

Livestock and Carnivore Coexistence

Larimer County

Undergraduate Student: Lily Alderfer

Mentors: **Morgan-Rae Hertel**, PhD Candidate
Jamie Raupp, Master's Student
Jenna Brager, Master's Student

Dr. Veronica Yovovich, Assistant Professor
Department of Fish, Wildlife, and Conservation Biology



PROJECT BACKGROUND

In December 2023, Colorado Parks and Wildlife released 10 wolves in western Colorado¹. After another release in January 2025, the known population has grown to 29¹. While the reintroduction efforts mark a shift in carnivore management, wolves are a native species reclaiming their historical habitat. As carnivore numbers increase, livestock producers face renewed challenges in managing herds. Research suggests that cattle respond to the presence of carnivores by altering their movement and habitat selection². Additionally, cattle display increased vigilance, which leads to less time spent foraging³. To support rancher livelihoods, ensure livestock safety, and reduce human-wildlife conflict, deterrent tools like Foxlights (flashing LED devices) are being deployed. However, no research has been conducted on how these tools, intended to scare carnivores, impact livestock welfare.

RESEARCH OBJECTIVE

Explore how deterrent tools affect livestock

PERSONAL APPLICATION

During my time as an undergraduate student in the Warner College of Natural Resources, I discovered a passion for addressing human-wildlife conflicts. While my education is grounded in conservation biology, I have always shared an interest in livestock welfare. This internship has allowed me to explore the complex relationships between wildlife and livestock – an area I care deeply about and hope to pursue in my future career.



Photo credit: Morgan-Rae Hertel



Photo credit: Lily Alderfer



Photo credit: Morgan-Rae Hertel



Photo credit: Lily Alderfer

INTERNSHIP GOALS

- Explore how **deterrent tools** impact **livestock behavior**
- Consider the relationship between **temperature, time of day, and cattle movement**
- Collect data to support broader research on **livestock-carnivore interactions**
- Expand my network to support future collaboration with CSU Extension and beyond

INTERNSHIP ACTIVITIES

Fieldwork

- Collaring: Fitted GPS collars on cattle at ARDEC to monitor movement in response to Foxlight deterrents
- Fecal Sampling: Collected fecal samples from collared cattle for cortisol analysis as an indicator of physiological stress related to deterrent exposure

Data Analysis

- Movement Analysis (CO): Used 2024 GPS data and RStudio to calculate average step lengths at night versus day to determine if Foxlights affect livestock movement patterns

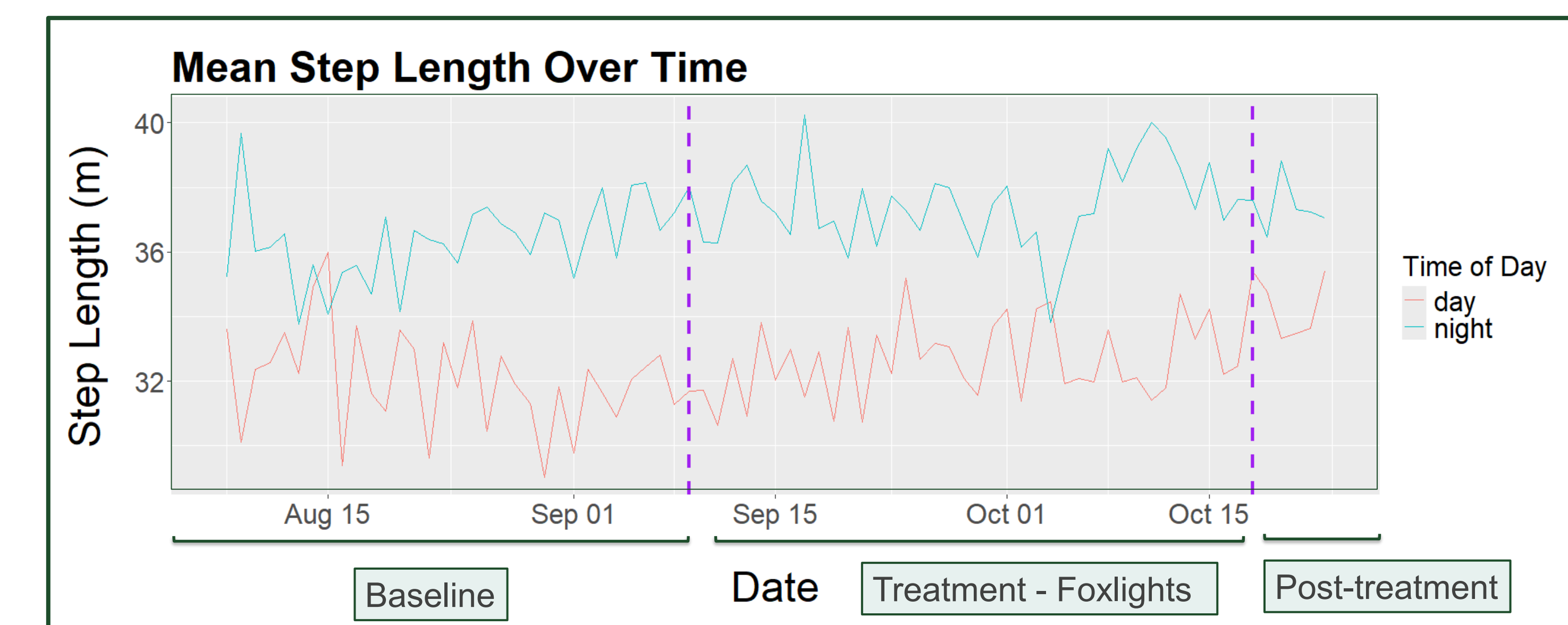
Side Quests!

- Movement Analysis (CA): Analyzed similar GPS data for project Panthera to compare cattle movement responses to Foxlights in northern Colorado versus California
- Literature Review: Assisted in a literature review on the indirect effects of carnivore predation on cattle

KEY TAKEAWAYS

- GPS data suggests **deterrent tools affect the movement patterns** of cattle in Colorado
- However, data suggest that **cattle in California are not changing movement** in response to Foxlights
- **Cortisol levels do not differ significantly** between baseline and treatment periods
- Although cattle are moving differently at night, there is **no evidence of a corresponding physiological stress response**
- **Patience** is a virtue
 - “Can’t make cows poop even if you ask nicely!”
– Morgan

CATTLE MOVEMENT PATTERNS OVER TIME



Cattle moved more at night than during the day, with nighttime activity peaking during Foxlight use and staying high even after removal.

MOVING FORWARD

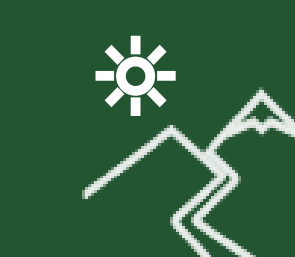
- **Explore options for deterrent tools** to protect livestock while minimizing stress
- **Collaborate with local ranchers** to deploy deterrents in real settings
- **Track carnivore movement** with camera traps or GPS collars to assess deterrent impact

References

- ¹Colorado Parks and Wildlife. (2025). *CPW concludes second year of gray wolf capture and release efforts.* <https://cpw.state.co.us/news/01192025/cpw-concludes-second-year-gray-wolf-capture-and-release-efforts>
- ²Laporte, I., et al. (2010). Effects of wolves on elk and cattle behaviors: Implications for livestock production and wolf conservation. *PLoS one*, 5(8), e11954. <https://doi.org/10.1371/journal.pone.0011954>
- ³Ramler, J. P., et al. (2014). Crying wolf? A spatial analysis of wolf location and depredations on calf weight. *American Journal of Agricultural Economics*, 96(3), 631-656. <https://doi.org/10.1093/ajae/aat100>



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Warner College of Natural Resources