Conceptualising the hydrology of tropical wetland habitats to inform biodiversity management in northern Zambia

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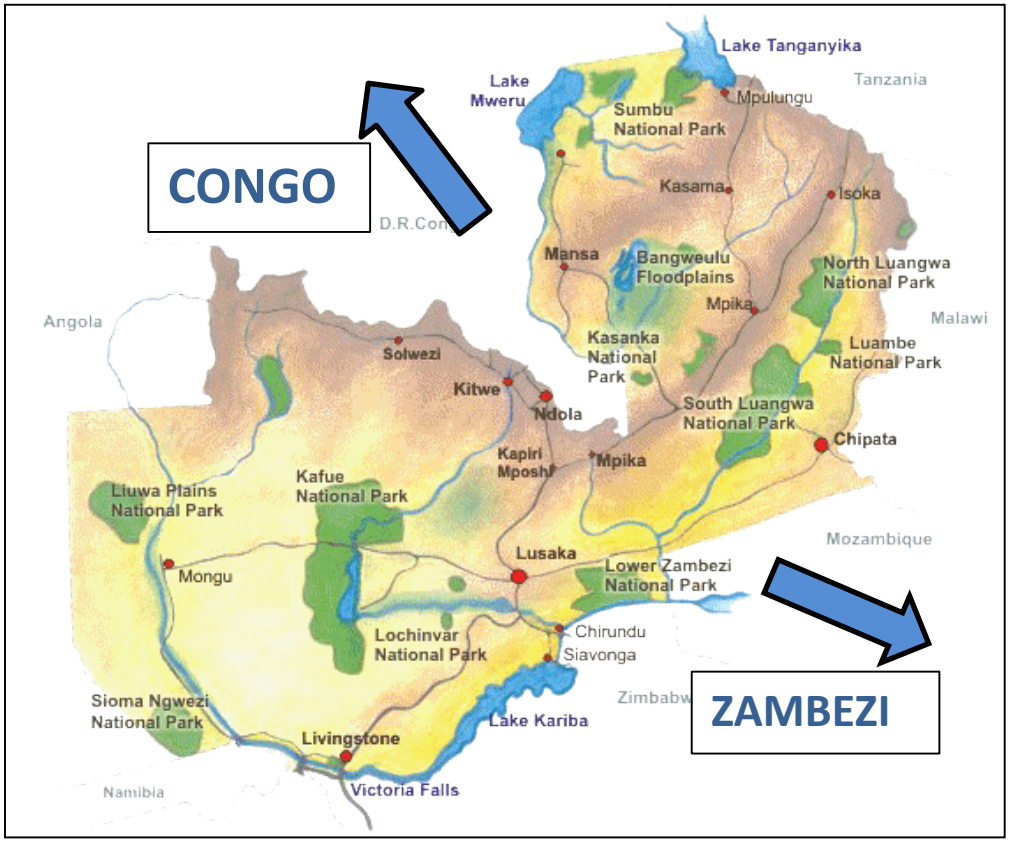
Overview

- Zambia: Introduction and natural resources
- Potential threats to key habitats
- Study area and aims
- Results
- Conclusions and further work

DARWIN INITIATIVE

The Hollyhill Charitable Trust

Zambia



- 19 National Parks and 34 adjoining Game Management Areas (GMAs) make up a third of Zambia's area
  - Mainly riverine wetlands and seasonally inundated floodplains

Zambia

- One of the poorest countries (DfID), limited economic base
- One of Least Developed Countries (United Nations)
- Estimated 10% of population formally employed
  - Potentially >20,000 in tourism
- Unlikely to meet key Millennium Development Goals by 2015:
  - MDG 1: 'End Poverty and Hunger'
  - MDG 7: 'Ensure Environmental Sustainability'
- **Projected c. 1000% population growth rate by 2100**
  - currently 13-14 million, to over 100 million?
- Maintenance of river ecosystem health will help support biodiversity and safe water supply

Study Area: Kasanka National Park

- 420 km2 (Designated in 1972)
- Neglected till late 1980's; poaching high
- Important freshwater habitats (high mammal & bird diversity)

Fundamental freshwater habitats: conservation and ecotourism

Dambos & floodplains

Mushito

Sitatunga – river floodplains

Fruitbats

Crocodile

Rivers

hSat
lGlobe

Pointer 12°37'11.59" S 30°13'51.24" E elev 3952 ft Streaming ||||||||| 100% Eye alt 18447 ft

Management issues:

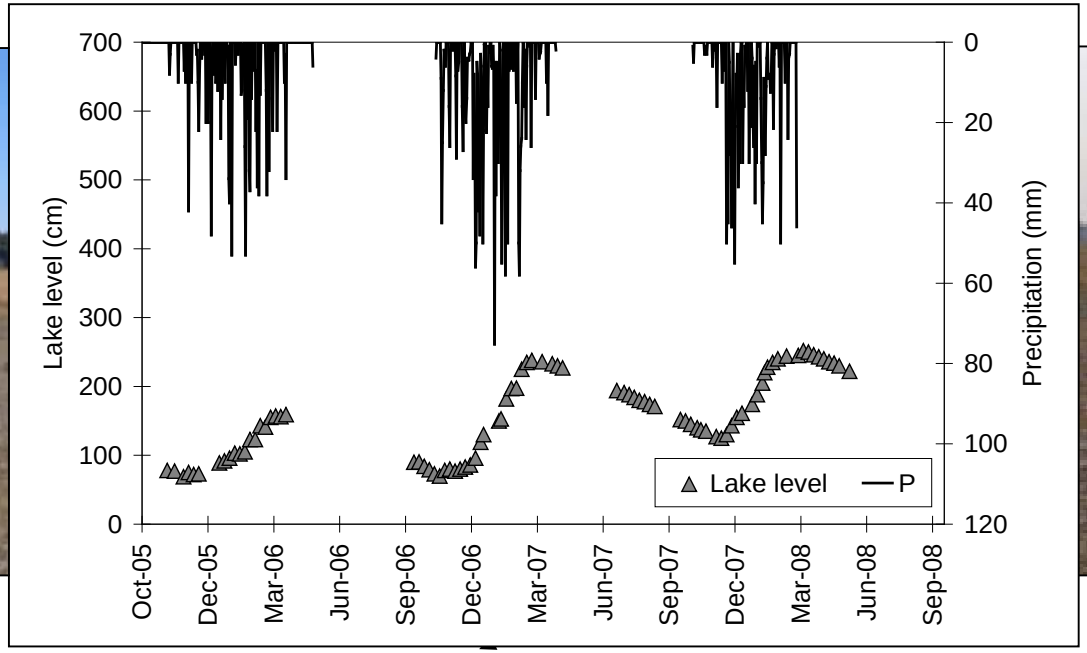
- Climate and hydrological pressure
  - ↓ Rainfall, ↑ Temperatures?

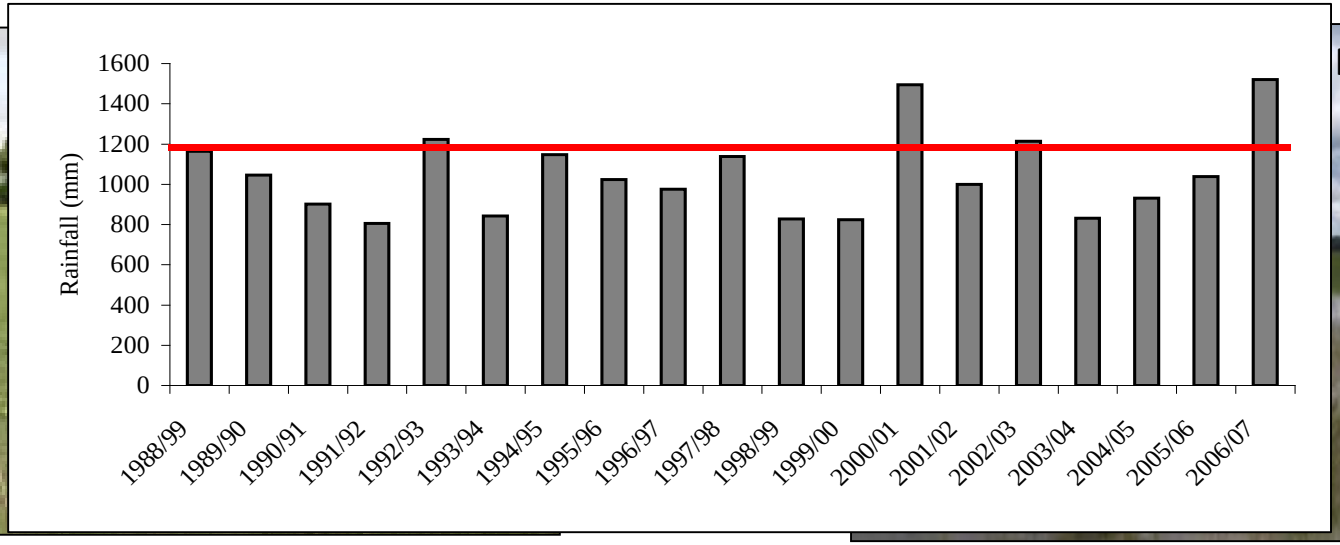
    (e.g.Sithole & Mweri 2009)
  - ↑ Demand & changing land use in upstream catchment?

- Burning
  - Too much or too little?
  - Effects on habitats?

- Implications for sources and sinks?

Seasonal dambos: Climate driving hydrology



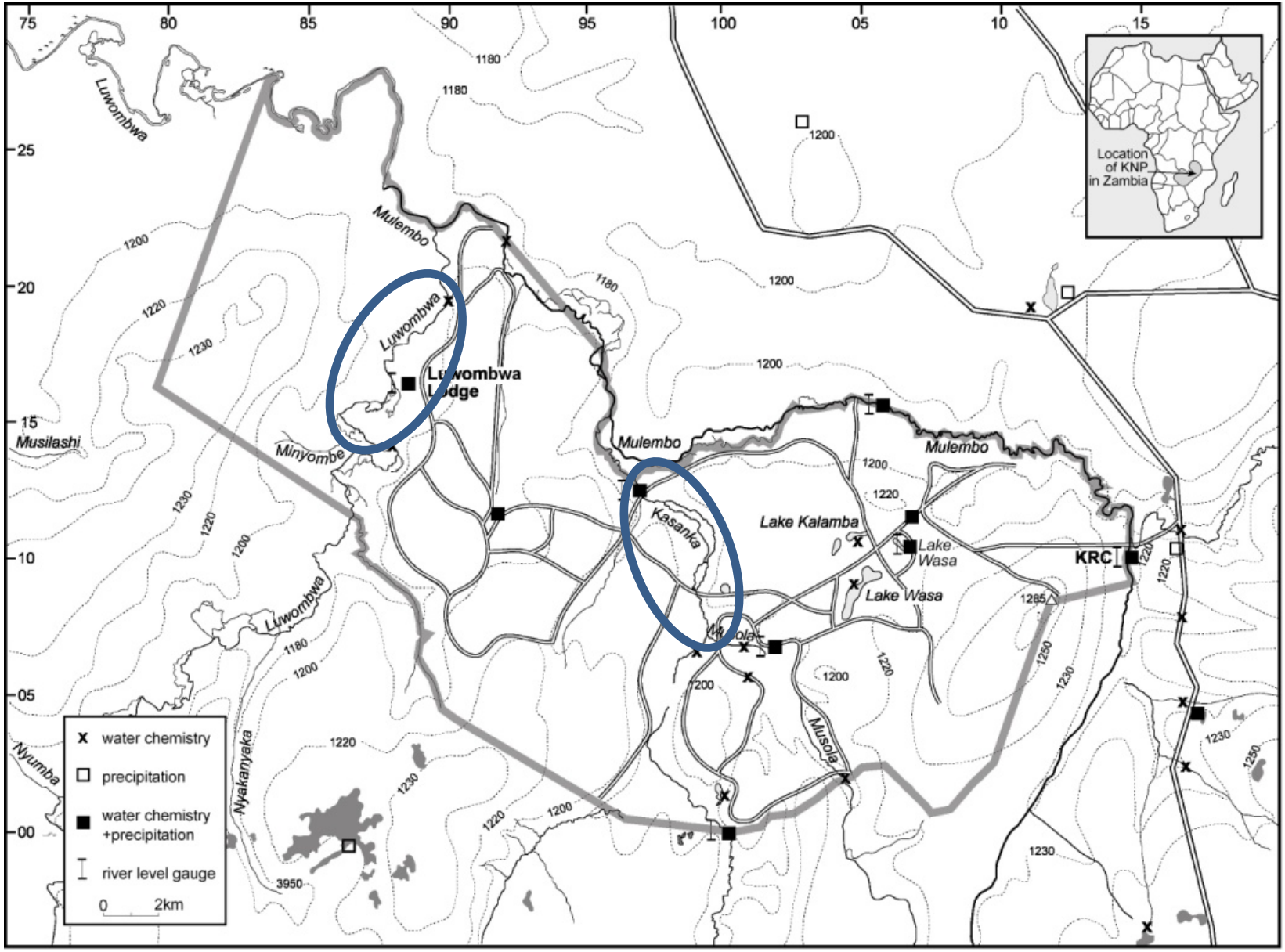


Hydrological monitoring objectives

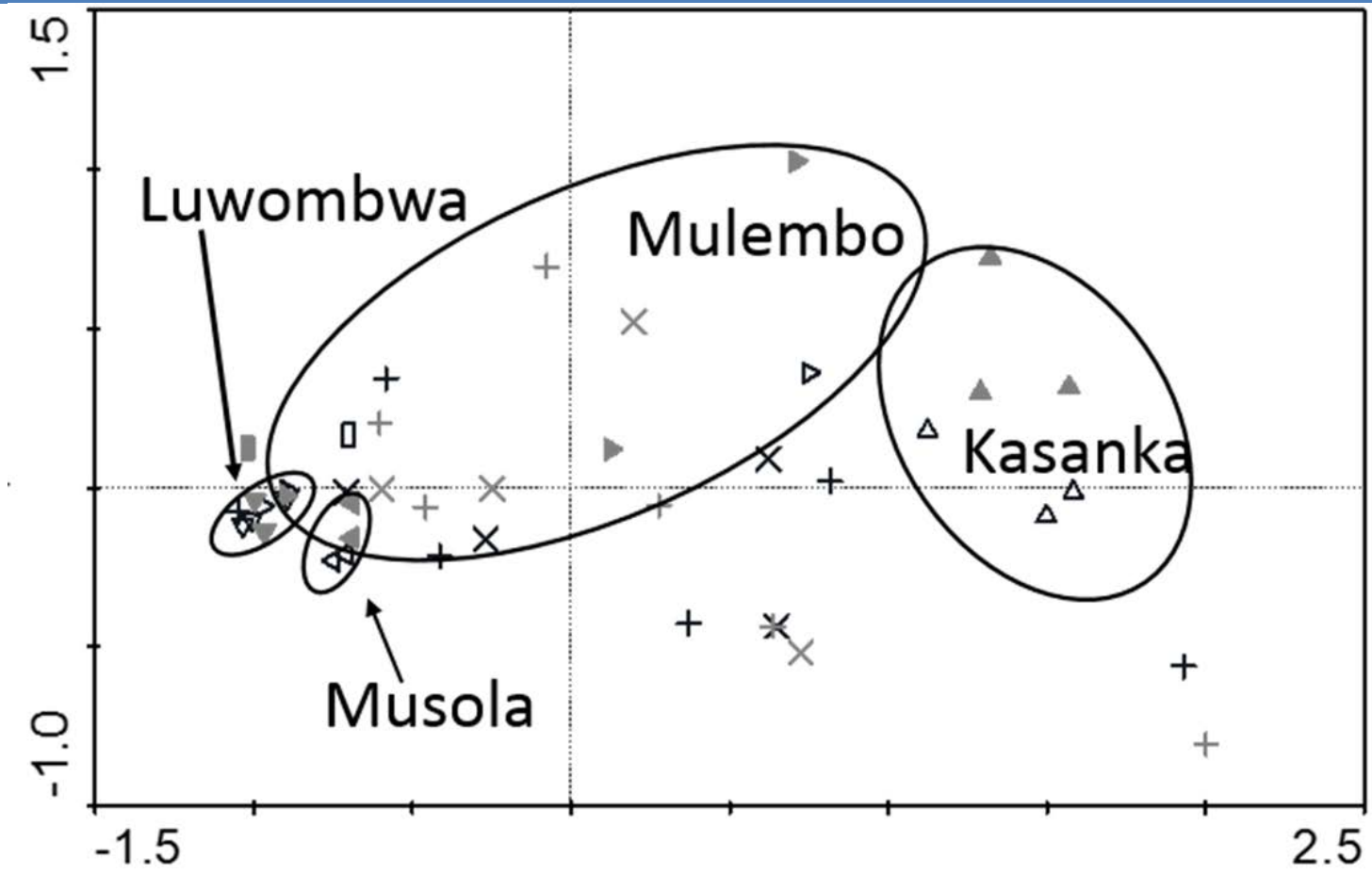
- Understand relationships between catchment recharge areas and freshwater habitats
- Understand threats to hydrological processes underpinning freshwater habitats
- Input to wider management plan for KNP

➢ *39 sites routinely sampled 2005 - 2008 (rivers, boreholes, seasonal lakes*

➢ Tracer study (Electrical conductivity, alkalinity, oxygen isotopes)


Luwombwa
Mulembo
Luwombwa Lodge
Musilashi
Minyombe
Luwombwa
Nyumba
Nyakanyaka
Kasanka
Mulembo
Lake Kalamba
Lake Wasa
Lake Wasa
Mulembo
KRC
Musola
Location of KNP in Zambia
water chemistry
precipitation
water chemistry +precipitation
river level gauge
0 2km

Waterbody characteristics



Dark/open = 2005

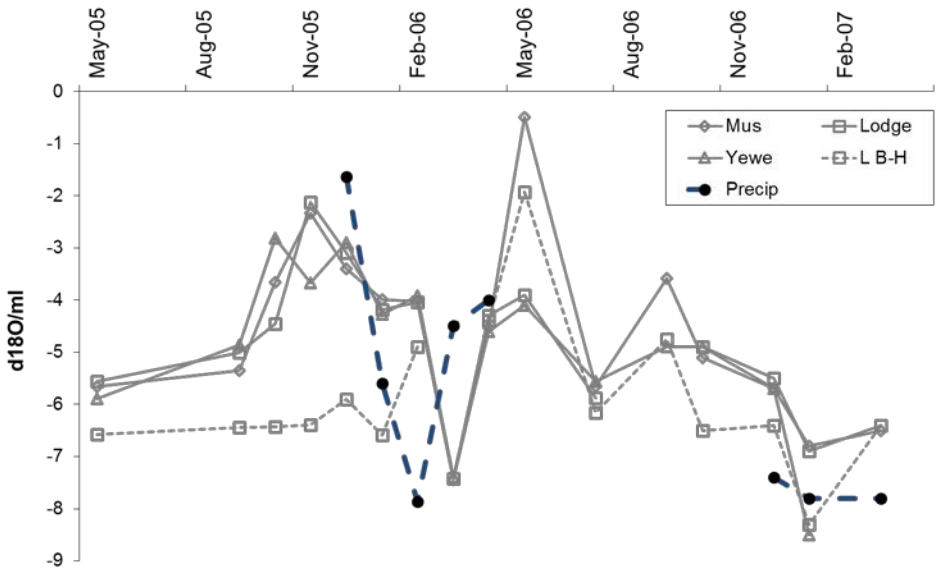
Gray/closed = 2006

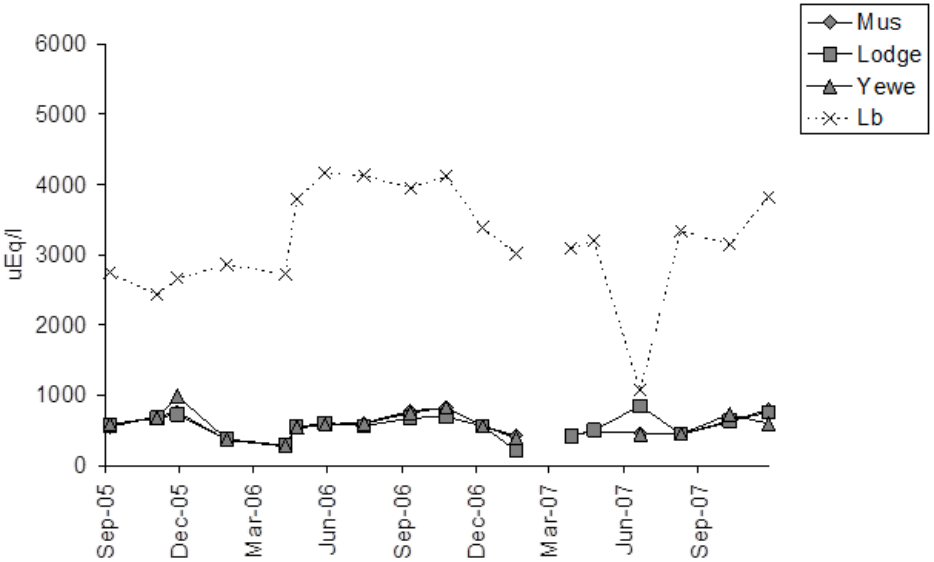
X = lakes

+ = groundwater

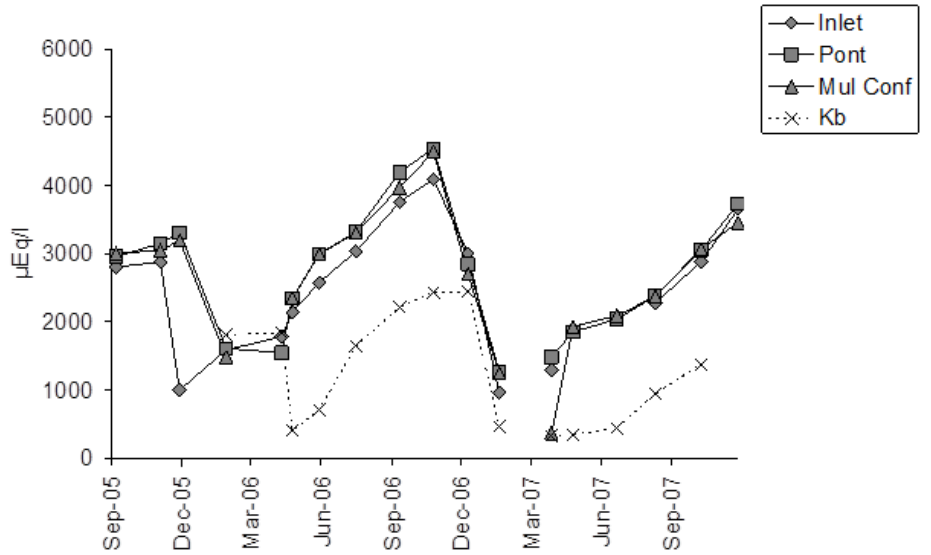
- δO18 correlated to Axis 1
- Mean Alkalinity correlated to Axis 2
- Cumulative percentage variance of Axis 1 = **87.2**
- Axis 1 and 2 combined = 98.5

Luwombwa River



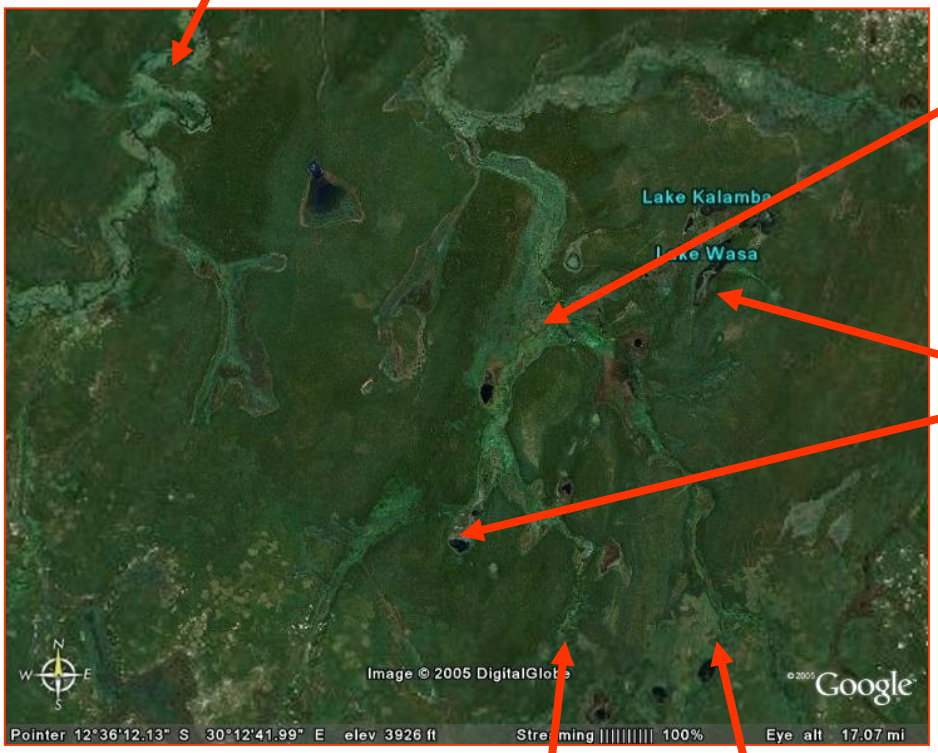


Kasanka River



Conceptualised model of hydrological inputs

LUWOMBWA: Water input from outwith park boundary; Little interaction with groundwater in KNP



KASANKA: Increasing groundwater and wetland interaction downstream

HEADWATER WETLANDS:

- Wet season (increasing rainwater dominance)
- Dry season (groundwater dominance in some lakes)

Proposed farm intensification to the south of park?:

- Groundwater and river abstraction?
- Increased siltation in river habitats?
- ↑ NO_3^- to surface and groundwater from fertilizer application?

Conclusions and recommendations

- Complex systems, largely climate driven, prone to human impact
- Major threats from outside of park
  - impoundments and river water abstraction
  - Fertilizer application and groundwater sensitive river headwaters
- Ensure protection of these headwater catchments
  - Designation as ‘conservation areas’ under KGMA Land Use Plan?
- Protection of wider catchments from over-burning
  - Maintain perennial flow and hasten recharge of wetland areas.

Thank you: ……any questions?