Remote sensing patterns of primary productivity of the Great Limpopo Transfrontier Conservation Area (GLTCA) in relation to land use and land tenure

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INTRODUCTION

- Primary productivity (i.e. NPP) refers to the amount of solar energy converted to biomass through photosynthesis by plants per unit area per unit time.
- ton ha^{-1} yr^{-1} or $gm^{-2}yr^{-1}$.
- The ecological, as well as economic significance of NPP makes it important to study.

INTRODUCTION

- In any ecosystem, all heterotrophs ultimately depend on biomass, thus consequently on NPP
- It is important to test the relationship between NPP and land use and land tenure patterns within multiple use areas such as the GLTFCA.
- Relationships are currently unclear and yet have a direct bearing on sustainable development, human livelihoods, biological conservation and the management of animal diseases and ecosystem health.

INTRODUCTION

- Remote sensing: an invaluable approach to determine the spatial and temporal distribution of NPP at large spatial scales.
- In this study we explore whether land tenure and land use variations can explain the spatial and temporal variations in NPP.

METHODS

- Estimated NPP using a remote sensing model based on the micrometeorological approach and derived from the Monteith equation

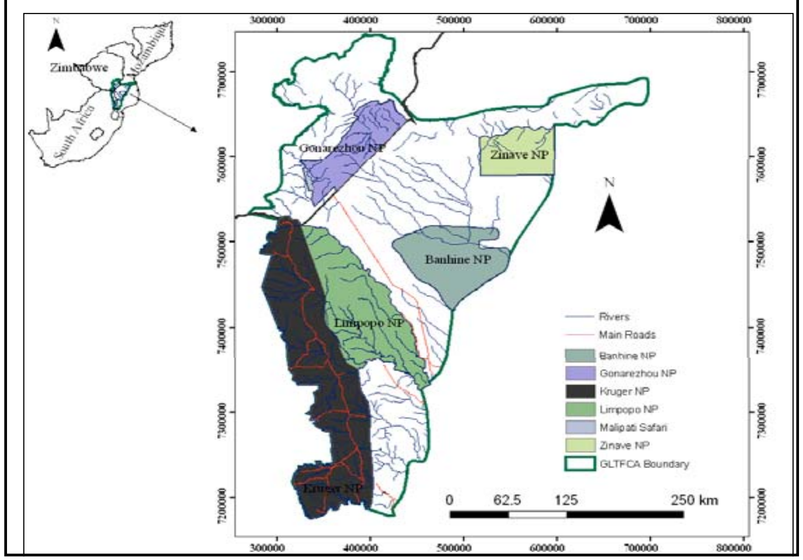
- The equation is given as follows; NPP=LUE x APAR ……. (1)

  where APAR refers to absorbed photosynthetically active radiation and LUE is the light use efficiency.

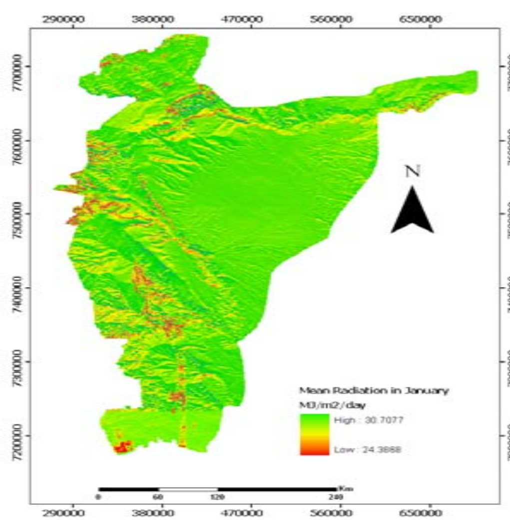
METHODS

- Radiation modeling
- Calculated radiation by latitude for each months (72 maps overall)
- Output radiation is in KJ/m^2/day
- Output was converted to MJ/m^2/day
- Used MODIS images for the calculation of NPP.

GLTFCA



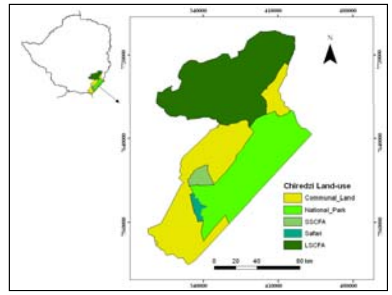
Solar Radiation Map

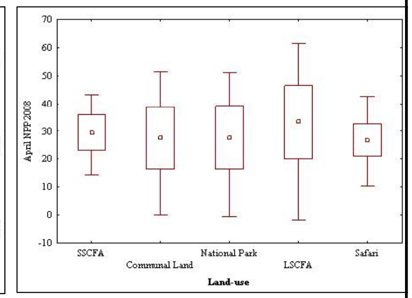


RESULTS

- Data was tested for normality and found to be normally distributed.
- Parametric tests applied
- Variance in NPP differed across landscape.

Chiredzi Land-use, NPP April 2008

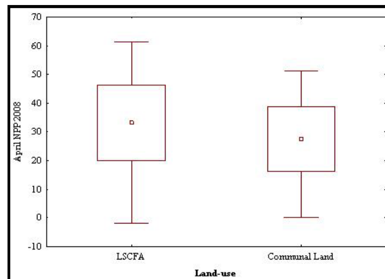


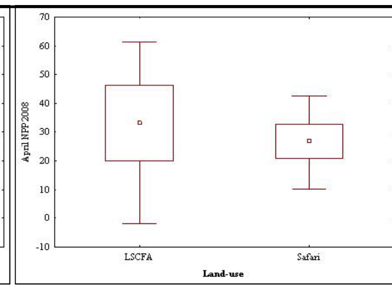


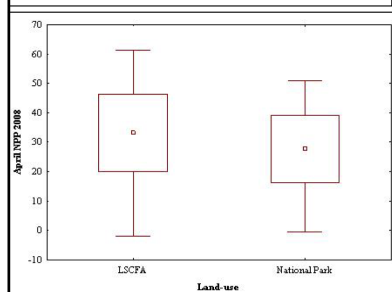
Variance in NPP in at least one of the land-use areas differed significantly from the others (i.e. LSCFA) (One-Way ANOVA, $p<0.05$)

April NPP across the SELZ

Chiredzi Land-use	Mean April NPP ($g/m^2/day$)	Mean-SD	Mean+SD
Communal Land	27.45	14.4	40.57
National Park	27.74	14.48	41
LSCFA	33.03	17.41	48.65
Safari	26.75	19.44	34.06
SSCFA	26.47	22.03	36.91

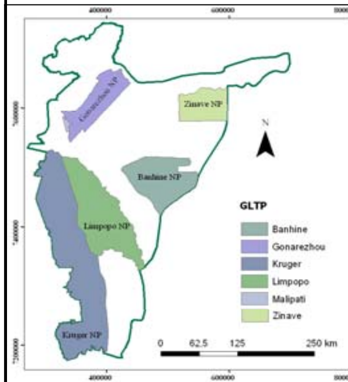


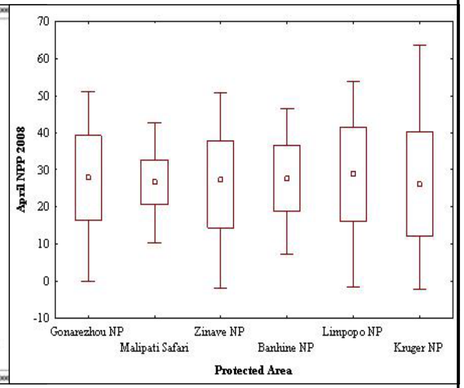




A significant variation in NPP between LSCFA and other land uses, ($p<0.05$, Scheffe multiple comparisons tests).

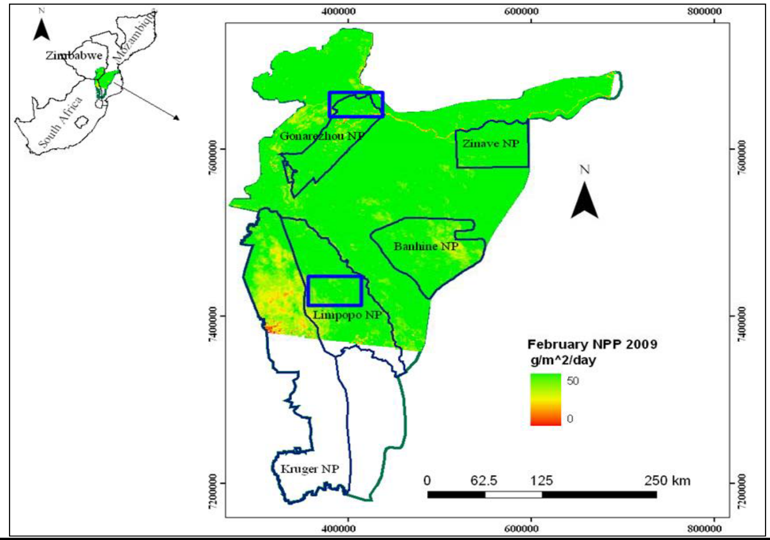
GLTP, NPP April 2008



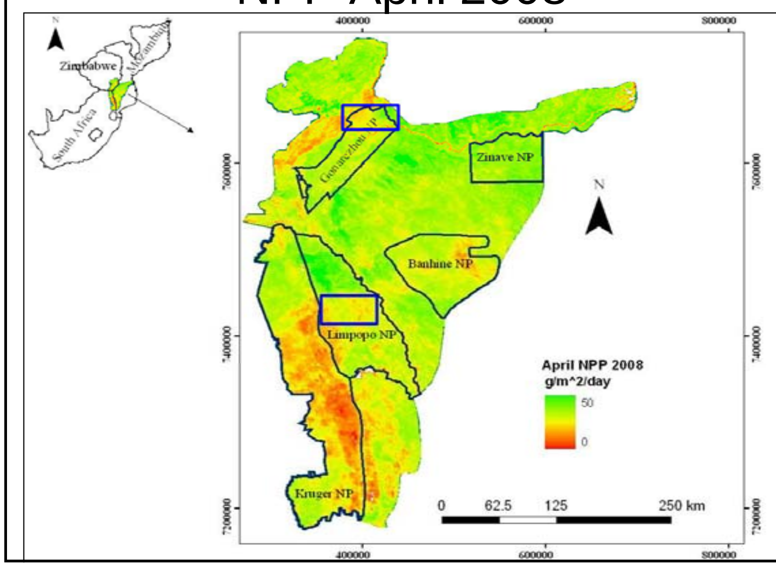


Variance in NPP differed across national parks within the GLTFCA (One-Way ANOVA, $p<0.05$)

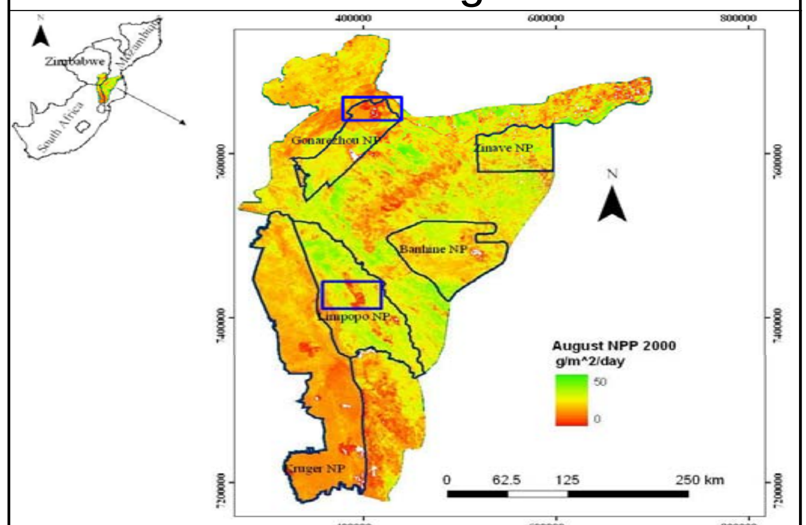
NPP February



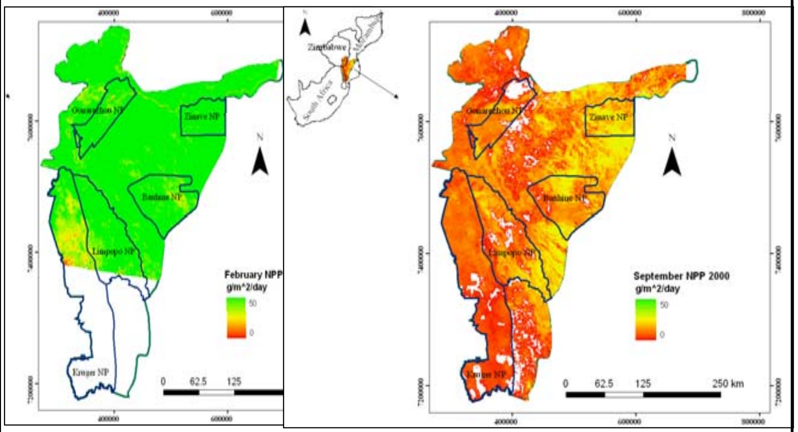
NPP April 2008



NPP August



February NPP vs September NPP



CONCLUSION

- February: little difference between zones (Wet Season).
- April: Maps indicate differences at large and small spatial scales
- Differences within the same land-use zone and also across the GLTFCA.
- August-October: Great variability across the landscape (peak of dry season).NPP levels very low (senescence).
- Study still investigating the spatial and temporal variations in NPP in more detail.

THANK YOU

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