# Quantifying cattle movement through identifiable pastural trails using unmanned aerial vehicles

*Delilah D. Bernal [1], Humberto L. Perotto-Baldivieso [1],*
*Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX 78363, USA[1]*
*Department of Natural Resources Management, Lubbock, TX, 79410, USA[2]*

CAESAR KLEBERG WILDLIFE RESEARCH INSTITUTE
TEXAS A&M UNIVERSITY-KINGSVILLE

TEXAS A&M UNIVERSITY KINGSVILLE®
MCNAIR SCHOLARS PROGRAM

## INTRODUCTION

- Cattle (*Bos Taurus*) play an essential role in shaping the vegetation composition and land structure in their given environments (Butt, 2010; Walker & Heitschmidt, 1986).
- Understanding the behavior of animals requires quantifying their movement and patterns (Ray & Stopfer, 2021).
- There is little information on quantifying cattle movement through identifiable pastoral trails using drones.

## OBJECTIVES

- Determine the feasibility of identifying cattle paths across the landscape.
- Determine the density of the cattle trails and the proportion of heavily used trails.

## METHODOLOGY

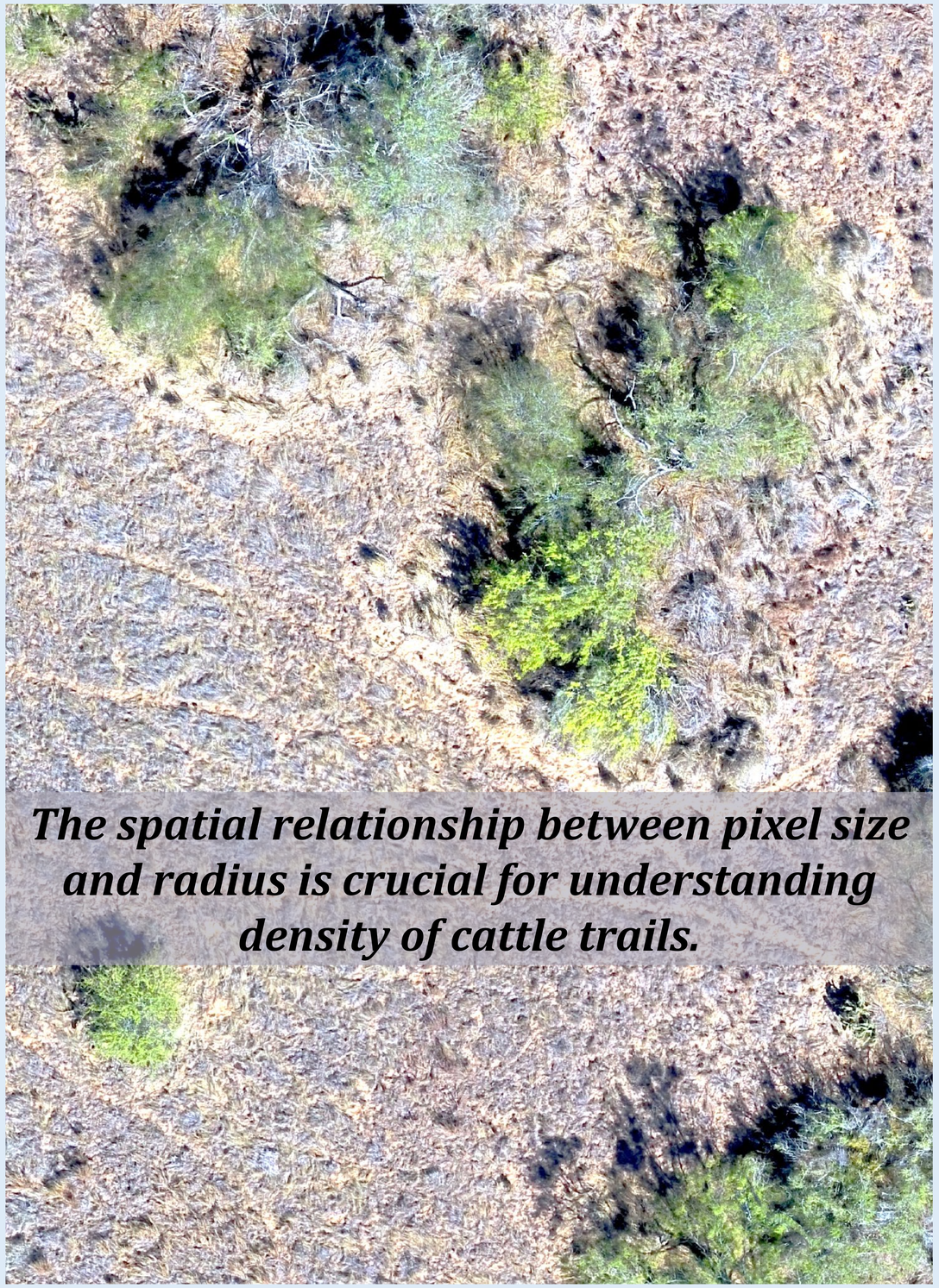
- Our study site was located on a 95.5-ha pasture located at Jim Hogg County, Texas, USA (Fig. 1).
- The data was collected at an altitude of 100 m (AGL) on July 03,2020 (Page, 2022).
- We created an orthomosaic model on Pix4D mappers then input into ArcGIS Pro to outline all identifiable cattle trails (Fig.2) (Pix4D, 2023; ESRI, 2023).
- Stratified 100 random points ranging from 1-50 in radius.
- We used the line density formula to determine the density of the cattle trails within various radiuses (Fig. 3-9).

## PRELIMINARY RESULTS

- From our analysis, as the radius increased the differences of density in the cattle trails increased.
- However, as the radius continues to increase at a certain range (between 8-15 m) the differences of density decrease and start to get classified together (Fig. 10).

## DISCUSSION

- There is limited research in quantifying cattle trails utilizing density.
- Drones provide a way to quantify cattle movement.
- Future analysis is required to determine at which scale the densities will be optimized before being classified together.




**Acknowledgments**: Funding for this project was provided by the McNairs Scholar Program. Special thanks to my mentor H. L. Perotto-Baldivieso and the following grad students Daniel Ramirez, Silverio Avila and Dakota Moberg. The rotary club of Corpus Christi Harvey Well sportsman conversationalist award

## FIGURES


**Figure 1.** Study site

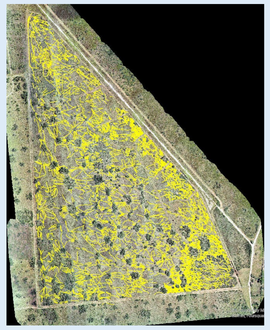


**Figure 2.** Our 2D orthomosaic model of all identifiable cattle trails

**Fig 3.** 2 m

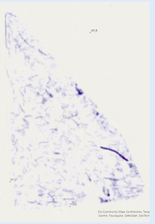


**Fig 4.** 6 m

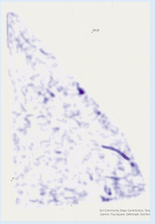


**Fig 5.** 10 m

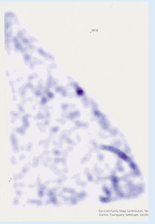


**Fig 6.** 18 m

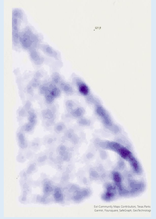


**Fig 6.** 26 m

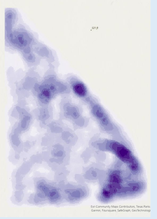


**Fig 7.** 34 m

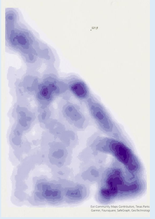


**Fig 8.** 42 m

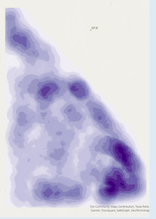


**Fig 9.** 48 m

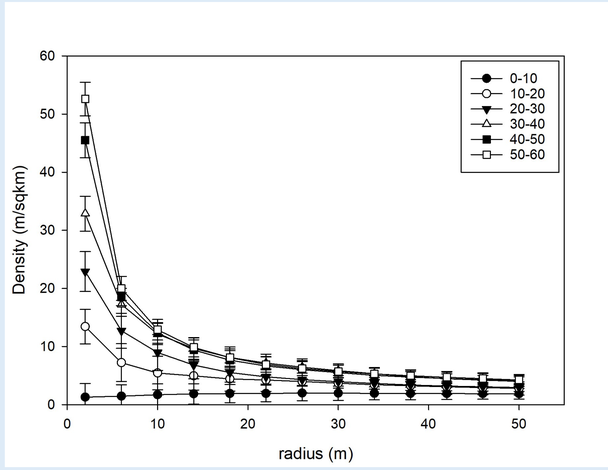



**Figure 10.** Mean and SD of all radius ranges in relation to the density of trails.