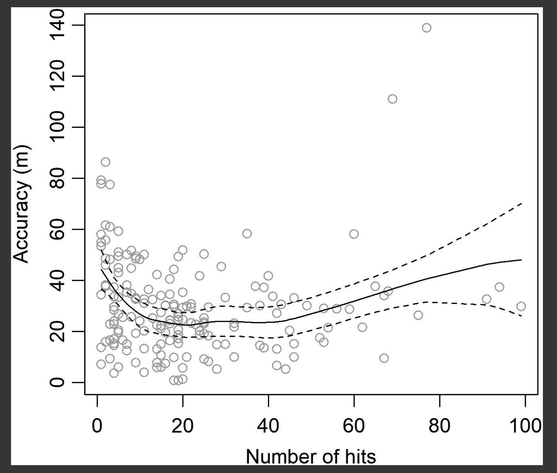

Figure 3. Number of pings compared to accuracy of UAV scanner. Location is calculated from coordinates sent from UAV to ground and known coordinates of tags. Trendline indicates comparison between accuracy and number of pings. (Roberts *et al.,* 2020)

References

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