Analysis of the Vegetation of Kafue National Park in Zambia using Remote Sensing and land-based techniques

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Presentation made at the Regional Workshop on the Applications of Global Navigation Satellite System (GNSS) Technologies in Sub-Saharan Africa

Taj Pamodzi Hotel, Lusaka - Zambia
(June 29, 2006)
Presentation Overview

1. Study Area
2. Study Objectives
3. Methodology
4. Results
Map of Zambia showing KNP and other National Parks

Oldest NP in Zambia (proclaimed in 1950);
Biggest NP (covering 22,480 sq kms)
Vegetation – a continental view

Legend / Légende

- Closed evergreen forest (>65% tree cover)
- Forest dense sempervirente
- Closed deciduous forest (>65% tree cover)
- Forest dense décide
- Swamp forest (>65% tree cover)
- Forest marécageuse
- Mangrove
- Mangrove
- Degraded evergreen forest
- Forest dense dégradée
- Mosaic Forest - Croplands
- Mosaïque forêt-agriculture
- Mosaic Croplands - Woody vegetation
- Mosaïque agriculture - végétation naturelle ligneuse
- Closed deciduous woodland (40-65% tree cover)
- Savane boisée - Forêt claire
- Open deciduous woodland (15-40% tree cover)
- Savane arbustive
- Closed shrubland with sparse trees (5-15% tree cover)
- Savane arbustive fermée à faible strate arbustive
- Closed shrubland (<5% tree cover)
- Savane arbustive fermée
- Open shrubland with sparse trees (5-15% tree cover)
- Savane arbustive ouverte à faible strate arbustive
- Open shrubland (<5% tree cover)
- Savane arbustive ouverte
- Closed grassland
- Savane herbacée fermée
- Open grassland with sparse trees (5-15% tree cover)
- Savane herbacée ouverte à faible strate arbustive
- Open grassland (<5% tree cover)
- Savane herbacée ouverte
- Sparse grassland
- Pseudo-stipe
- Swamp bushland and grassland
- Savane herbacée inondée
- Rain-fed agriculture
- Agriculture pluviale
- Irrigated agriculture
- Agriculture irriguée
- Mosaic Croplands - grasslands
- Mosaïque agriculture - savane herbacée
- Orchards
- Vergers
- Bare soil
- Sol nu
- Salt marshes
- Dépôts salins
- Waterbodies
- Eaux

[Map of Africa showing various vegetation types]
Vegetation – a continental view
Vegetation – a continental view

- Scale compromises the diversity of vegetation types

Zambia: covered by Woody vegetation & Closed Shrubland
Vegetation – a continental view

Scale compromises the diversity of vegetation types

**Legend / Légende**

- Closed evergreen forest (>65% tree cover)
- Forti dense sempervirente
- Closed deciduous forest (>45% tree cover)
- Forti dense décide
- Swamp forest (>65% tree cover)
- Forti marécageuse
- Mangrove
- Mangrove
- Degraded evergreen forest
- Forti dense dégradée
- Mosaic Forest - Croplands
- Mosaïque forêt-agriculture
- Mosaic Croplands - Woody vegetation
- Mosaïque agriculture - végétation naturelle ligneuse
- Closed deciduous woodland (40-65% tree cover)
- Savane boisée - Forti claire
- Open deciduous woodland (15-40% tree cover)
- Savane arborée
- Closed shrubland with sparse trees (5-15% tree cover)
- Savane arbustive formée a faible strate arboresce
- Closed shrubland (<5% tree cover)
- Savane arbustive formée
- Open shrubland with sparse trees (5-15% tree cover)
- Savane arbustive ouverte a faible strate arboresce
- Open shrubland (<5% tree cover)
- Savane arbustive ouverte
- Closed grassland
- Savane herbescence formée
- Open grassland with sparse trees (5-15% tree cover)
- Savane herbescence ouverte a faible strate arboresce
- Open grassland (<5% tree cover)
- Savane herbescence ouverte
- Sparse grassland
- Pseudosavane
- Savanna bushland and grassland
- Savane herbescence inodore
- Irrigated agriculture
- Agriculture irrigée
- Mosaic Croplands - grasslands
- Mosaïque agriculture - savane
- Orchards
- Verger
- Bare soil
- Sol nu
- Salt hardspans
- Dépôts sels
- Waterbodies
- Eau

**ZAMBI A:** covered by Woody vegetation & Closed Shrubland

**KNP:** Covered by Closed Shrubland with sparse trees (5 - 15% tree cover) and Closed Shrubland (<5% tree cover)
Study Objective & Rationale

- **Study Objective:** To conduct research intended to generate information on the diversity, structure and distribution of the vegetation

- **Rationale:**
  - Vegetation is important in the provision of diverse range of habitats upon which the distribution of and relative densities of most animals depend – yet there is little information about the vegetation.
  
  - Management and/or research work that require the evaluation of wildlife and habitat relationships will need information on vegetation measurements.
Methodology

Remote Sensing & GIS

- Initial differentiation of vegetation – Aerial photos;
  - AP interpreted stereoscopically
  - Uncontrolled photo-mosaic of portions of the Park – interpreted monoscopically
  - Natural vegetation boundaries drawn corresponding to homogeneous vegetation types

Key to Vegetation Structure

- Grassland
- Wooded Grassland
- Open Shrubland
- Open Woodland
- Dense Shrubland
- Shrubland
- Woodland
- Dense Thicket
- Thicket
- Forest

Major physiognomic units are in italics
Methodology

Remote Sensing & GIS

Landsat Thematic Mapper images (two scenes taken May 19, 1993 and two scenes taken April 11, 1994)

- Landsat TM data were georeferenced to the system used for topographic maps used in Zambia;

- Images first trimmed to cover the Park with ample margin;

- Images were then contrast-marched and mosaicked using the nearest-neighbour algorithm;

- Computer assisted classification using very broad vegetation cover classes (Forest, Woodland, Shrubland and Grassland) was used to prepare preliminary vegetation map – using TNT Mips software
Methodology

**Land-based techniques:**

- Plot sizes determined: 20m X 20m (Forest); 30m X 30m (Woodland); 10m X 50m (Riparian Forest) and 50cm X 50cm (Grassland)
- Plant species identified and measurements (dbh, height, crown, etc) recorded
- Vegetation classification done based on field observations
Basis for setting optimum sampling size

Plot Size (sq m)

Number of species

Density of species
Land-based techniques - cont

- Plot marking system GPS location

Data collected:
- Tree / Shrub identification
- Plant relative location
- Circumference or DBH
- Height and crown cover size
- Soil sample to max depth of 120cm

- Traversed some vegetation types to establish boundaries
Methodology used a combination of data sources

PASTL: Panchromatic aerial photos - Aerial survey - Satellite imagery - Topographic maps - Land-based techniques

- Landsat Images
- Panchromatic aerial photographs
- Topographic Maps + other existing data
- Computer-assisted classification - GIS
- Visual Interpretation
- Aerial Survey
- Preliminary Vegetation Map
- Land-based Techniques: - field work
- Vegetation Classification
- Vegetation Map
Results
Kafue National Park - Vegetation Map

Compiled By: Henry Kankomba MWIMA
Data Sources: Digital Vegetation Map (Kohira, 1998)
Landsat Images: TM band 1-6 (May '93/April '94)
Multivariate Analysis
- TWI NSPAN -

- 100% grouping of *Acacia* and Mopane Woodlands
- 93% *Baikiaea* Forest quadrats grouped together
- 91% of the 72 sample plots for Miombo were grouped together
- 88% each of Combretaceae and Riparian quadrats grouped together
- 87% grouping of Thicket quadrats
- 50% of Shrubland quadrats grouped together
- Wooded Grassland and Termitaria were not grouped together
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Thank You