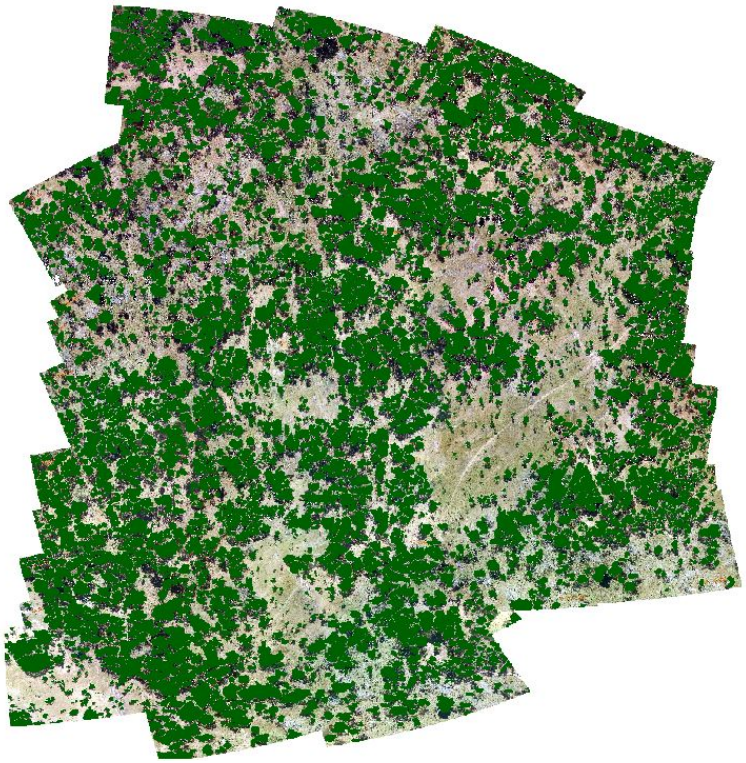
ENVIRODRONE™
Autonomous Aerial Vehicles

Estimating Canopy Cover Using Aerial Photography for a Chimpanzee Habitat, Tanzania.



Prepared for External Use

Document Revision History

Rev No.	Rev Description	Author	Reviewer	Approver	Rev Date
A	Issued for Internal Review	Rebecca Shearon	Justin Barnes	Ryan Cant	August 5, 2016
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1 PURPOSE

To digitize all visible tree canopies within an area of study and calculate the density of these trees using GIS and aerial orthophotos.

Figure 1. Tanzania study area

2 DIGITIZATION

Figure 2. A section of the digitized tree canopy layer

To digitize the tree canopy for analysis these steps were followed:

- A new polygon layer was created and the editor toolbar was used to start editing.
- The create features tool was used to create polygons for each tree canopy
- The tree canopies were digitized based on where shadows occurred, where the ground was and where natural divisions appeared to be.

3 ANALYSIS

For this purpose, cells within the Tanzanian tree image can have one of two values: tree canopy or tree understory. Before the tree density could be calculated the tree polygon layer had to be converted to a raster using the 'polygon to raster' tool. This was done in order to get the number of cells with the 'tree canopy' value. To find the total number of cells within the study area, a polygon of the same size and shape was created and then converted into a raster with cell size the same as the original image. Since the study area is an irregular polygon, this had to be done rather than calculating the total number of cells according to the number of columns and rows. The number of cells was found in the attribute table of the new layer.

Figure 3. Clipped area of study

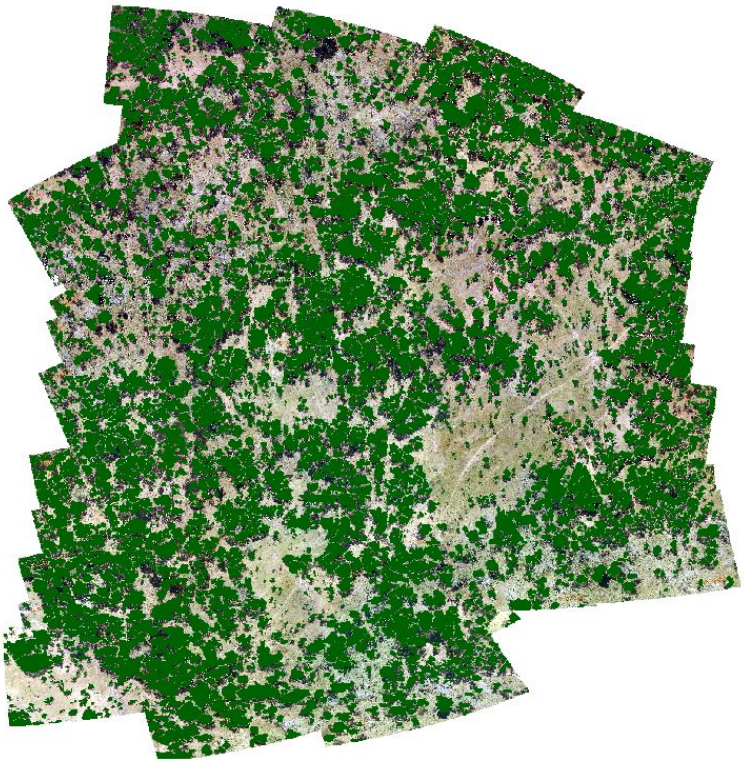

Figure 4. Raster layer of tree canopy

In order to calculate the tree density, the number of cells with 'tree canopy' value was divided by the number of total cells in the area of study.

For comparison of figures, a rectangle was taken from the middle of the study area and the percentage of tree canopy was calculated for just that area.

4 RESULTS

	Tree Count (cells)	Tree Count (cells)
Full Study Area	17 225 567	42 584 946
		Percentage: 40.45%
Sample Area	9 176 412	22 818 280
		Percentage: 40.22%

Table 1. Density Calculations of Study Area and Sample Area.

Tree canopy covers 40% of the study area and 40% of the sample area.

5 DISCUSSION

This method was chosen because it made the best use of the data provided in the photos, as most density calculations are typically done using LiDAR imaging. This method is a modified version of a method used by Darrell Inskeep (Inskeep, Wagner, & Buchanan, 2011). The method was modified so that the digitized pixels of the known canopy cover was used in order to calculate percentages rather than estimating its value using Jenks breaks on a grayscale image.

6 REFERENCES

Inskeep, D., Wagner, A., & Buchanan, B. (2011). *Estimating Canopy Cover Using Aerial Photography for a Mixed Conifer Zone, Northern, New Mexico.* Lexington, KY: ASMR.