Vehicle noise disturbance on carnivores and large herbivores in Karongwe Private Game Reserve

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Overview

Road development is one of the most spatially extensive sources of anthropogenic noise and is directly related to the increase of human populations[1]. South Africa's economy and infrastructure has increased significantly in the last decade. In the next three years South Africa has dedicated USD$140 million towards maintaining and developing the public road system[2]. Studies regarding African wildlife and the impact of noise pollution have been minimal even though individual species have varying degrees of sensitivity to disturbance[2]. Vehicle traffic can not only affect acoustic communication but also cause deleterious physiological responses in both humans and wildlife[1].

Study Area and Focus Species

- *Location:* Karongwe Private Game Reserve (KPGR) in the Limpopo Province, South Africa.
- *Area:* Less than 8 000 ha.
- *Habitat and surroundings:* Primarily bushveld. Bordered by a paved road on the western side and dirt roads on the northern and eastern side.

Elephant

- Three adult bull males and a breeding herd of 18 individuals.

White Rhinoceros

- Between 5 and 25 (confidential due to high activities of poaching in the area).

Lion

- One adult male and two adult females. Telemetry device on one female and the male.

Cheetah

- Two males and one female. Telemetry device on one male and the female.

Methods

Thus far only the elephant herd has been analyzed. Further work will look at the white rhinoceros, lion and cheetah movements.

The elephant herd was broken up into 4 different entities: the breeding herd (BH), BE (Bull Elephant) 1, BE 2 and BE 3.

A density map was created for each elephant entity based off all known locations from 2006-2012 collected by the Global Vision International (GVI) research team (Figure 1 and Figure 2). Using a vegetation map created by John Wilson*, the type of vegetation for each location within the high-density area was then determined.

Random points were generated based on the vegetation preference within the high density locations to act as the null hypothesis (Figure 1). The closest distance from the paved road and dirt road was calculated for each individual elephant point and each random point.

The Wilcoxon t-test was used to compare the random and true points for both the distance from the paved road and distance from the dirt roads.

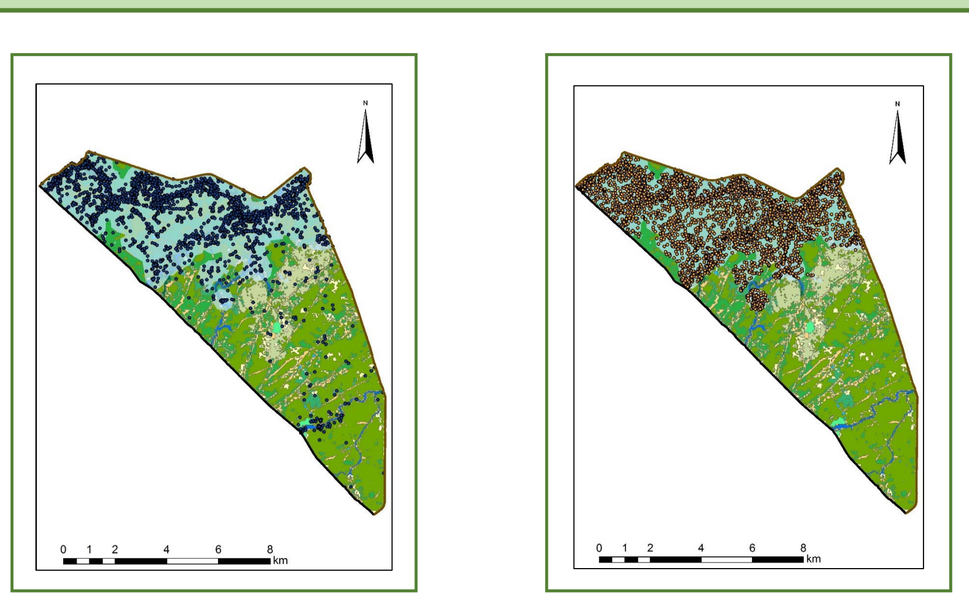

Figure 1. Comparison of known breeding herd locations and generated points based on high density areas

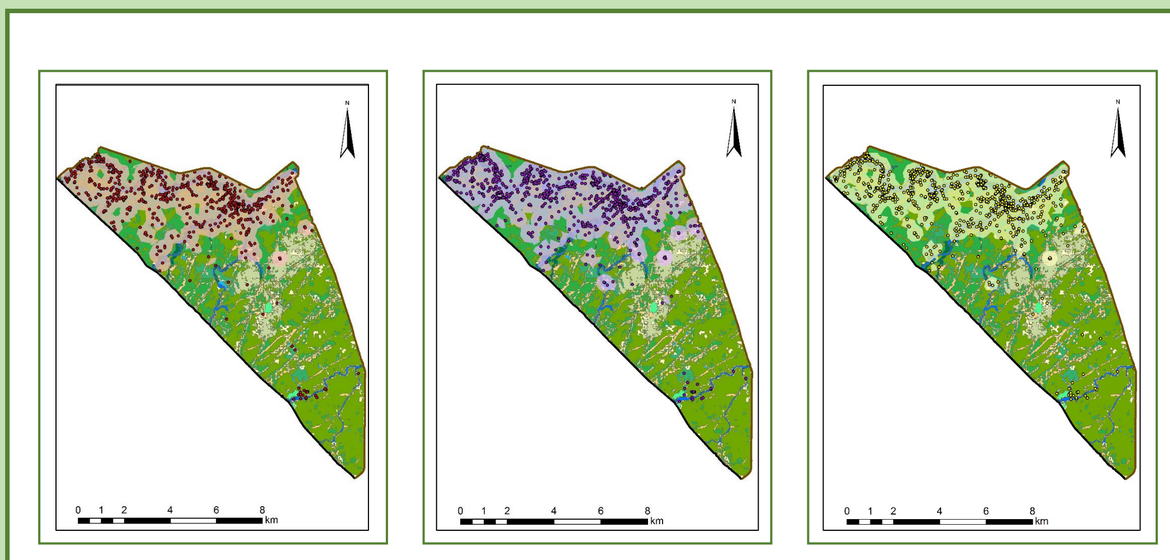

Figure 2. Comparison of known BE1, BE2 and BE3 locations and individual high density areas

Results

All four elephant entities had no significant difference between the randomly generated points and the real locations in terms of distance from the paved road ($p > 0.05$). All four entities have a highly significant difference from the dirt road ($p < 0.05$).

Discussion and Future Work

The results of this outcome are interesting. From these results it appears all four elephant entities are not impacted by the paved road and prefer close proximity to the dirt road. More likely, however, elephants in KPGR either are 1) not disturbed by the bordering public roads, 2) merely avoid a certain buffer around these roads, which does not extend across the entire reserve or 3) the analyses are skewed due to high vegetation preference along the northern rivers which overrides the disturbance from the bordering public roads.

Further analyses will look at buffer zones around the public roads. Preliminary results indicate an avoidance of paved and dirt roads when the high vegetation preference near the northern rivers is removed. A habitat suitability model will be created based on impact from noise pollution (if any) and habitat preference for each species.

Field work over the summer on KPGR will include monitoring frequency of vehicles/day and /hour along the dirt and paved road as well as recording distance and decibels of noise emitted from vehicles.

Acknowledgements

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Literature Cited

[1] Barber, J, et al. 2009. "The Costs of Chronic Noise Exposure for Terrestrial Organisms." *Trends in Ecology & Evolution* 25 (3) (March): 180–9. [2] Wildlife & Transport Programme. 2014. "The Green Mile." *Endangered Wildlife Trust*, January.

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