The Influence of Burning on Elephant Foraging In Kenyan Savannas

Will Kanagy[1*], Miranda Schlabach[2]
1. Department of Biological Sciences, Goshen College. Goshen, Indiana 46526, USA.
2. Department of Art, Goshen College. Goshen, Indiana 46526, USA.
*Email: williek@goshen.edu

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Introduction

Understanding the relationships that exist within African savannas is essential to understanding a significant portion of our world's terrestrial life and is especially important for the pastoralist and ranching communities that live in the African savanna (Scholes and Walker, 1993). Besides rainfall, many of these relationships are dependent on fire, people and the wildlife. This project shows how the increasing overlap between people and wildlife, specifically elephants, has the potential to be positive for both parties, if combined with the practice of burning. It has been shown that with burning and the presence of a moderate elephant population (~3070 in pop.) the spatial heterogeneity of the savanna environment would increase (Holdo. 2009). From a pastoralist perspective, this increase in heterogeneity creates different food sources for wildlife and cattle within the savanna ecosystem which is essential for drought tolerance.

This study will consider whether there is a direct connection with how elephants feed in burned and unburned areas of the East African savanna. This will help to show what specific interactions are occurring with burn use and elephants, and potentially show how management could use both elements as tools for creating greater heterogeneity within habitats on a micro scale, such as community or commercial grazing land.

Research Questions

Is elephant foraging more prevalent in burned versus unburned areas?
Do elephants have different height preferences in burned versus unburned areas?

Materials and Methods

Data was recorded in the Kenya Long-term Enclosure Experiment (KLEE) land plots in both burned and unburned locations. In both the burn site and the control site 30 meter by 10 meter transects were used to record data concerning elephant browsing. From each transect the following data was recorded for each previously tagged tree; transect location, tree species, tree tag number, height of tree, diameter of tree at 15 cm (or if the tree <15 cm the measurement was taken at the base as well), type of ant species found on the tree, presence of stem borer, elephant forage rating on a scale of 0-5 (0- no foraging, 5- dead), and % dead rating on a 0-5 scale(0- completely alive, 5- completely dead). Additional comments were noted if the tree was top-killed, leaning, topped, had coppice, or if there was evidence of herbivory by browsers other than elephants. This data was then tabulated and analyzed using the statistics program JMP to run a t-test to determine the significance of treatments, an ANOVA test to consider the effect of height and treatment with regards to elephant foraging, along with simple comparison of tree height between treatments with regards to elephant foraging in the program Excel.

Results

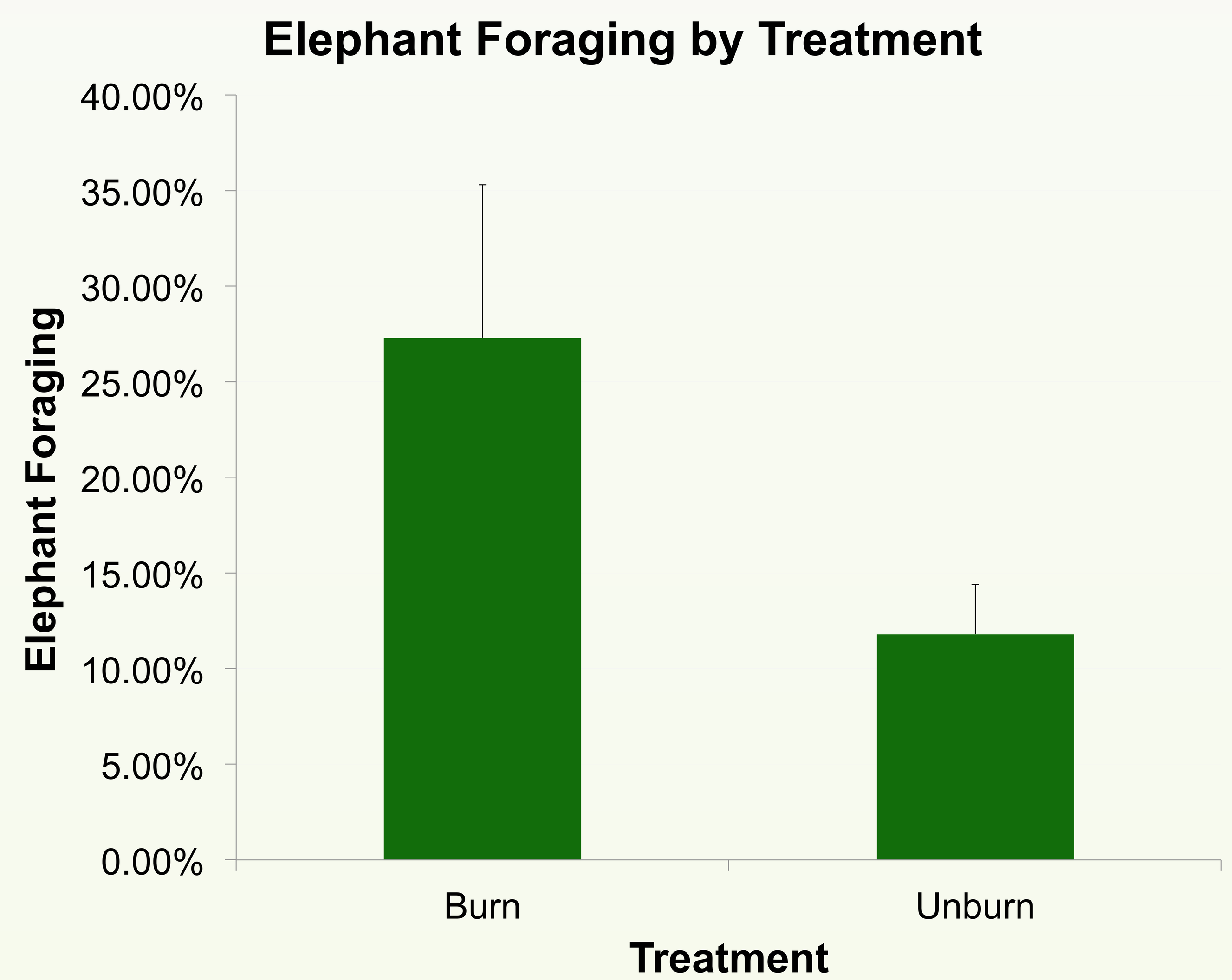

Figure 1: Average percent of elephant foraging per transect in both treatments. This graph shows that elephants forage in burn sites more often than unburned, with a p-value of 0.017 with t-test analysis.

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
HT class	5	5	14	2.7	0.036
Treatment	1	1	23	23	2.8 E-05

Table 1: ANOVA results for the comparison of height and treatment with regards to average elephant damage. This table shows that although height is a significant factor in determining elephant forage location, treatment is statistically more significant.

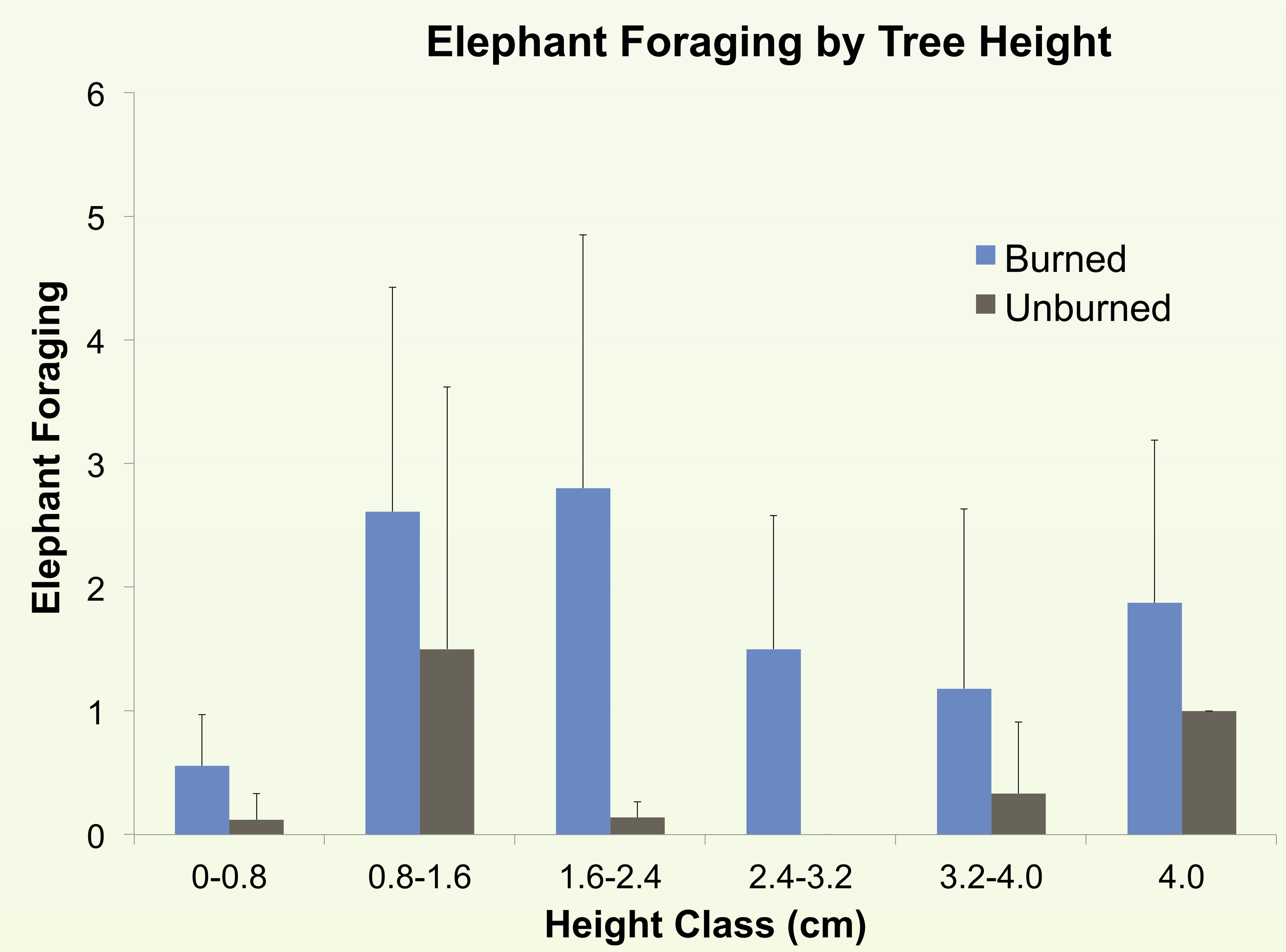

Figure 2: Elephant foraging with relation to tree height, between burned and unburned sites. This graph shows the height preference for both treatments.

Discussion

From our data it appears that there is indeed an increase in the amount of foraging by elephants in burned savanna versus unburned. **Figure 1.** shows the comparison between the percent foraging that occurred in both burned and unburned, and after running a t-test on the data, the correlation was shown to be significant with a p = 0.017. Reasons for this increase in foraging in burned areas is likely due to a number of factors. Amongst these are a likely decrease in the density of acacia ants per tree, an increase in the amount of nutrients per tree, and/or the simple weakening of the trees due to fire decreasing the tolerance of the trees against elephant damage caused by foraging.

We believe the most likely of these factors is the density of acacia ants per tree. We hypothesis that fire caused the density of ants to decrease in the burn site so that elephants could more readily feed on the acacias. Furthermore, increased foraging could be caused by the stress of fire on trees, where entire branches die and only a limited portion of the tree undergoes re-growth, allowing for increased impact in the dead portions. In addition, in **Figure 2.** we compared elephant foraging with relation to mean tree height per transect, in both burned and unburned sites. It was observed that despite the increase in total foraging in burn plots, there was not a change in selection preference for tree height between treatments. Lastly, to test to see if density of average tree height per plot was confounding the measured effect of burn or unburned treatment an ANOVA test was used to compare the effect of tree height to treatment of site in relation to elephant foraging. **Table 1.** shows that there is in fact a significant impact caused by average tree height per plot (p = 0.036), however, the effect from treatment was much greater with a p = < 0.001.

Acknowledgements

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