

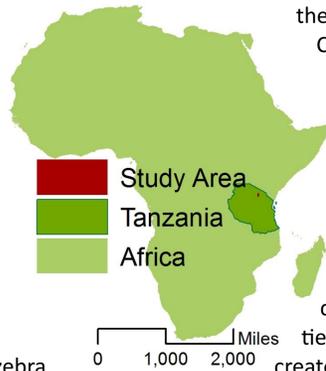
# Battle For Pasture: livestock's potential to competitively exclude wildlife in Northern Tanzania's National Parks

## Introduction

Northern Tanzania's expanding community areas pose threats to migratory species like wildebeest and zebra who's lives are spent mostly outside of park boundaries. The Tarangire-Manyara Ecosystem (TME) is dotted with protected areas like Lake

Manyara National Park, Tarangire National park, and semi-protected areas surrounded by developing communities. Livestock from these communities like Cattle, Sheep, and Goats (shoats) can compete with wildlife for resources especially in the dry season when. They are able to graze in the Wildlife Corridor and Manyara Ranch, both areas that act as crucial connection between the national parks.

Cattle in particular have the potential to compete with wildebeest and zebra. All three are grazers meaning they feed on grasses. Wildebeest and cattle are primarily short grass feeders while zebra can graze on a variety of grass types. This allows Wildebeest and Zebra to graze together but potential conflicts can arise when cattle are introduced. Understanding if cattle compete with wildebeest and zebra is important to conservation and future land-use decisions.



## Methods

Research Question: Where and when do herds of wildlife overlap with livestock, and are areas of overlap associated with any resource or land type?

To Answer these questions, data on wildlife sightings in the TME was utilized and selected for the 4 study species.

Data points were collected through driven transects in the semi-protected areas (Manyara Ranch) and the Community area. Sighting data associated with GPS was taken for all species and represents a 5 year old data set for wildlife in the TME. Data is restricted to roads or areas accessible by car and was collected by students studying at the School for Field Studies, located in Rhotia, Tanzania.

GPS data for wildlife sightings was geocoded and points were used to create kernel densities for the 4 study species. Kernel Densities were then reclassified into high and low to create the population maps. The area of the densities were then used to calculate percent overlap.

A regression was used to look at sighting density location. A layer for land type, and ones with distance to resources were joined to a fishnet with a point file of siting for all 4 species to run the regressions in Geoda.

## Results and Conclusion

The most striking result was the visualization of the species' density for each season, especially the dry season when herds not only shrank in area of highest density but also overlapped the least with one another. Shoat herds shared the least overlap with the wildlife species over the three seasons, and were mainly spotted around and north of the community area. Cattle on the other hand shared considerable overlap with all three species and unlike the Shoat herds were seen in very high densities in Manyara Ranch.

The 4 species also showed strong habitat preference. Woodland was favored by Cattle, Shoats, and Zebra with the other habitat types showing almost a magnitude less of correlation in the regressions. The large woodland in the south of Manyara ranch was also a location where the highest densities of the species frequently overlapped across the seasons.

In terms of the wildlife corridor, all three were observed in what is considered an area important for migration, though much of the area between the parks can be considered a corridor.



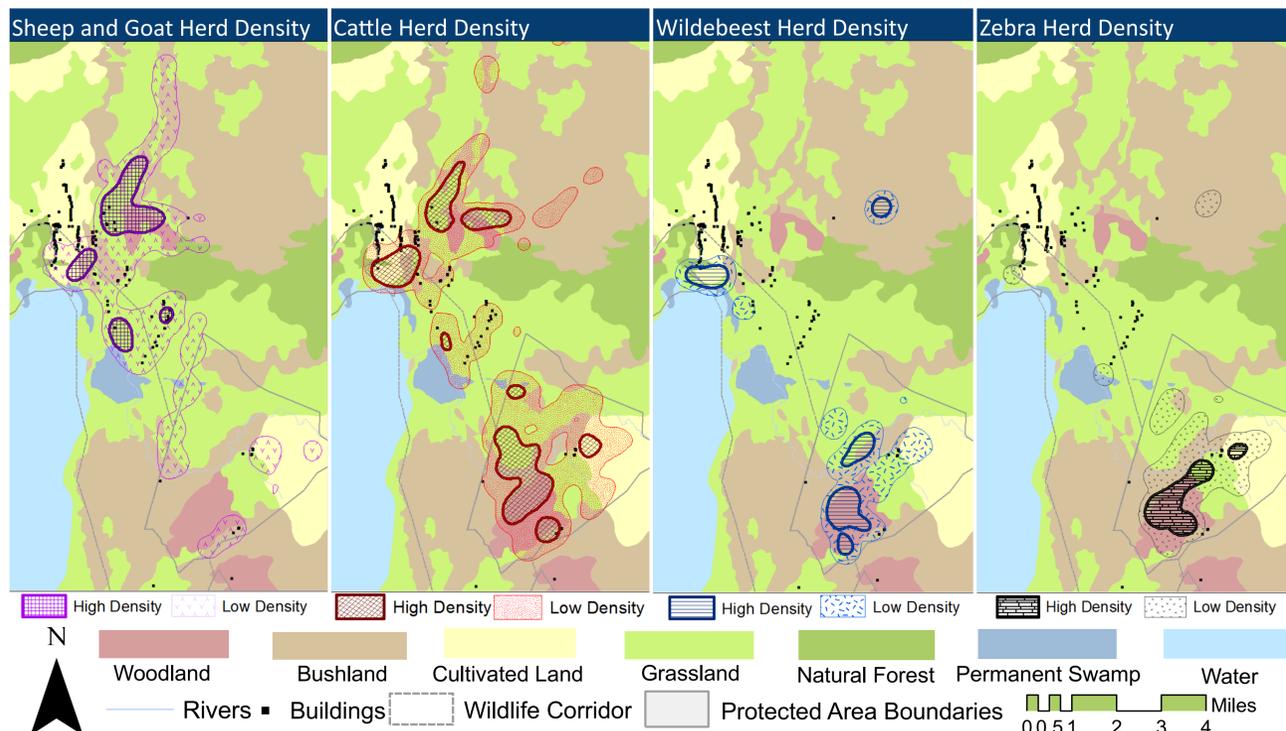
## OLS Regression : Location and Density of Animal Herd likelihood

A multivariate regression was conducted to examine the relationship between sighting density of the 4 study species and seven possible explanatory variables. The summary table below highlights that habitat types like Woodland have an incredible positive correlation to sighting of the 4 species.

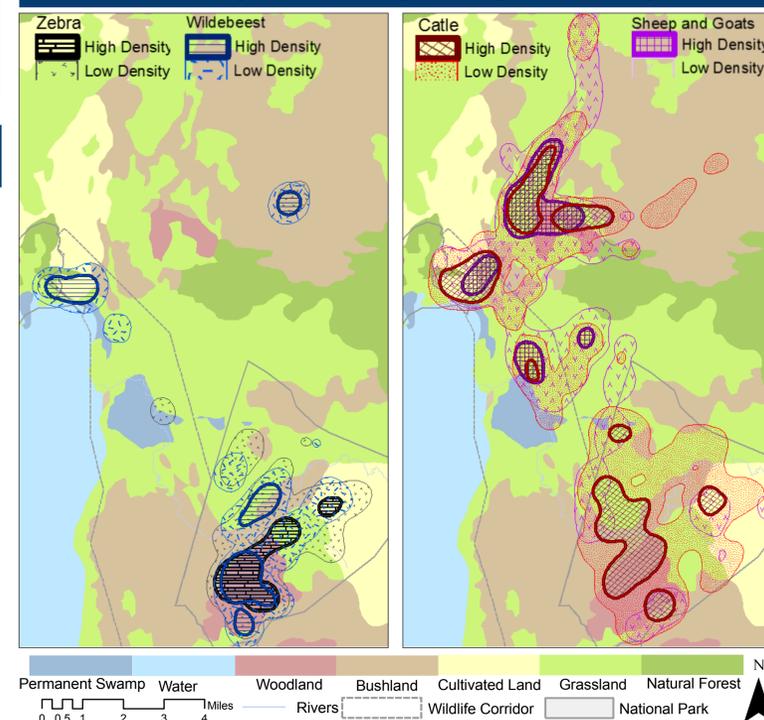
	# Bushland	# Woodland	# Grassland	# Cultivated Land	Distance to Water	Distance to Community Areas	Distance To Rivers
Wildebeest	0.03	1.22	0.11	0.2	-0.000038	0.000012	0.0000027
Zebra	0.08	2.27	0.19	0.25	0.000013	-0.000027	-0.000018
Cattle	0.61	4.39	1.19	1.46	-0.000003*	-0.000045	-0.000074
Shoat	0.6	0.19	1.27	1.16	-0.000018	-0.000032	-0.0000013

# Indicates dummy variable \*indicates non-significant p-value using .005 cutoff

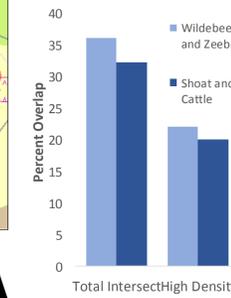
The maps below show the observed sighting densities of the 4 species, the corresponding habitat, and relative locations of National Parks, homes the community area, and Wildlife Corridor.



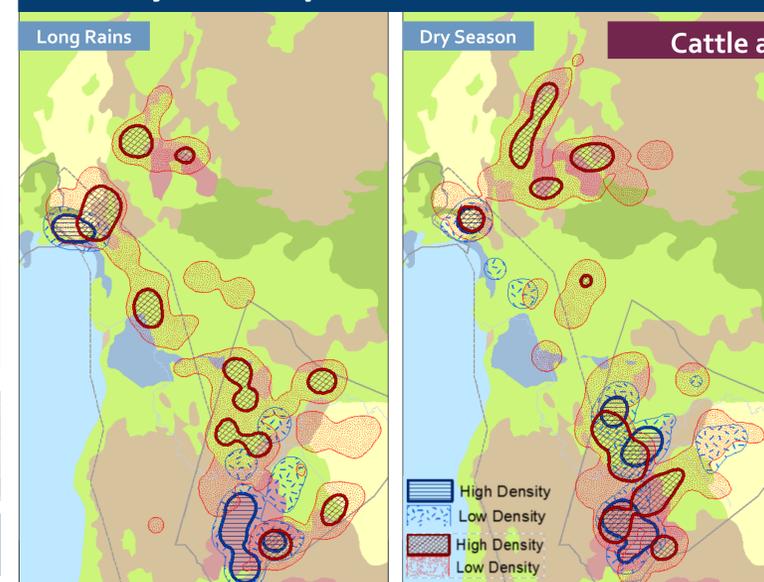
## Species Sighting Density Overlap



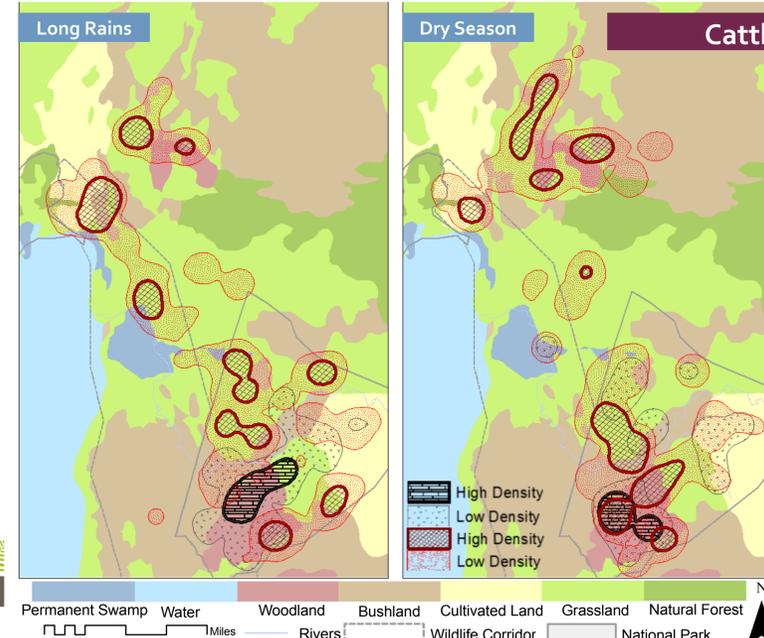
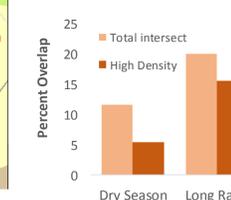
The sighting densities of Wildebeest and Zebra overlapped considerable across the 3 seasons most notable in Manyara Ranch. The two commonly feed together in MR because it is more protected than the surrounding community areas and their grazing niche differ. Livestock herds were also seen frequently in the same spots, most commonly seen near the community area where pastoralists frequently pass through.



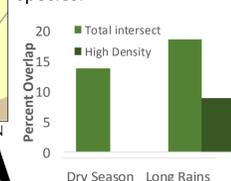
## Density Overlap between Wildlife & Cattle by season



Cattle and Wildebeest distribution during the dry season when resources are scarce differ notably from their distribution during the long rainy season when food and water are more abundant. This map highlights locations where the herds are potentially excluding one another during the dry season.



Cattle and zebra have a similar relationship during the dry season to Cattle and Wildebeest. The two did not overlap at all at their highest sighting densities during the dry season. Moreover, during the long rains, cattle are found in the areas of highest Zebra densities where they weren't seen in high numbers in the dry season. This highlights an area that is very attractive to both species.



## Implications

The data points towards spatial competition for resources in the Manyara Ranch area between these 4 species. Based on these findings, the policies surrounding community grazing in semi-protected and near community areas need to be further assessed to see if they are negatively impacting wildlife migration. More field work during the dry season is necessary to determine if Cattle is being spatially displaced by wildlife, or if herders are avoiding the woodlands area in the south of Manyara Ranch. Additionally, a radio-collar study would provide more insight into the migration of herds between parks to shed more light on the dynamic of the wildlife corridor.

Sources:

- 1) International Livestock Research Institute, Tanzanian land cover and tenure [layer files]. [1:12,000]. (2007) International Livestock Research Institute, Dar es Salaam
- 2) School for Field Studies long-term research spreadsheet. Retrieved Fall (2015)

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 Tufts SFS  
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