

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

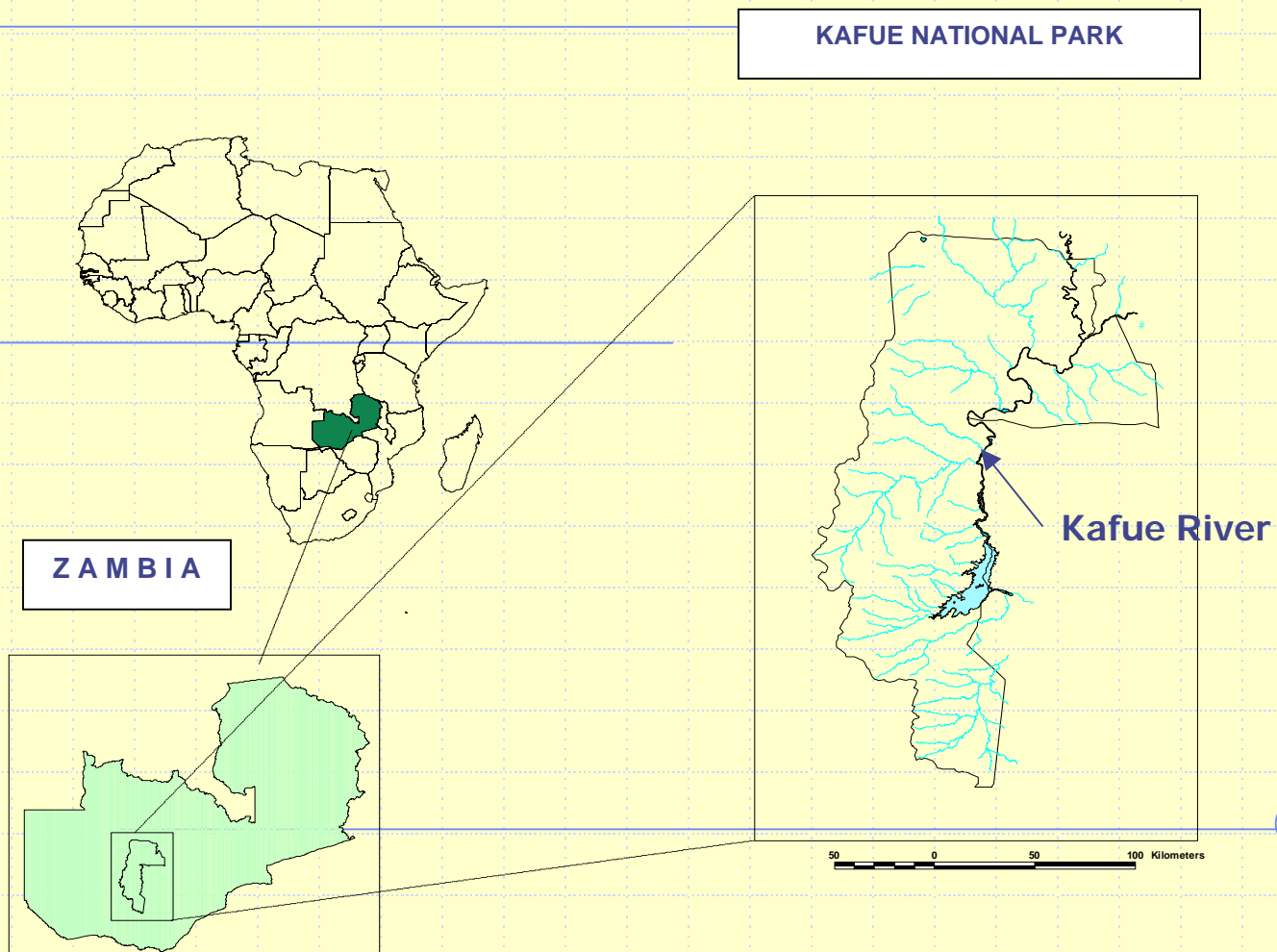
**Taj Pamodzi Hotel, Lusaka – Zambia
(June 29, 2006)**



Presentation Overview

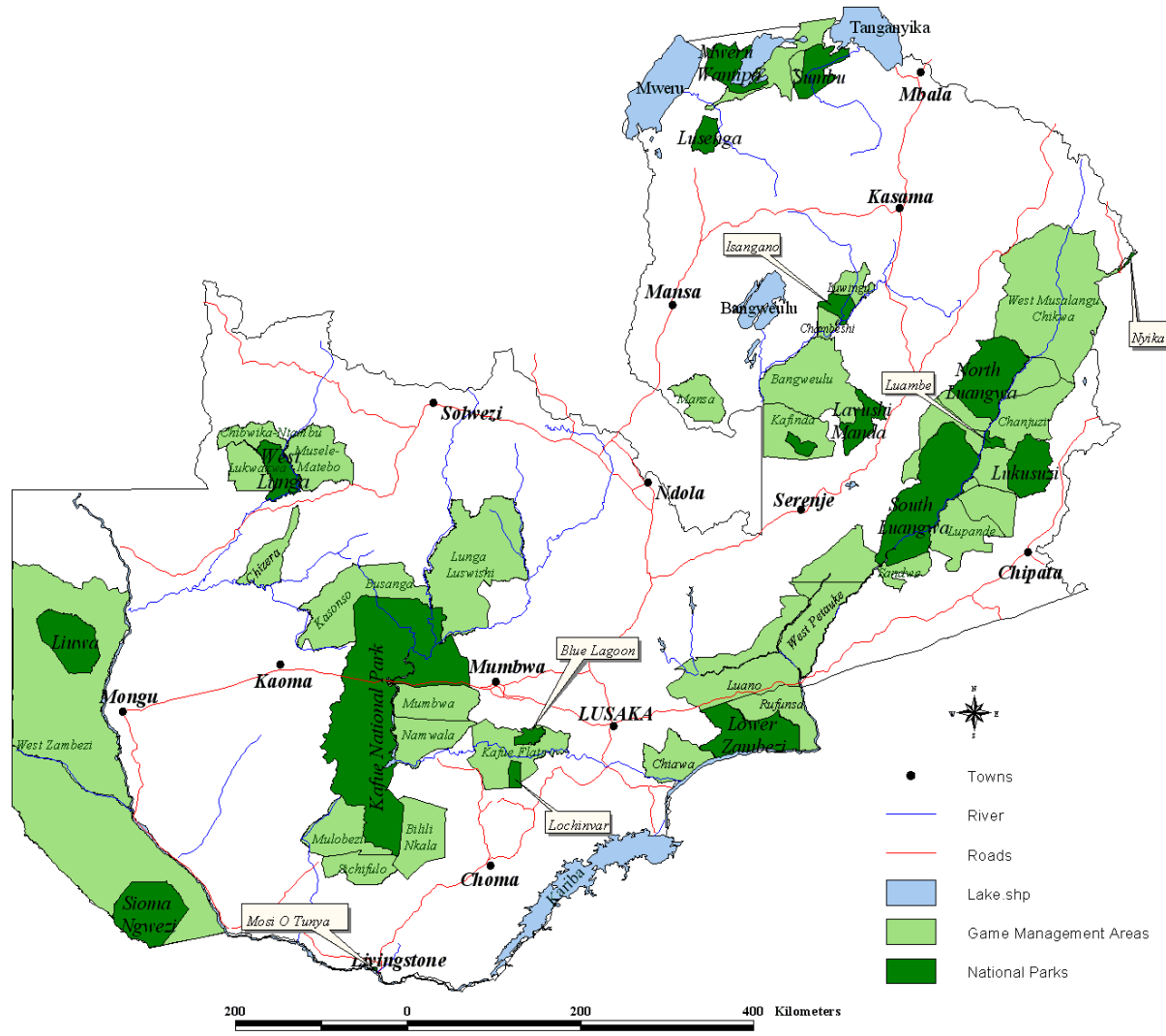
1. Study Area
2. Study Objectives
3. Methodology
4. Results

Location of Kafue National Park



Map of Zambia

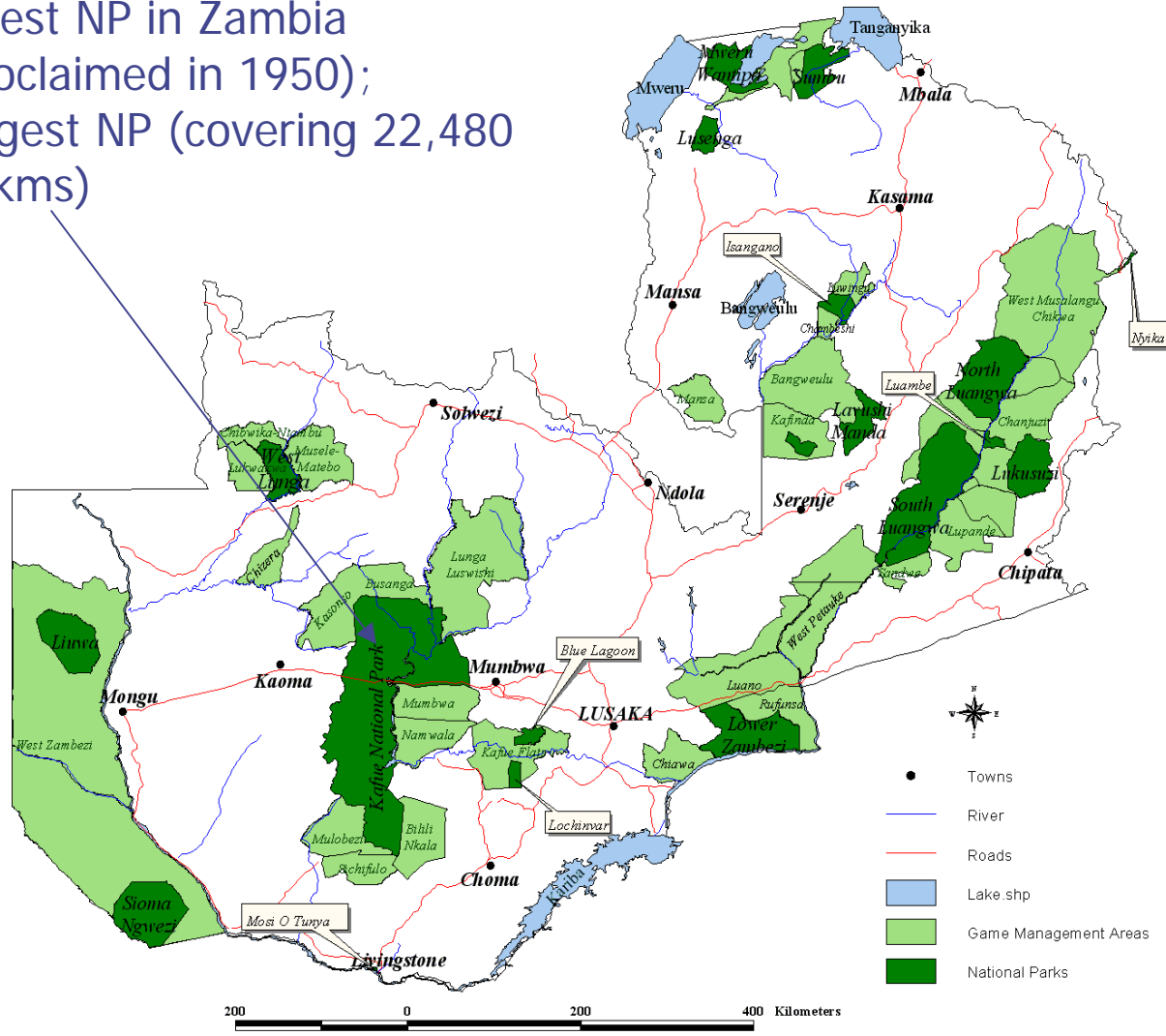
showing KNP and other National Parks



Map of Zambia

showing KNP and other National Parks

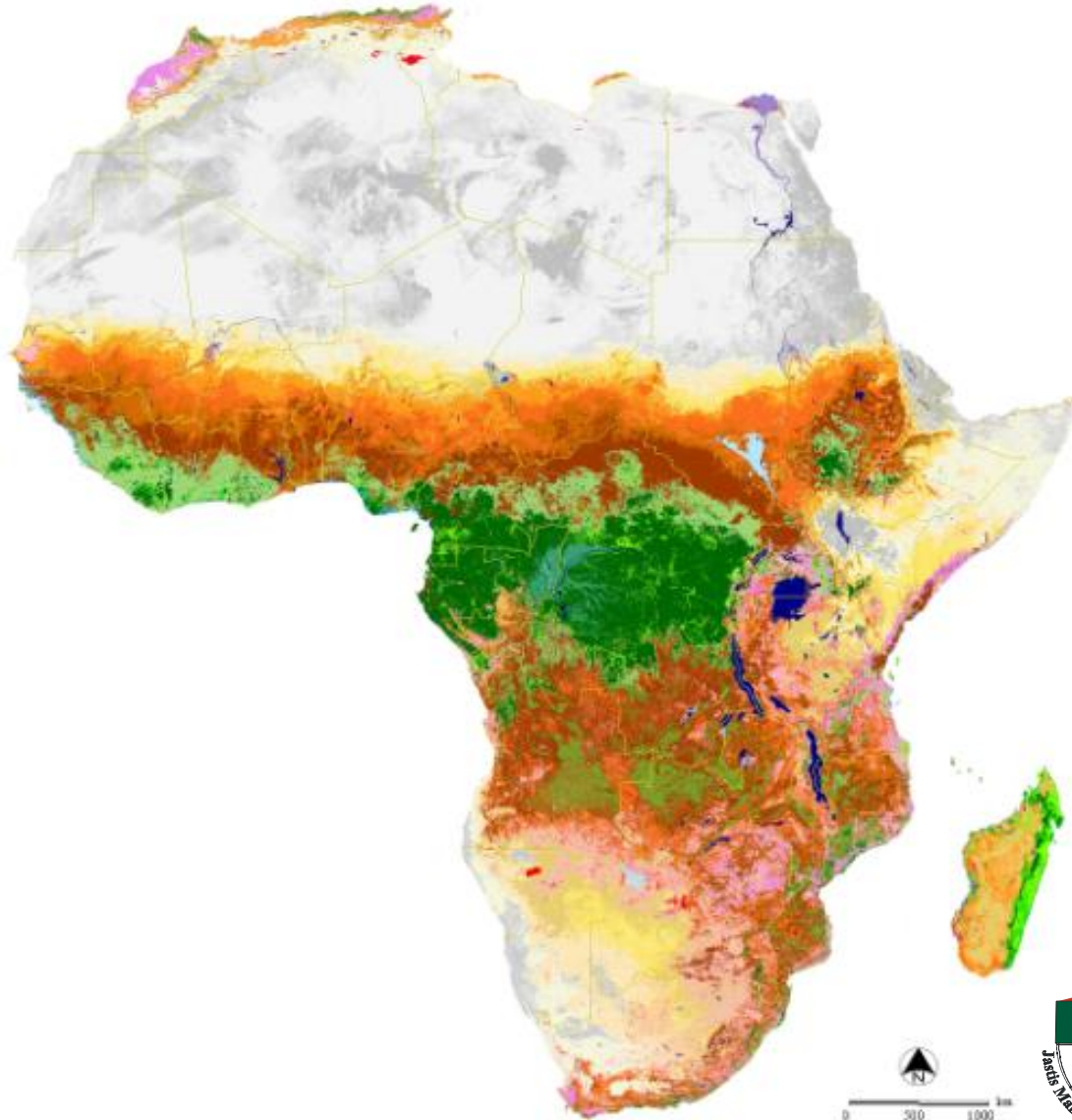
Oldest NP in Zambia
(proclaimed in 1950);
Biggest NP (covering 22,480
sq kms)



Vegetation – a continental view

Legend / Légende

- Closed evergreen forest (>65% tree cover)
Forêt dense sempervérente
- Closed deciduous forest (>65% tree cover)
Forêt dense décidue
- Swamp forest (>65% tree cover)
Forêt marécageuse
- Mangrove
Mangrove
- Degraded evergreen forest
Forêt 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 arborée
- Closed shrubland with sparse trees (5-15% tree cover)
Savane arbustive fermée à faible strate arborée
- Closed shrubland (<5% tree cover)
Savane arbustive fermée
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Savane arbustive ouverte
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Savane herbueuse ouverte à faible strate arborée
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Savane herbueuse ouverte
- Sparse grassland
Pseudo-steppe
- Swamp husband and grassland
Savane herbueuse inondée
- Rain-fed agriculture
Agriculture pluviale
- Irrigated agriculture
Agriculture irriguée
- Mosaic Croplands - grasslands
Mosaïque agriculture - savane herbueuse
- Orchards
Vergers
- Bare soil
Sol nu
- Salt hardpans
Dépôts salins
- Waterbodies
Eau

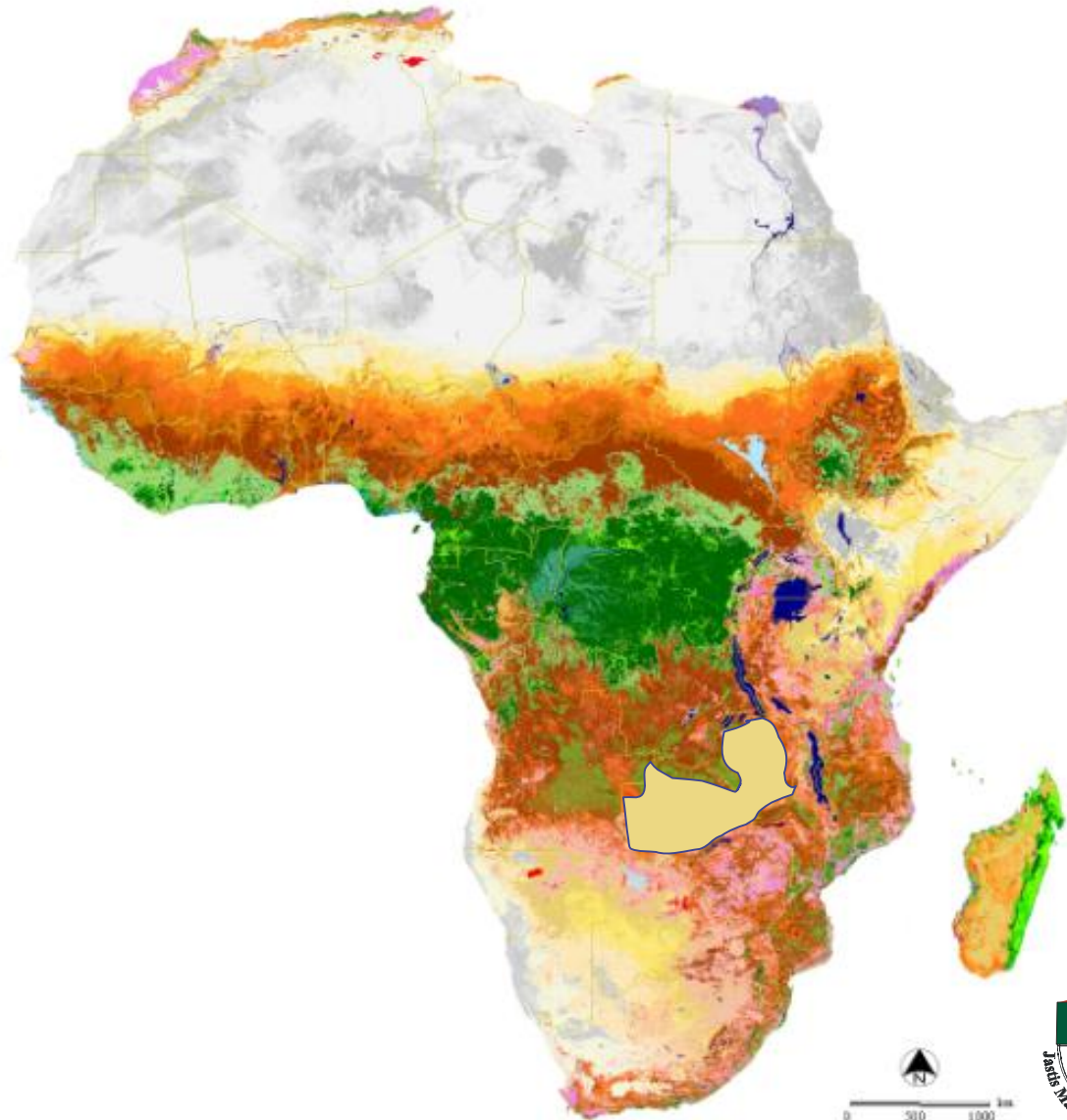


GLC
2000
GLOBAL LAND COVER 2000

Vegetation – a continental view

Legend / Légende

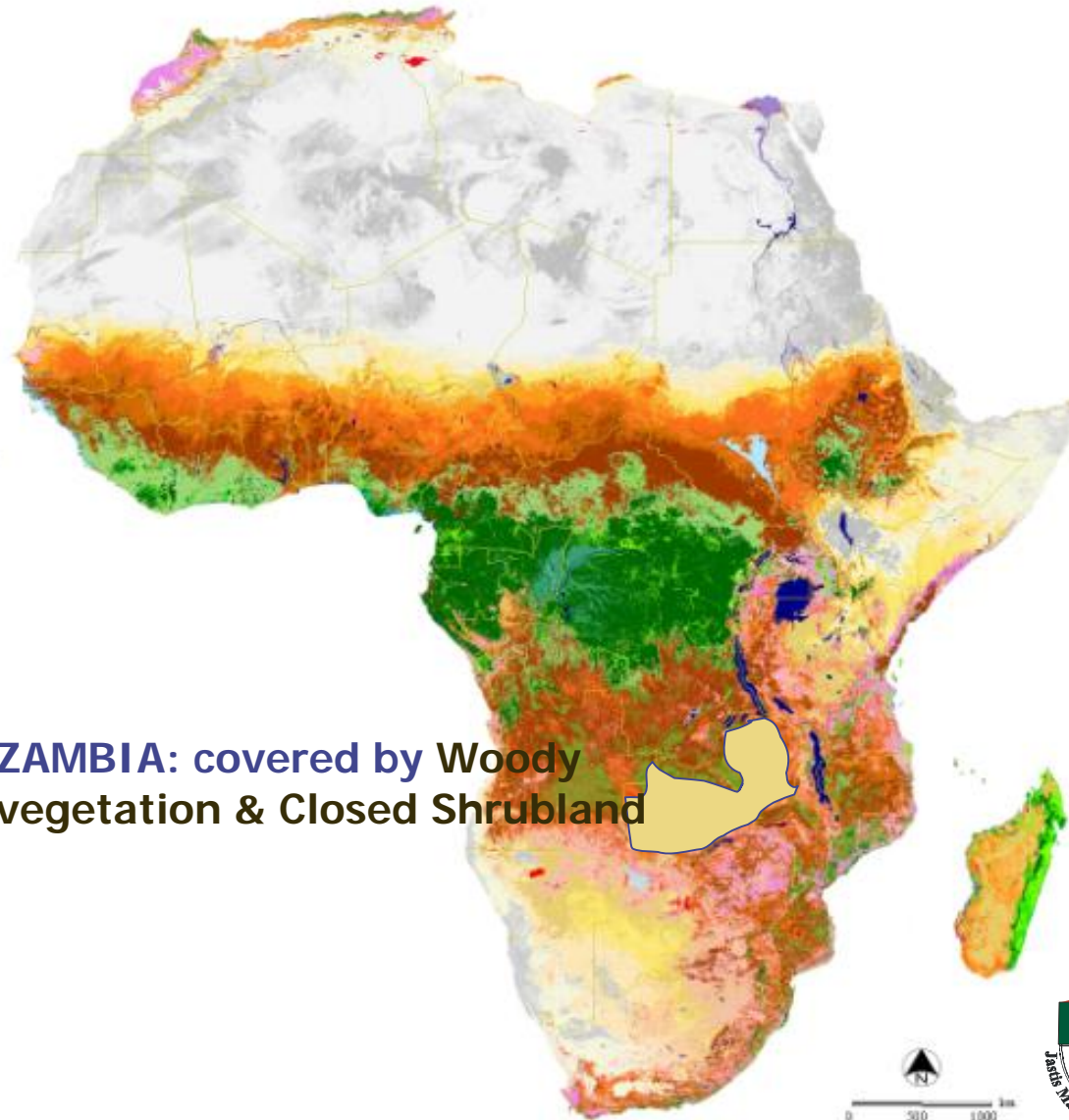
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Vegetation – a continental view

◆ Scale compromises the diversity of vegetation types



ZAMBIA: covered by Woody vegetation & Closed Shrubland

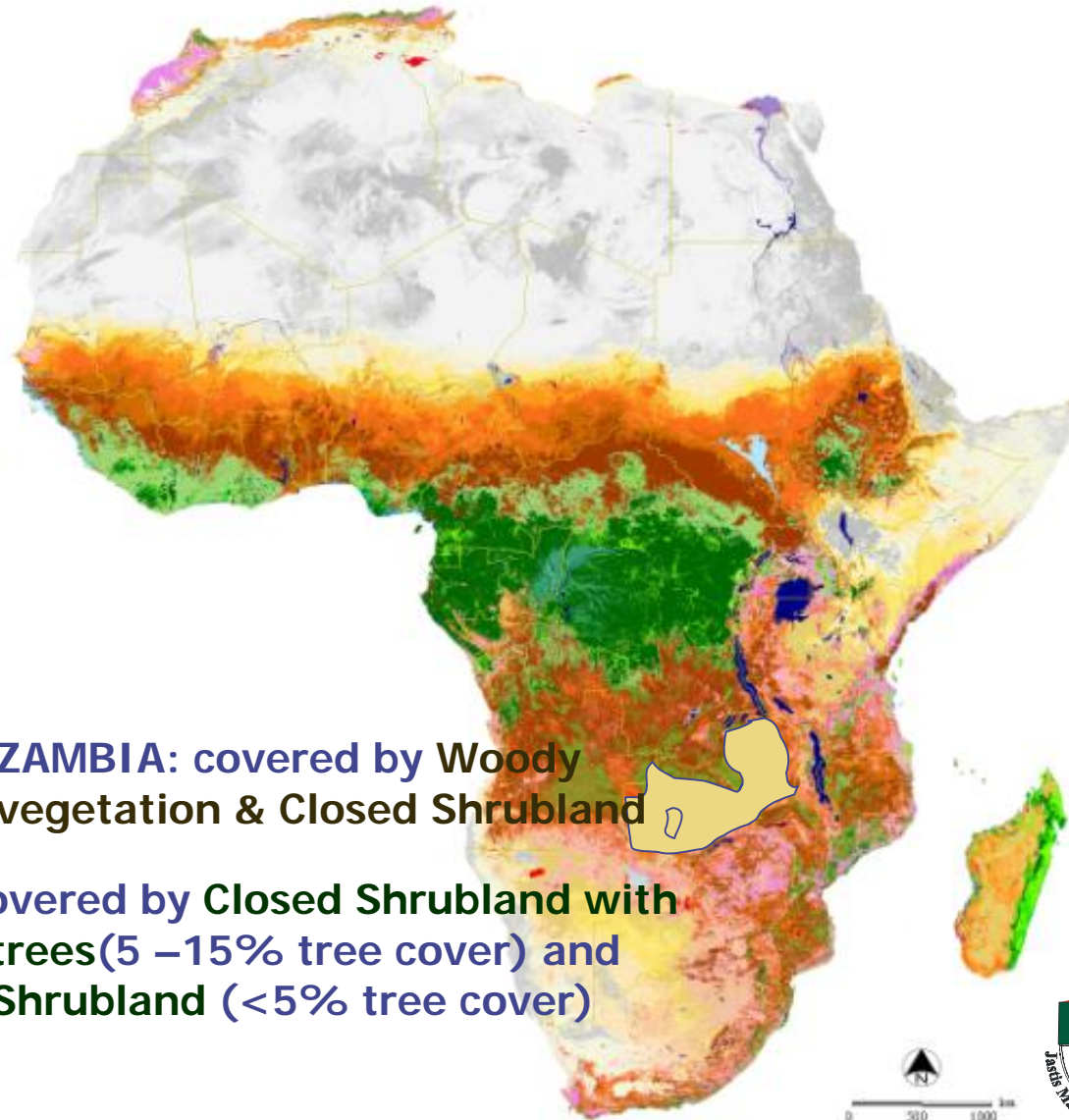


Vegetation – a continental view

◆ Scale compromises the diversity of vegetation types

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	Orchards Vergers
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	Waterbodies Eau



ZAMBIA: 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*

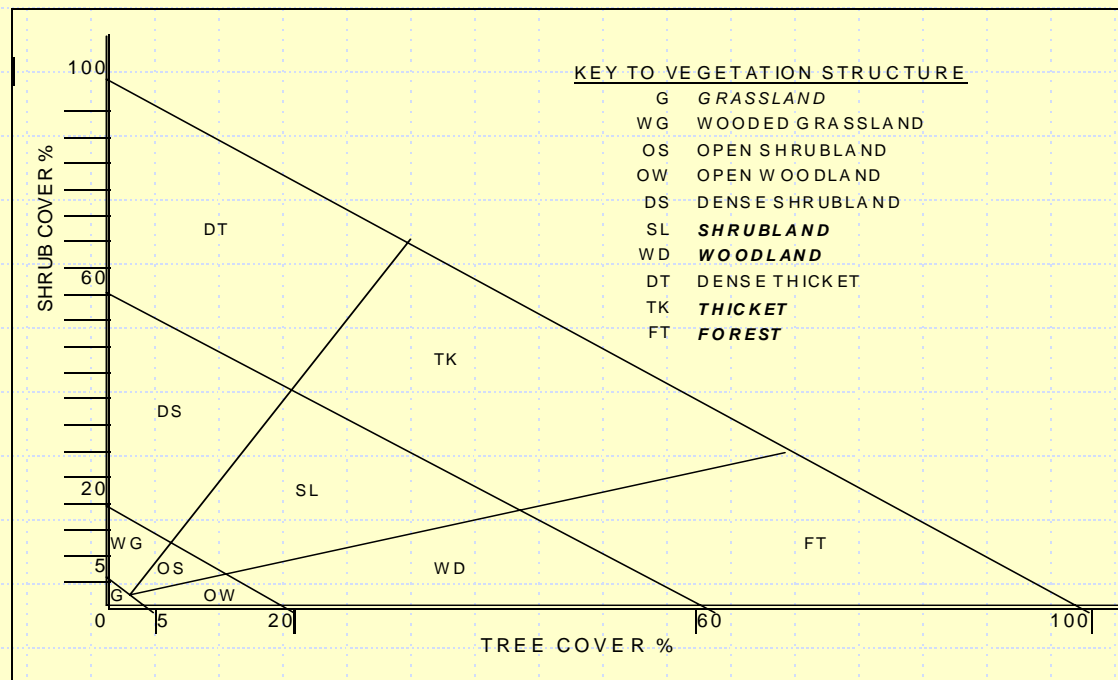
◆ **Rationale:**

- 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



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-matched 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

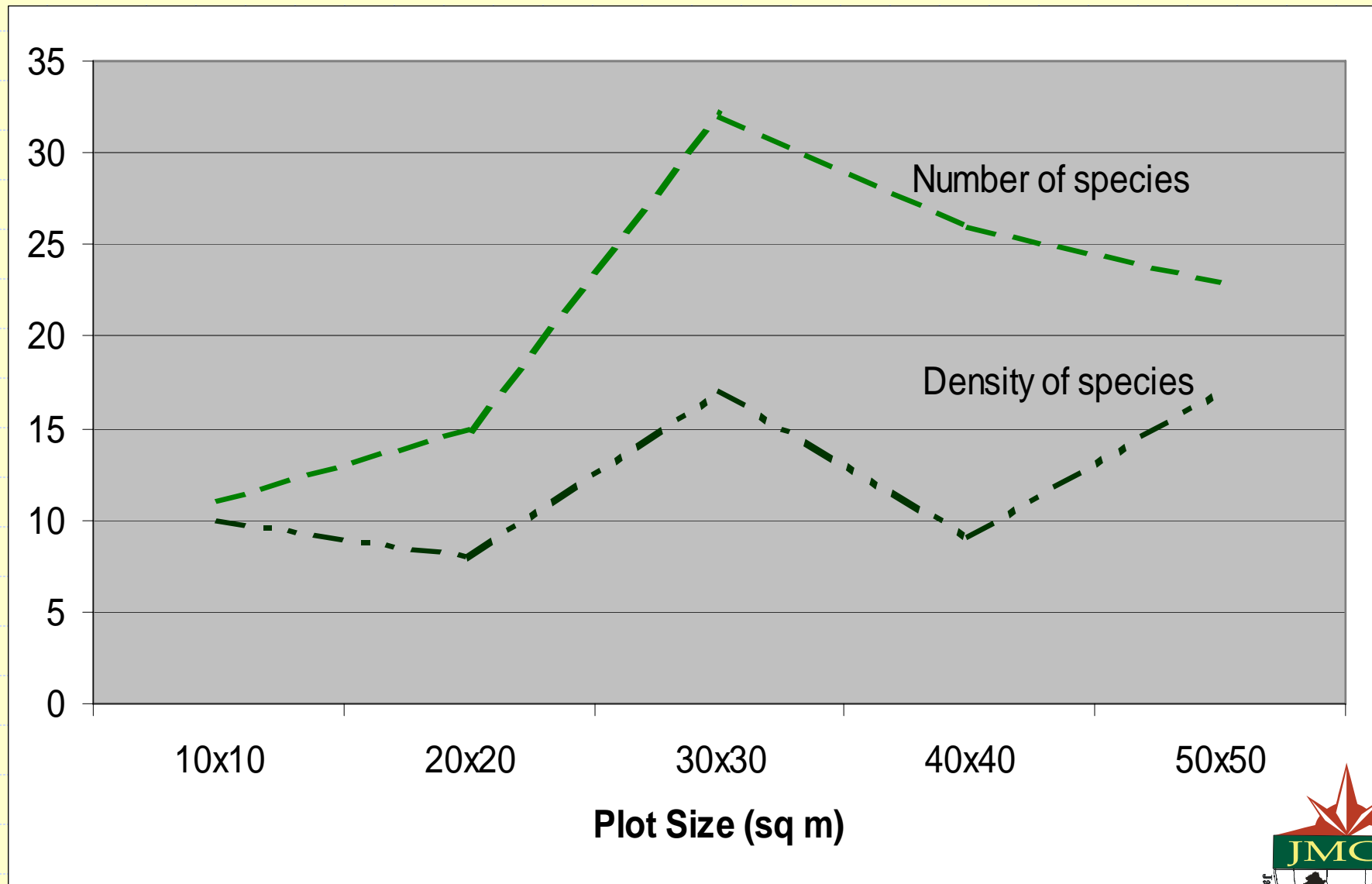
Methodology

◆ 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



Land-based techniques - cont

- Plot marking system GPS location

- Data collected:

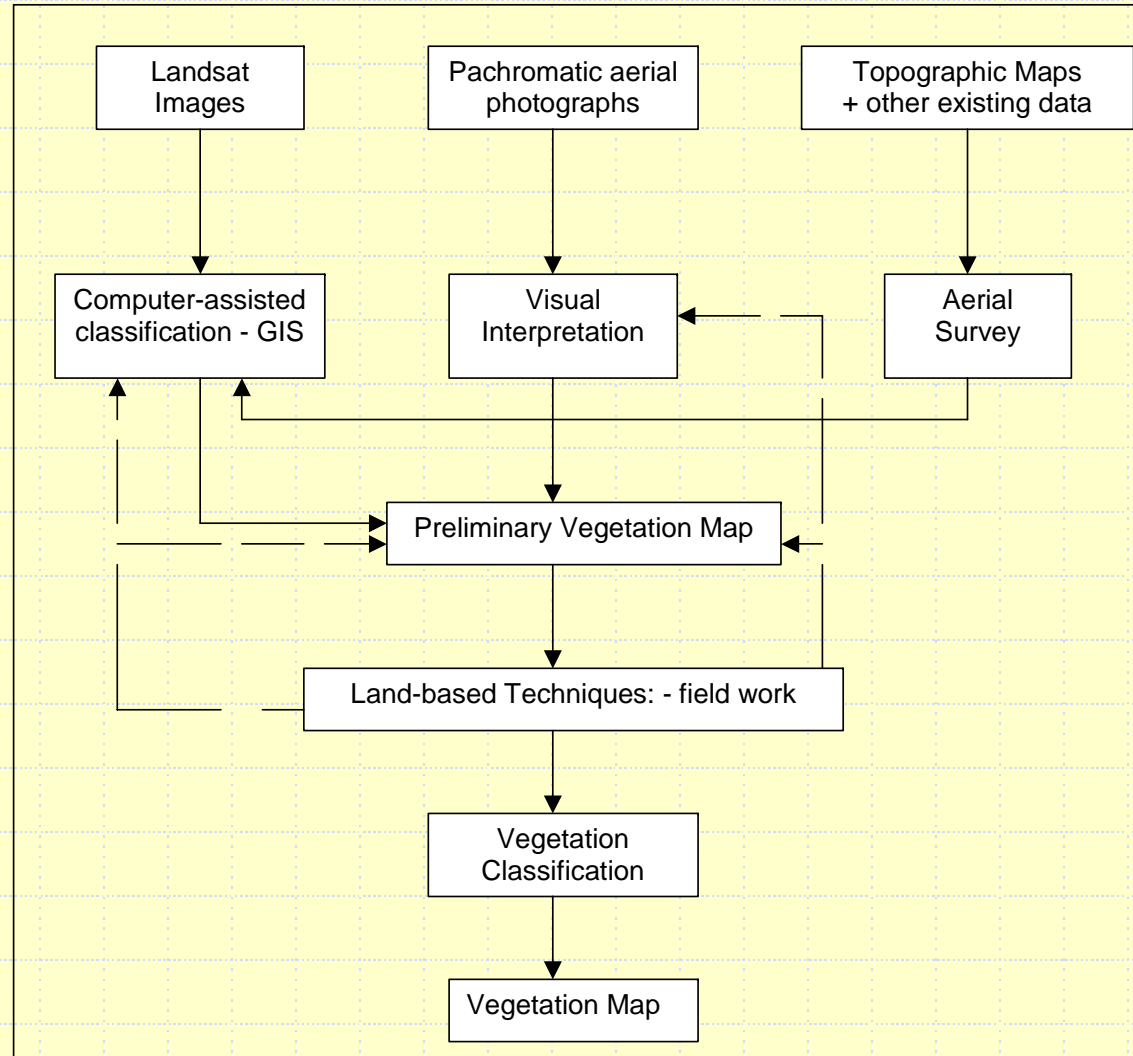
- ◆ Tree / Shrub identification
- ◆ Plant relative location
- ◆ Circumference or DBH
- ◆ Height and crown cover size
- ◆ Soil sample to max depth of 120cm

- Traversed some vegetation types to establish boundaries

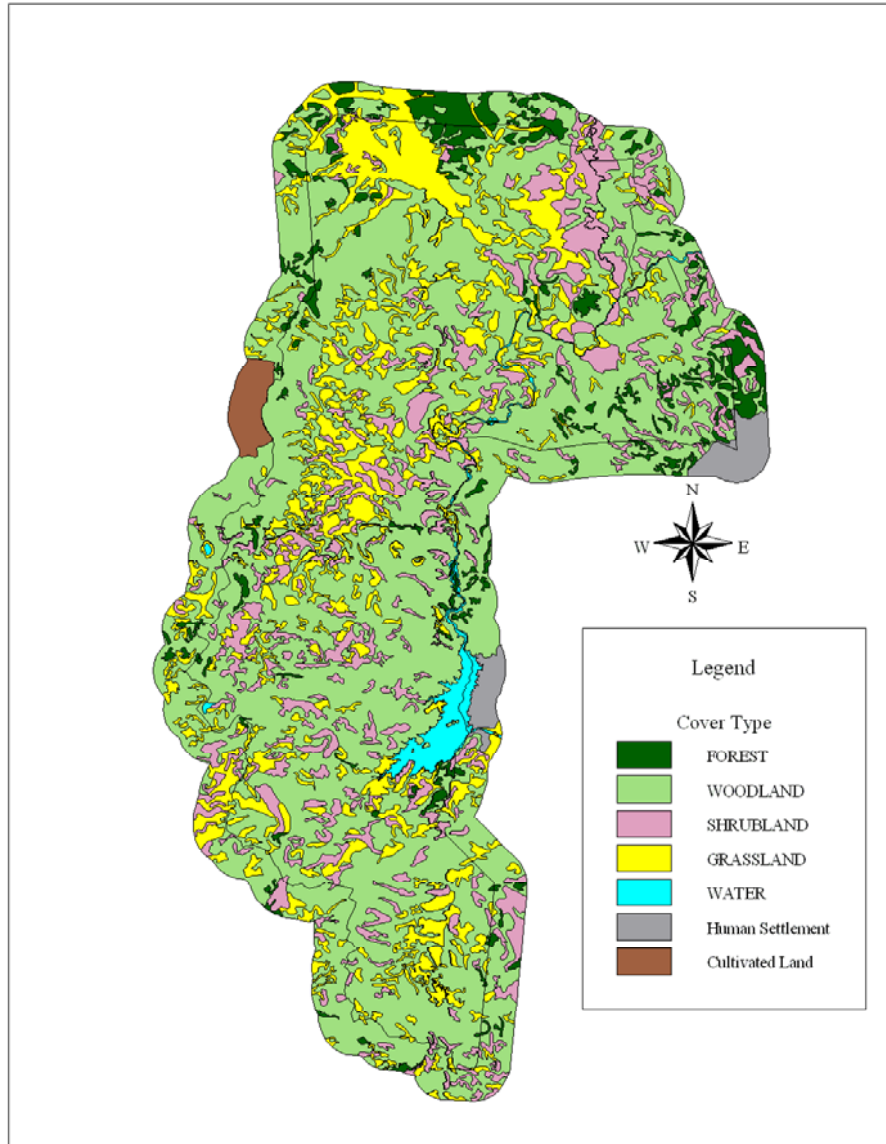


Methodology used a combination of data sources

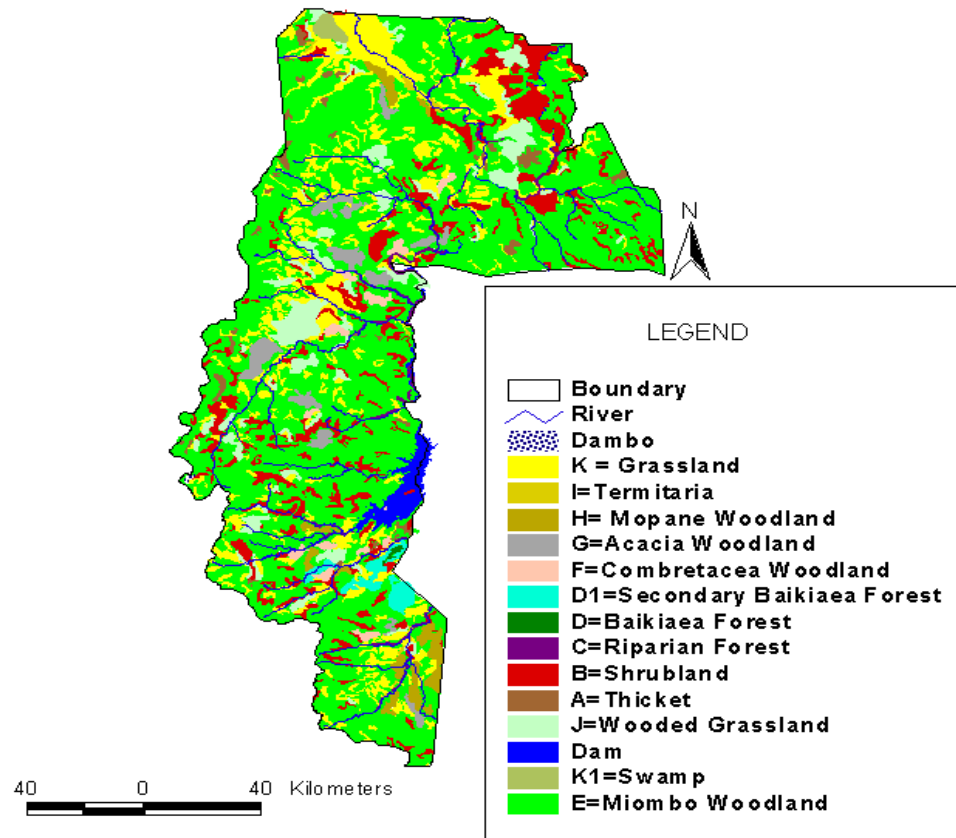
PASTL: **P**anchromatic aerial photos – **A**erial survey – **S**atellite imagery – **T**opographic maps – **L**and-based techniques



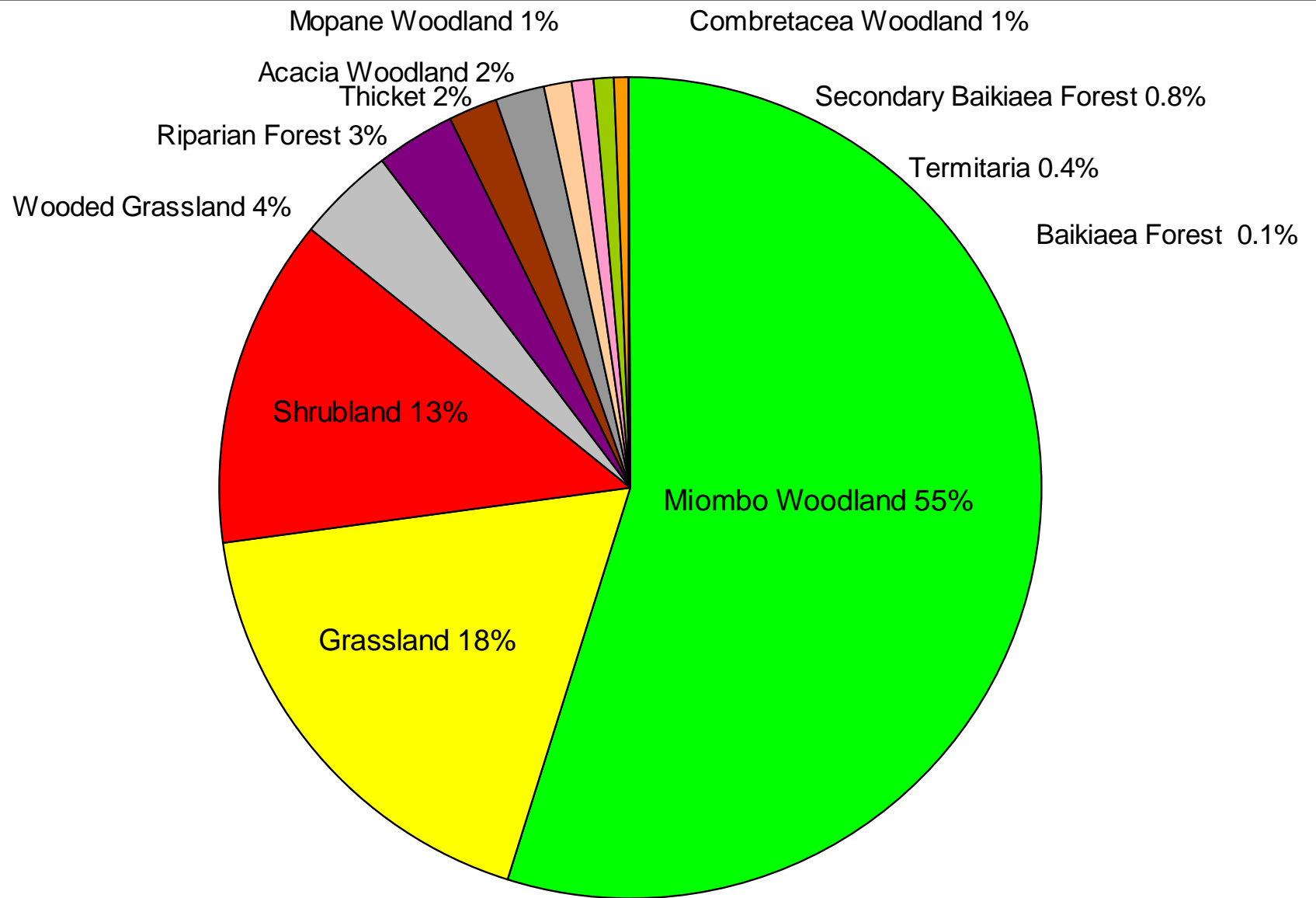
Results



Kafue National Park - Vegetation Map



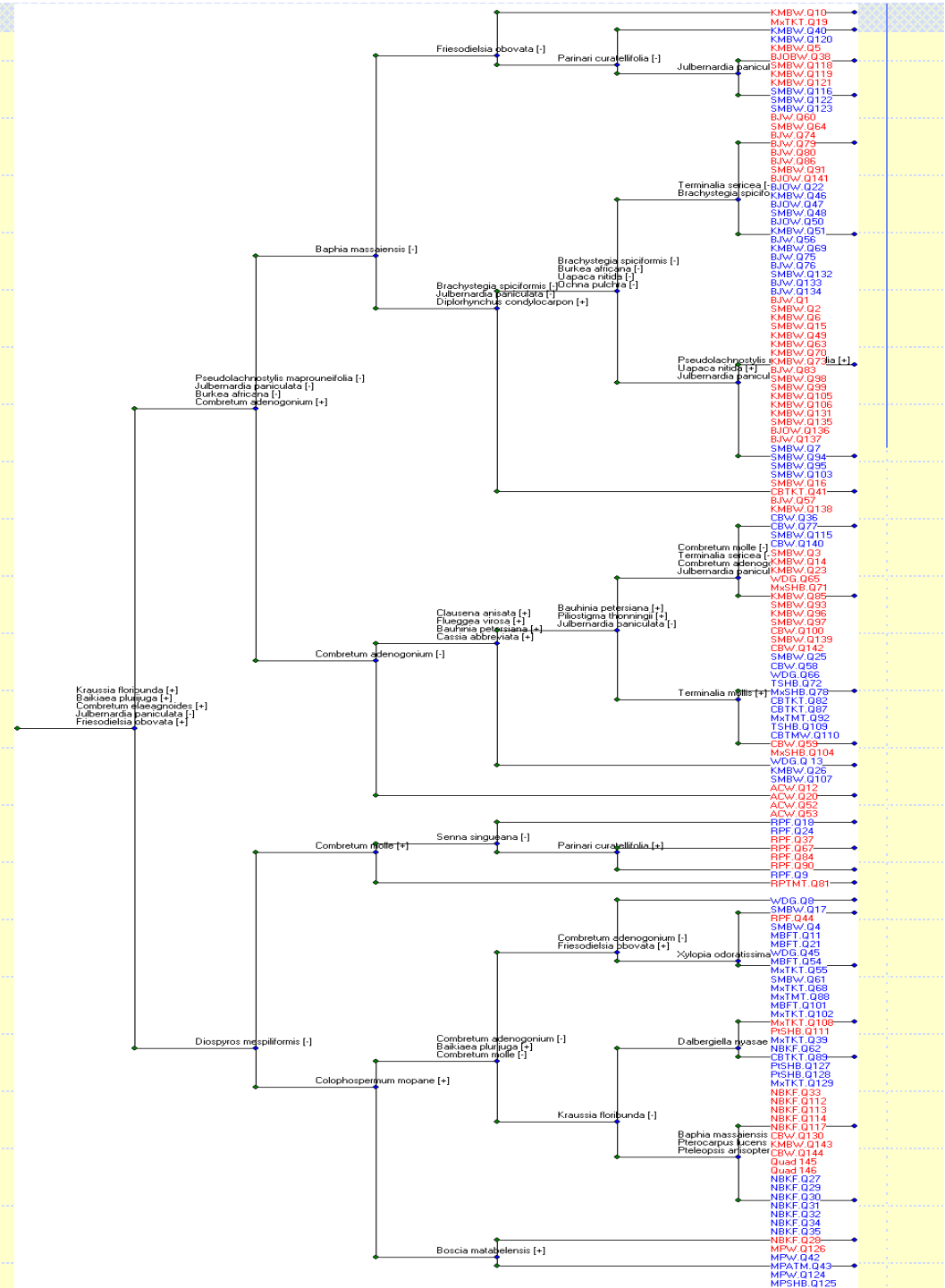
Compiled By :Henry Kankomba MWIMA
Data Sources :Digital Vegetation Map (Kohira, 1998)
Field Data Collected; Mar, Jun, Sep.1997, Jun-Oct.1998, May-Oct.1999.
Landsat Images TM band 1-5 (May '93/April '94)
Aerial Photos; 1970,1980,1981,1982



Multivariate Analysis

- TWINSPLAN -

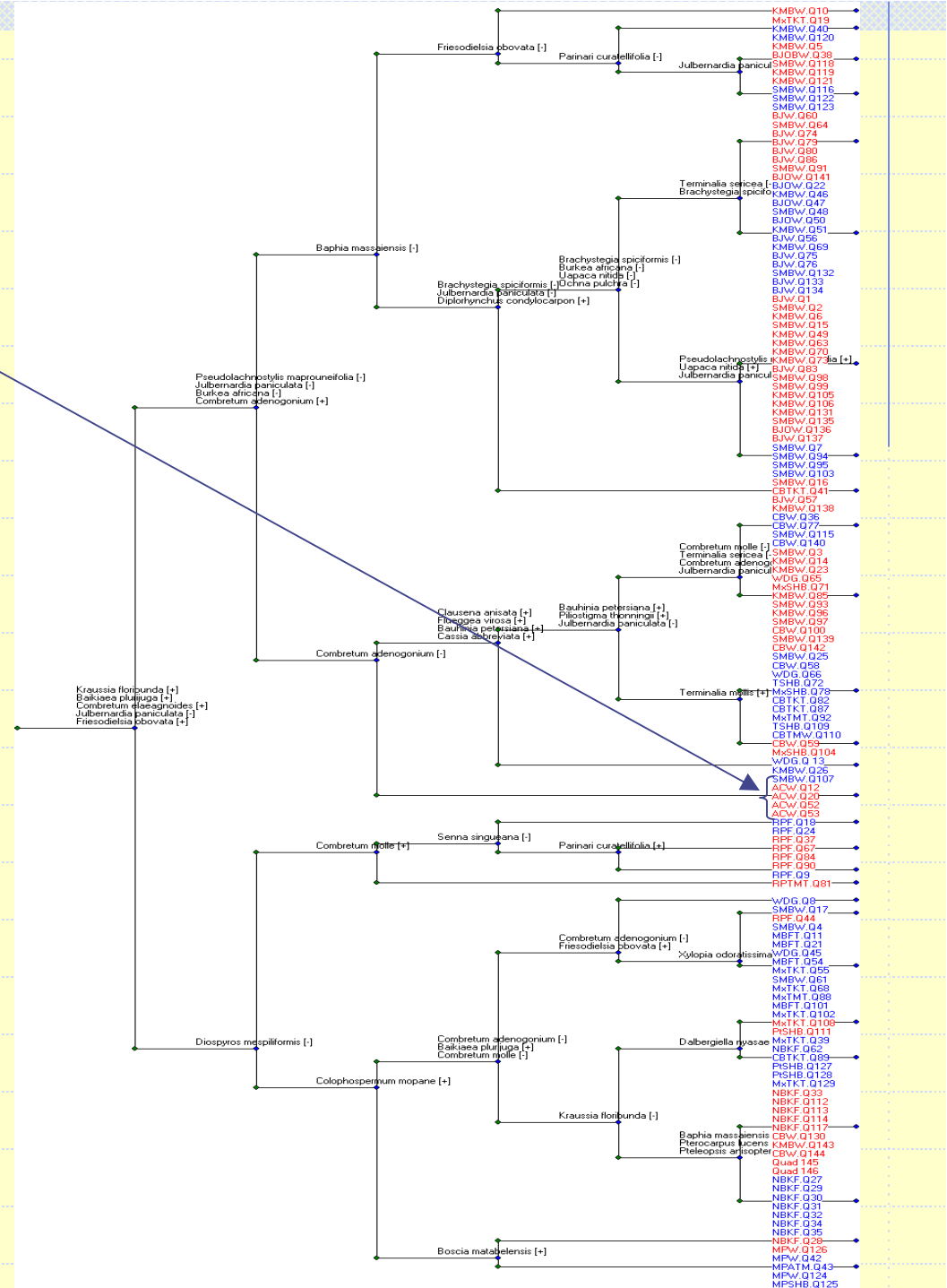
- ◆ 100% grouping of *Acacia* and Mopane Woodlands
- ◆ 93% *Baikiaea* Forest quadrats grouped together
- ◆ 91% of the 72 sample plots for Miombo were grouped together
- ◆ 88% each of of Combretaceae and Riparian quadrats grouped together
- ◆ 87% grouping of Thicket quadrats
- ◆ 50% of Shrubland quadrats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



Multivariate Analysis

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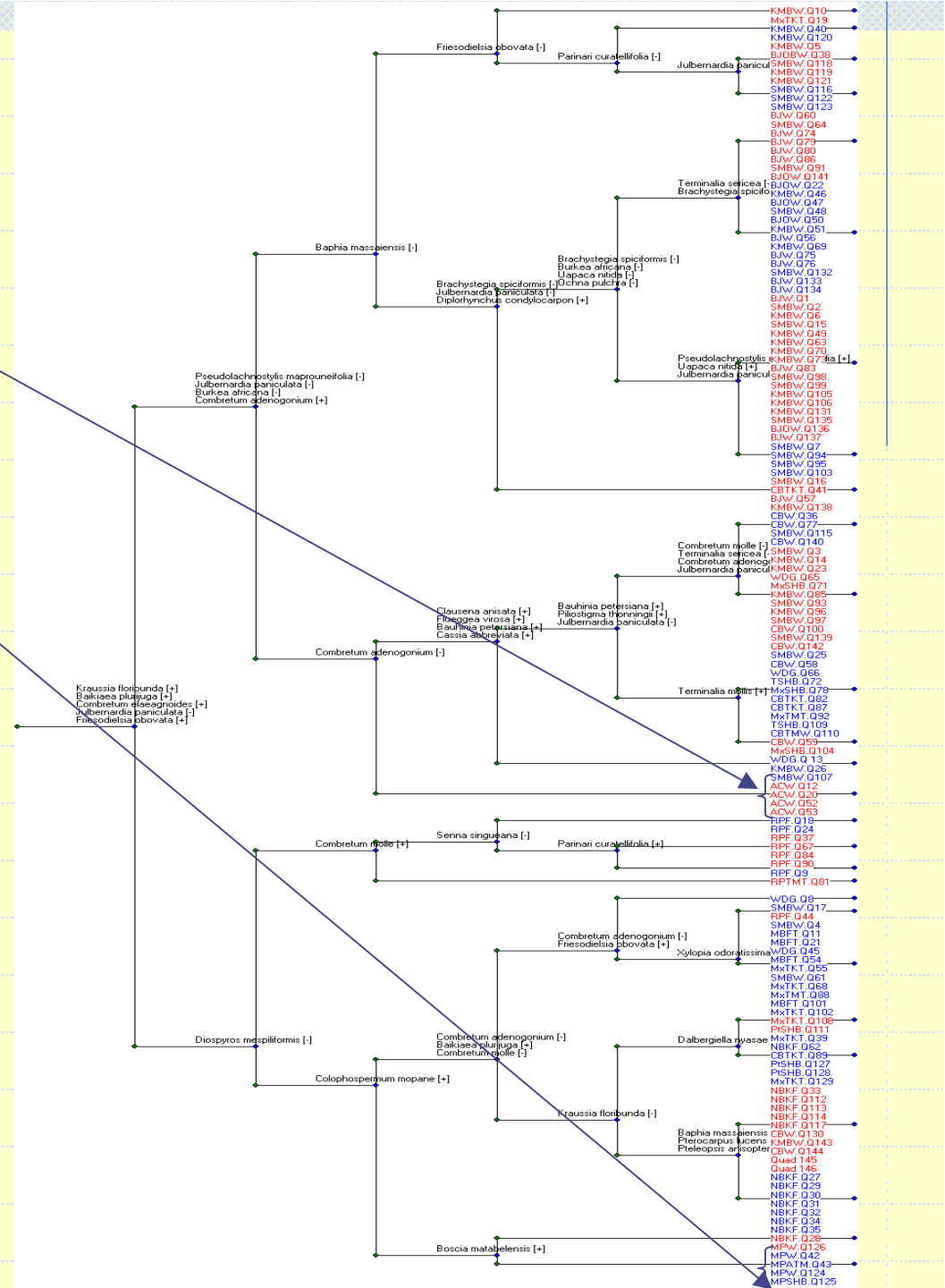
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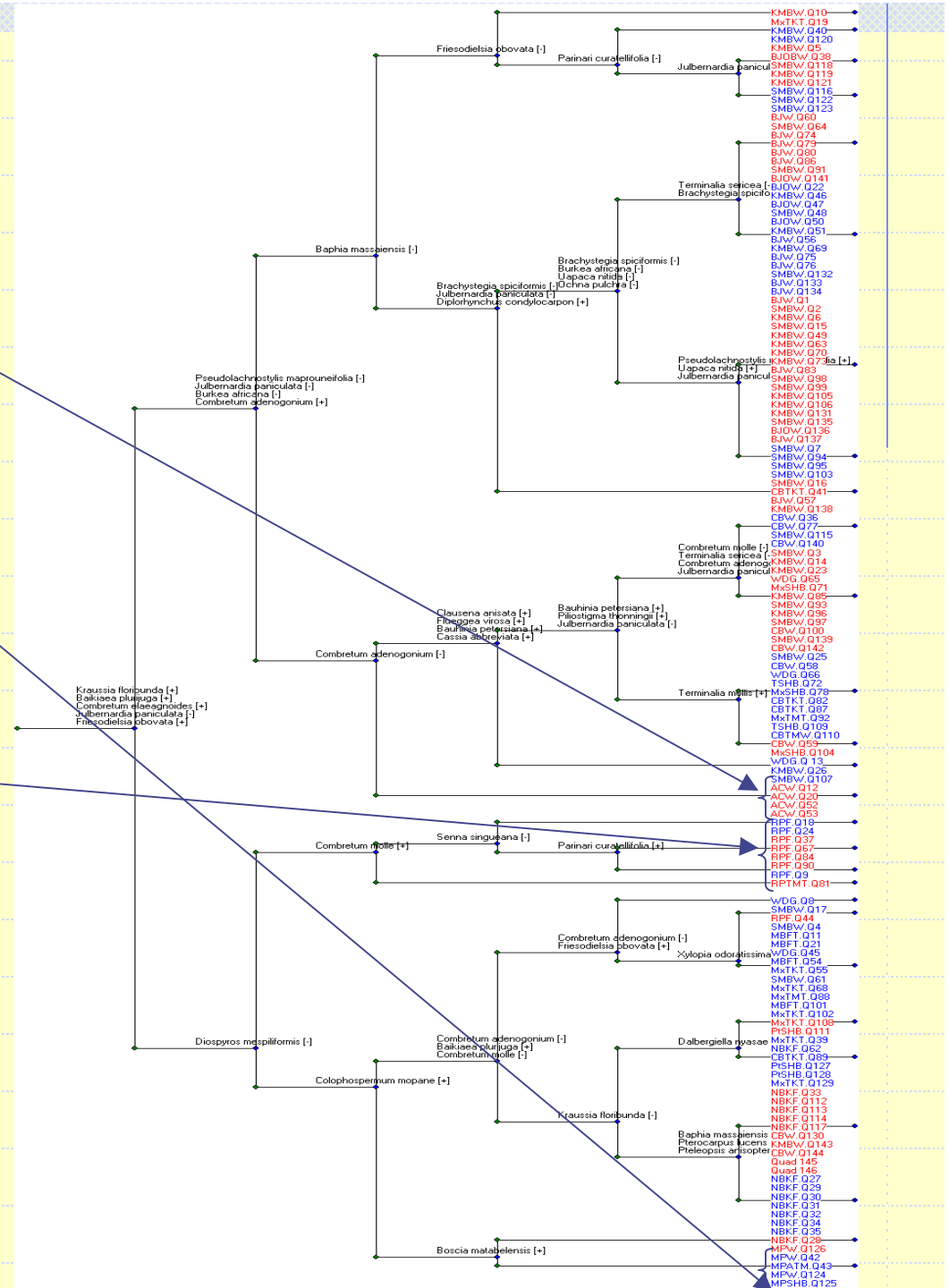
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Thank You

