

Home(ostasis) on the Range: Reconciling Discrepancy in Conservation Grazing Strategies

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UEP 294: Advanced GIS
December 18, 2015

Introduction

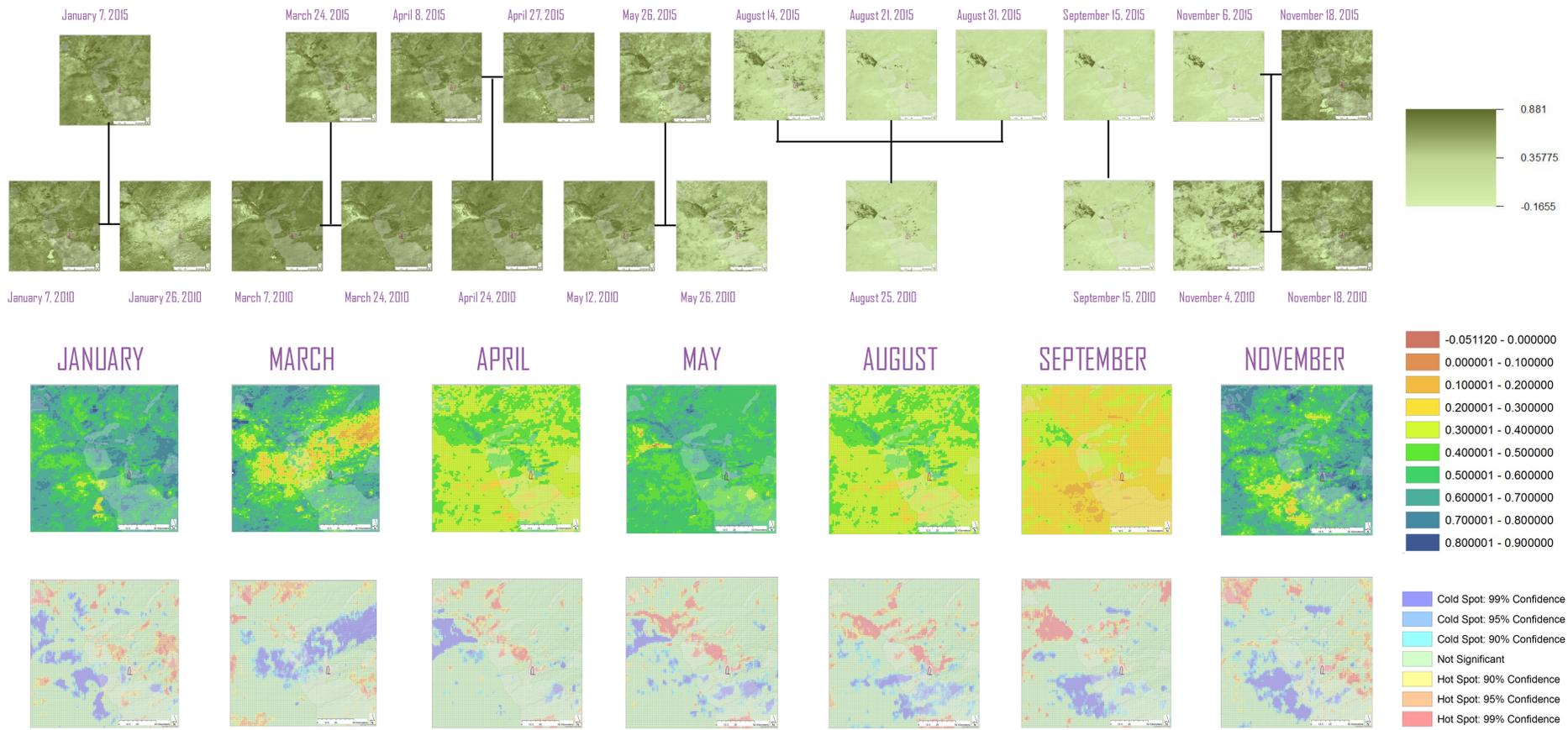
The environmental costs of meat production include degradation of soil, water, and atmosphere. There are many methods of conservation grazing, however the Natural Resources Conservation Service finds a trade-off between ecological outcomes and profitability due to the necessity of keeping livestock at low stocking rates and at low density. Proponents of Holistic Planned Grazing, however, assert that managing livestock to mimic the high stocking rates, density, and mobility of wild herds improve land function. This study analyzes Dimbangombe Ranch in Zimbabwe (shown in magenta polygon), the site of longest continuous Holistic Planned Grazing, for changes in Normalized Difference Vegetation Index between 2010 and 2015 to determine if vegetative health has in fact improved over time. The study compares these changes to those in protected national parks, shown in grey shading.

All data are projected using a Sphere Sinusoidal transformation.

Land Processes Distributed Active Archive Center (LP DAAC). 2015. MODIS/ Terra Surface Reflectance 16-day Global 500m SIN Grid V005. Accessed November 9, 2015 from <<http://www.earthexplorer.usgs.gov>>.

Southern Africa Development Community Protected Areas. 2015. Peace Parks Foundation. Accessed December 1, 2015 from <<http://www.arcgis.com/home/item.html?id=1914a112380a41038c47b006163b53ac>>.

Boundaries for Dimbangombe Ranch provided by Seth Itzkan, CEO of PlanetTech



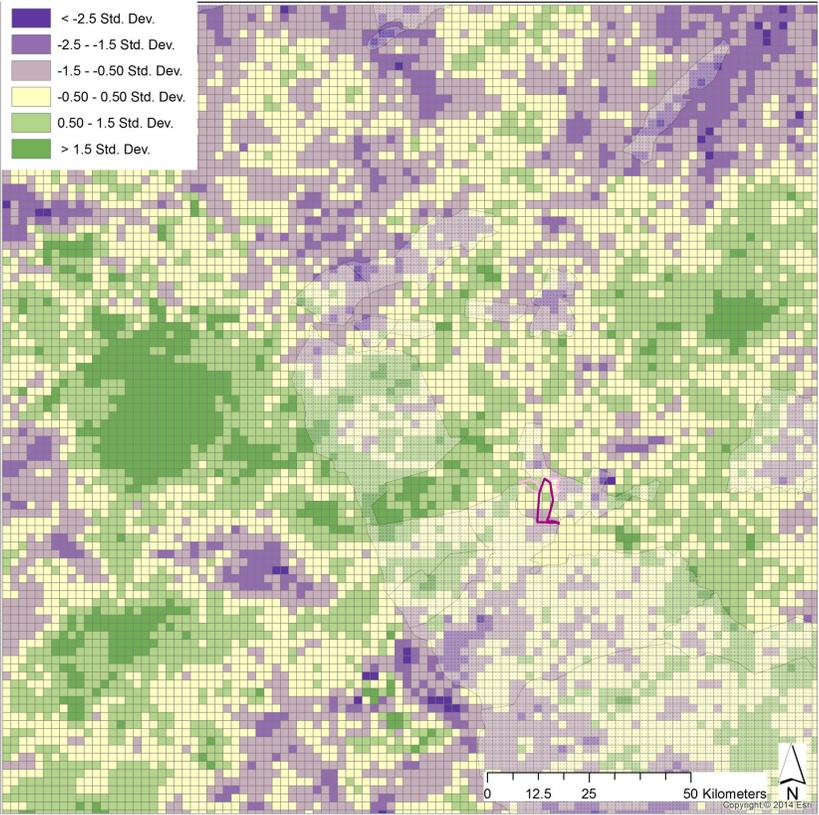
Methods

Data from 2015 were differenced (shown in vertical lines) with available monthly data from 2010. For months where there was more than one observation, the raster data were averaged (relationship shown with horizontal lines).

The differenced raster was then cast with a fishnet that was 100 cells by 100 cells. Zonal statistics were used to calculate the mean NDVI reading per cell.

Finally, a Getis-Ord hotspot analysis was conducted using the fishnet to identify spatial trends in NDVI difference.

This map shows the difference between averages of all observations from 2010 and 2015. Differences were symbolized to show standard deviation from the mean. This scale demonstrates that on average, there has been a loss of healthy chlorophyll in the region surrounding Victoria Falls. Areas within protected parks and the ranch both appear to experience a mix of changes in NDVI.



Conclusions

In its pursuit to determine if holistic planned grazing improves incidence of healthy chlorophyll, this analysis is somewhat inconclusive. The changes in NDVI readings on the ranch are not statistically significant, and show a mix of degradation in the south and improvement in the north. It appears that areas within protected parks have experienced similar variance in changes of healthy chlorophyll, suggesting that livestock exclusion is not adequate for improving ecosystem function and healthy vegetation. Further study should consider using higher resolution data from Landsat to discern more localized nuance. This analysis is prone to spatial error because of the aggregation within fishnet cells. Error also likely arises from incomplete temporal data, as seasonal changes likely defy calendar measurements of time.