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Analyzing Interactions among Migratory Elk and Semi-permeable Fences amongst a Highly Fragmented Landscape on the Blackfeet Reservation

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ABSTRACT

Large scale fences pose a threat to ungulate movement on the Blackfeet Reservation. Since the beginning of the last decade, the Blackfeet Reservation has experienced intense habitat fragmentation in the northern regions of the reservation, particularly in prime elk habitat that is believed to be along a migration corridor. One source of fragmentation has been the erection of a semi-permeable fence associated with a large bison ranch. The purpose of this study was to preliminarily assess potential interactions of elk (*Cervus canadensis*) and the semi-permeable bison fence as a precursor for further study. I worked in collaboration with the Blackfeet Fish and Game Department and the University of Montana, who will be initiating a larger elk migration study in the coming year. A small network of six trail cameras was deployed along the bison fence on an adjacent landowner's property at the eastern most edge of the bison ranch for a total of two months (January to March). Using information from the landowner, four locations were identified that were believed to be crossing points or pinch points for camera placement. Based on an initial analysis of trail camera images, there were no recorded interactions between elk and the fence: however, there was an observed interaction between the fence, white-tailed deer (*Odocoileus virginianus*) and many coyotes (*Canis latrans*). Elk frequently move in large groups and are not evenly distributed across a landscape. My findings suggest a larger camera array than initially anticipated will be needed to adequately assess elk-fence interactions. I also recommend that camera settings be adjusted strategically to allow for the best possible documentation of behavior.

Keywords: fragmentation, migration, elk, *Cervus canadensis*, crossing points, pinch points.

Introduction

Since the start of the late 1800s when the United States began mass producing barbed wire, the installment of fences across America had grown exponentially, exceeding the networks of roads, in order to define boundaries, reduce animal-vehicle collisions and control livestock (Jones 2014). The fences have accelerated one of the biggest problems in conservation: habitat loss and fragmentation. The barriers that we have created with our implementation of fences have dramatically changed how wildlife interacts with the environment. "Global loss of vagility alters a key ecological trail of animals that affects not only population persistence but also ecosystem processes such as predator-prey interactions, nutrient cycling, and disease transmission" (Tucker at al. 2018). Fences, both exclusionary and permeable, effect wildlife through the impacts on ecological processes, direct and indirect mortality, creating barriers that disrupt movement patterns through fragmentation, obstacles to resources and the alteration of responses to changing conditions (Trouwborst et al. 2016, Jones 2014, Jakes et al. 2018, Burkholder et al 2018).

The impacts are especially detrimental to large carnivores and herbivores, especially those who migrate (Trouwborst et al. 2016). In fact, these amazing long-distance movements are in danger as habitat fragmentation is the leading cause of the disappearance of long-distance movements by ungulates, among countless species (Ito et al. 2013, Jones 2014). One of the main reasons migratory species are so affected is that the fences block seasonal movements, i.e., migration. As such, the presence of fences amplifies the negative effects of fences on migratory ungulates during the winter months when populations begin to migrate to an area that has enough forage availability to survive through the winter.

In the Intermountain West, ungulate species like elk (Cervus canadensis) and deer (Odocoileus virginianus and Odocoileus hemionus) are known to seasonally migrate between summer and winter ranges to access forage to successfully breed and recruit young (Sawyer et al. 2009, White et al. 2010). In this Intermountain West region lies the Blackfeet Reservation. One of the biggest problems the Blackfeet are facing is the fragmentation of their land by private entities, which is particularly devastating for many ungulate species. In the northern regions of the reservation, nearly 30,000 acres of prime elk habitat is encompassed in fences. This fence is constructed from woven wire and metal posts to form a 10- to 6-foot fence, which

Burkholder et al. 2018 categorizes as a “complete physical obstruction to large wildlife, such as deer and elk…” Here, the tribe is seeing increases in wildlife related conflicts where deer, elk, and moose (Alces alces) are not able to traverse across the landscape, i.e., they’re getting stuck inside or outside these fences. It is possible that elk are having to increase their total migratory or general movement distance to avoid the fragmented areas, which could increase mortality either through an increase in either energy expenditure or the probability of mortality. These elk are also experiencing direct injury from crossing attempts. The private entity has since made small modifications to allow for wildlife passage. The Blackfeet Tribe wishes to examine the ability of wildlife to cross these modifications and identify other potential crossing points and other wildlife-fence interactions, especially those at predetermined pinch points (corners where elk may become entrapped during a predator encounter) and known crossing areas.

Methods

This study will take place along the Blackfeet Indian Reservation – Canada border near Babb, MT. The private entity, Grizzly Ridge Bison Ranch, owns nearly 30,000 acres of land for bison use that is mostly encompassed in the aforementioned fence. Due to the unavailability of the Grizzly Ridge Bison ranch for permission, this project will utilize the adjacent landowner’s land at the eastern most edge of the exclusive area for camera trap set up. Without permission from the bison ranch, fence modifications will not be examined, so data will only be collected along this fence at predetermined points between the bison ranch and Rumney ranch (as indicated by the black circle in Fig. 1). These points will be recommended by the neighboring landowner (Rumney Ranch) and Blackfeet Fish and Wildlife Department (BFWD). Although this project only looks to take data from a small snapshot of an elk’s life history, it is one of the most important times of the year, i.e., as they migrate to their wintering grounds for sufficient forage.

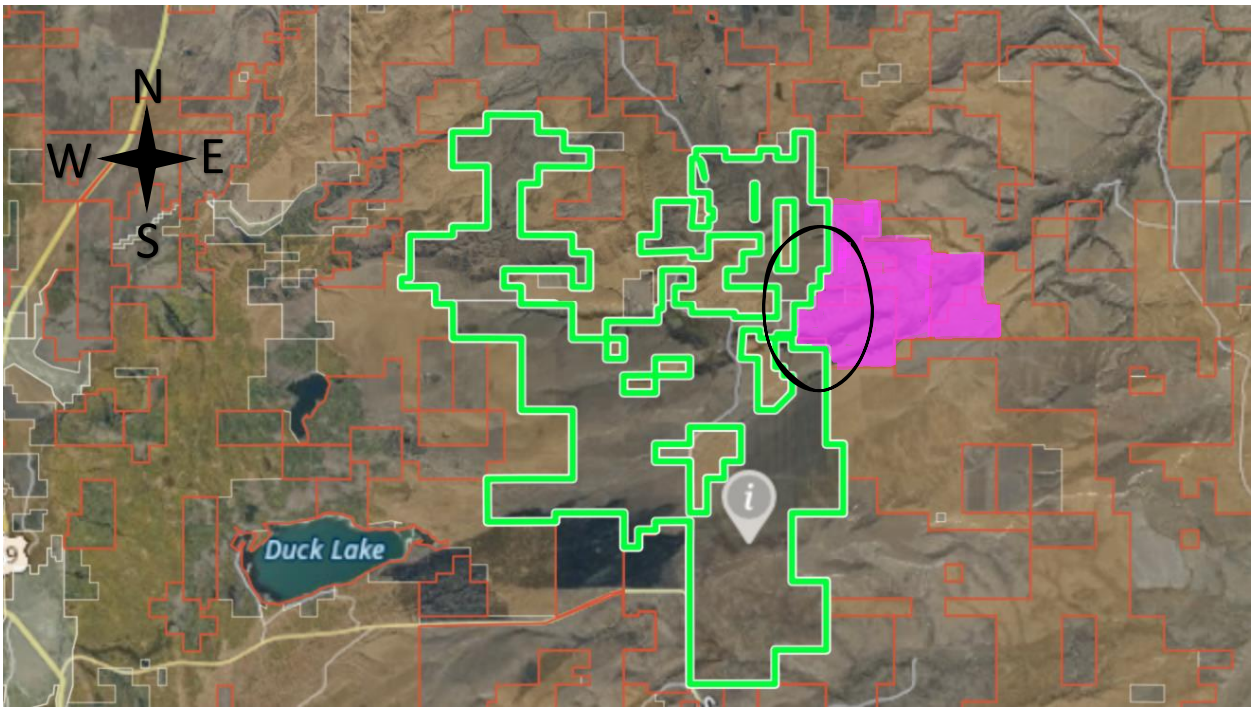

Figure 1: The Grizzly Ridge Bison Ranch eastern property, as shown in green. A portion of the Rumney Ranch shown in purple. The green line indicates the boundaries where the fences exist. The cameras were deployed along the green line within the circled area.

Camera traps will be the most integral component to observe the behaviors and actions that elk exhibit when they encounter a nearly impermeable barrier. Once the camera locations were identified, a network of six total Reconyx Hyperfire Professional IR cameras were deployed along the fence line. Of the four locations, one was in the creek bottom and three were in the native rangeland habitat, with one of those being near a water source. The cameras were secured to either a tree or fence posts using a python cable and positioned to an appropriate line of sight down looking at the fence. At two of the camera locations, two cameras were deployed (Figs. 2a – 2b). At these locations, one camera was positioned directly at the fence to view potential interactions up close. The other camera was placed farther back to observe the broader landscape and other interactions that may be out of frame of the closer camera, i.e., an animal may approach a way back but turn away. Each camera was set with the same settings and although video was preferred, the cameras used did not have a video mode. Cameras were set on high sensitivity so that potential interactions and behaviors exhibited

were not missed. The number of pictures per trigger was set to 10, with a rapid-fire interval between each picture in a single trigger and no delay between each trigger, so that the entirety of the interaction would be captured on camera rather than just a portion of it.

The cameras were left out for a total of two months from the beginning of January 2021 to the beginning of March. Throughout the observational period, there were several periods of frequent snowfall followed by a melt off caused by increased temperatures. Essentially, the purpose was to look at the behaviors elk exhibit as they encounter the fence, i.e., successful or unsuccessful crossing, mode of crossing, behaviors of approach (run up and down the fence line, stop and examine, turn away, etc.) and quantify such interactions similar to that of Burkholder et al. (2018).

Figures 2a – 2b: The image on the left depicts the closer viewpoint. The image on the right depicts the broader view.

Analysis and Results

A thorough review of all events captured on camera was conducted. Based on this analysis, there were no elk captured on camera. The majority of events captured were as a result of livestock (mostly horses) and false triggers caused by grass moving in the wind or snow falling. Beyond these events, there were numerous coyotes (Canis latrans) and a couple of white-tailed deer that were caught interacting with the fence. Summary statistics for each of these other species could be compiled into a spreadsheet for future exploration if necessary or as the Blackfeet Tribe sees fit. However, given the absence of elk on all cameras, there is no need for further analysis of this data set.

Discussion and Implications

I expected that once elk approach a fence, they would not attempt to cross and would frantically move up and down the fence line searching for a way across. This behavior has been observed by the Blackfeet Fish and Wildlife Department along the fence line that runs parallel with a nearby highway to the southwest of the study area. They witnessed this happen with elk of all age classes and sexes, as well as moose. I also observed a herd of white-tailed deer display this same behavioral pattern within the study area, which prompted the placement of a camera in that general location. It was also expected that if elk did attempt to cross, it would be done through jumping over but that there would be a very small success rate. However, with no conclusive evidence of elk interacting at this local scale, it is impossible to draw any sort of conclusion of the behaviors exhibited by migrating elk.

Although no conclusions can be made regarding elk behaviors as they encounter habitat fragmentation, this study does provide a useful narrative into the use of similar methods for either the continuation of this study or other similar studies. The use of camera traps has been proven useful in other observational studies: however, it often relies on the use of the most appropriate settings. In the case of this research project, it should be noted the resources were limited in terms of the quantity of cameras available and the availability of an object in which to attach the cameras to, as the fence in question did not provide for a secure attachment. For future reference, it would be most beneficial to have a larger set of cameras to extend the total network across a large portion of land and to have metal fence posts available for superior camera positioning. Likewise, it was valuable to have two cameras with different points of view and should be considered for future use at all camera locations. Consequently, a few of the cameras were moved because of livestock rubbing against the posts and cameras. The python cables were often hard to fully tighten around a fence post for a secure attachment, which most likely allowed for easier movement from the livestock. A different type of cable or strap, along with some sort of livestock deterrent is recommended to avoid such situations and allow the cameras to remain in the desired position.

The settings on the cameras should be changed in a strategic manner that best fits the positioning and situation. Based on photo processing, the number of pictures taken per trigger

may have been too high, especially if the cameras are prone to false triggers. I do recommend that video be the main mode of capture if applicable, and if not, pictures per trigger should stay within five to ten. The sensitivity was set to the highest option, so reducing that could decrease the probability of false triggers.

A case could be made arguing that because the study took place on the eastern most edge of the exclusive area, the elk were not able to navigate that far east given the intense degree of fragmentation from their summer ranges to their winter ranges. Hopefully in the future, the Grizzly Ridge Bison Ranch will allow for access to the western portions of the exclusive area and to the fence modifications for a more in-depth analysis. Furthermore, the cameras were only available for a small snapshot into the potential migratory behaviors of elk, so perhaps a longer period capture period will be needed, i.e., from the beginning of fall to the end of winter or for the entire year.

Effective fencing is imperative for wildlife and landowners because of the cost and time associated with repairing damaged fences from negative interactions with wildlife and the implications to sustaining wildlife populations (Burkholder et al. 2018). Hopefully the continuation or the use of the methods and/or data of this study in future studies will allow for a more positive relationship with the bison ranch to promote a more collaborative environment to enforce more efficient wildlife-friendly fencing. The Blackfeet tribe is also lacking in the availability of biological data for all species, game and non-game. With proposed and upcoming studies that are focused on migrating elk, it is impertinent to have some relevant data available for future use in analyzing elk and other species. One of these future BFWD studies will focus efforts on examining the relationship between the migratory elk and the exclusive fence. Additionally, this fence not only creates potential consequences for elk, but also for the diverse array of wildlife, e.g., moose, deer, grizzly bears, wolves, etc., that require large areas of habitat and open land to search for food and shelter. This study serves as an initial examination into the consequences of habitat fragmentation on the Blackfeet Reservation, but this approach may be more broadly applied to different sources of fragmentation and the ramifications for all species of wildlife.

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