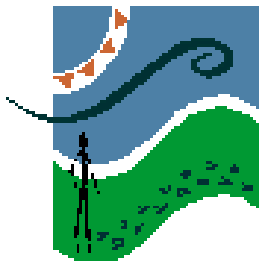


Using Landscape Function Analysis to assess vegetation cover around Open vs. Closed water points in a small semi-arid savanna game reserve

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Introduction (1)

- Widespread provision of water points in semi-arid savannas
 - led to increase in grazing pressure
 - influences ecosystem structure and function
- Herbivore distribution
 - water-dependent species (mobile & non mobile)
- Management implications of water points provision in small game reserves
 - Development of grazing gradients

Other studies

- Some studies using LFA on water points in savanna conservation areas:
 - Great Limpopo Transfrontier Park (Farmer 2010)
 - Kruger National Park (Matchett 2010)
- Common findings:
 - extreme degradation close to the water point (sacrifice zone)
 - Increase in unpalatable perennial shrubs
 - Decrease in abundance of perennial grasses due to selective overgrazing

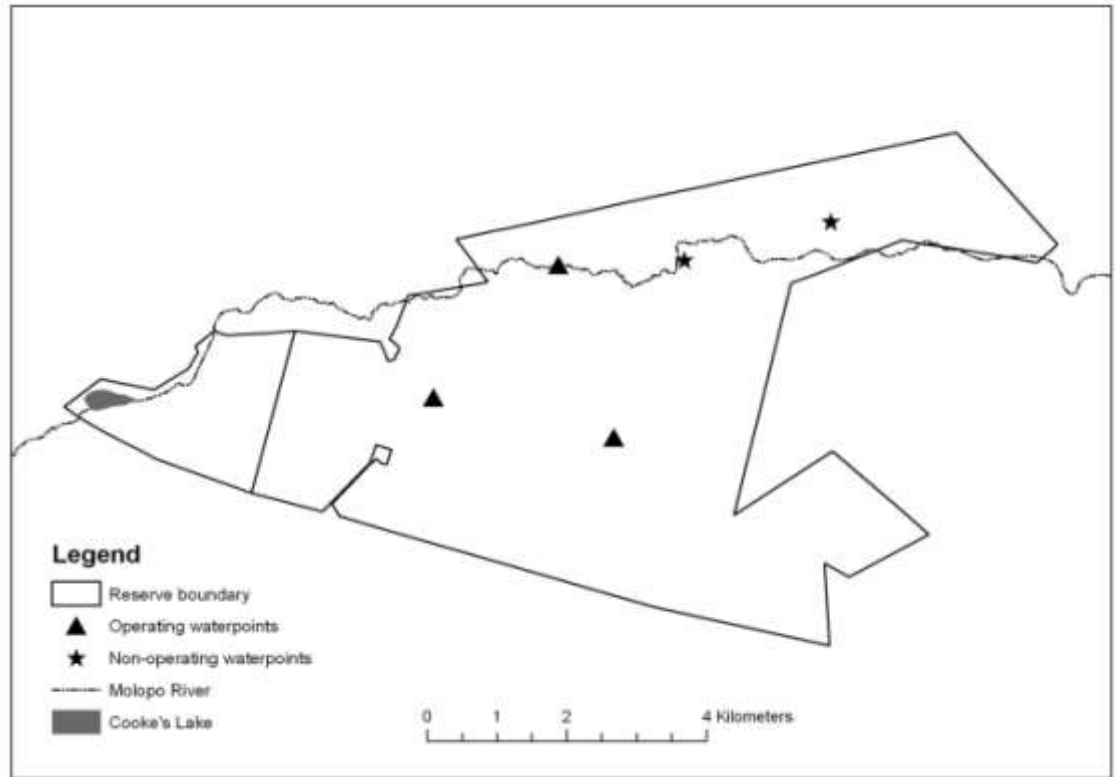


Landscape Function Analysis

- Developed in arid Australian rangelands & mine rehabilitation projects
- Field indicators -determine the functional status of rangelands.
- Landscape organization data and Soil surface analysis

The need for the study (2)

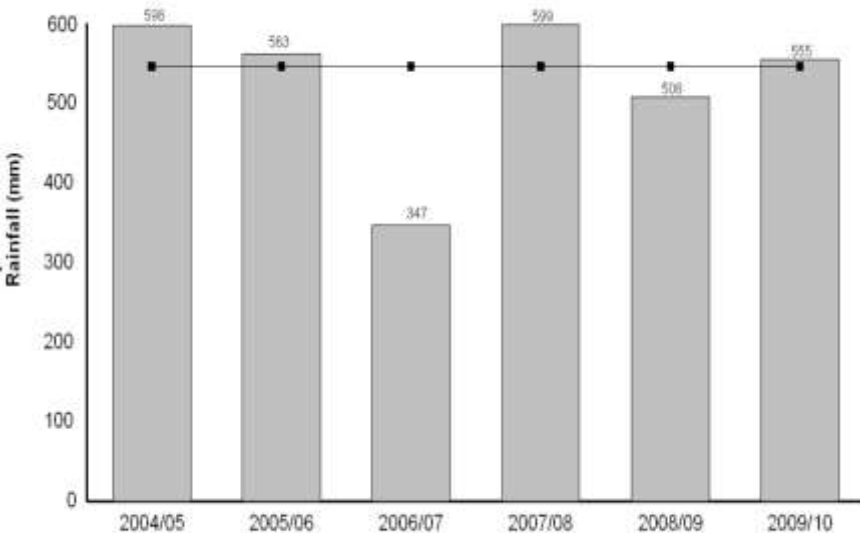
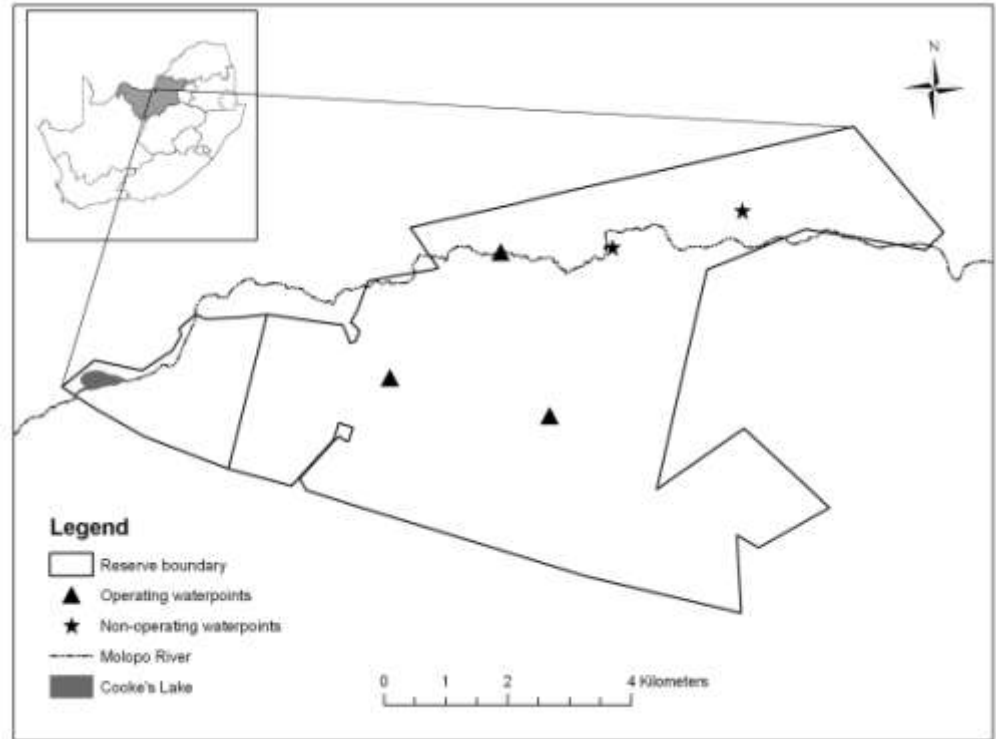
- Some water points location conflicts the current Reserve Management plan
- More utilization, low fuel load in the central part of the reserve
- Additional water points are envisaged further south



- ✓ Reserve's key objectives:
 - Sustainable management of the veld and indigenous wildlife populations
 - Provide wildlife-based tourism activities
 - Ensure the appropriate management of the wetlands within the system

Study Area (1)

- Mafikeng Game Reserve
- Established in 1992
- 4600 ha, flat terrain with plains

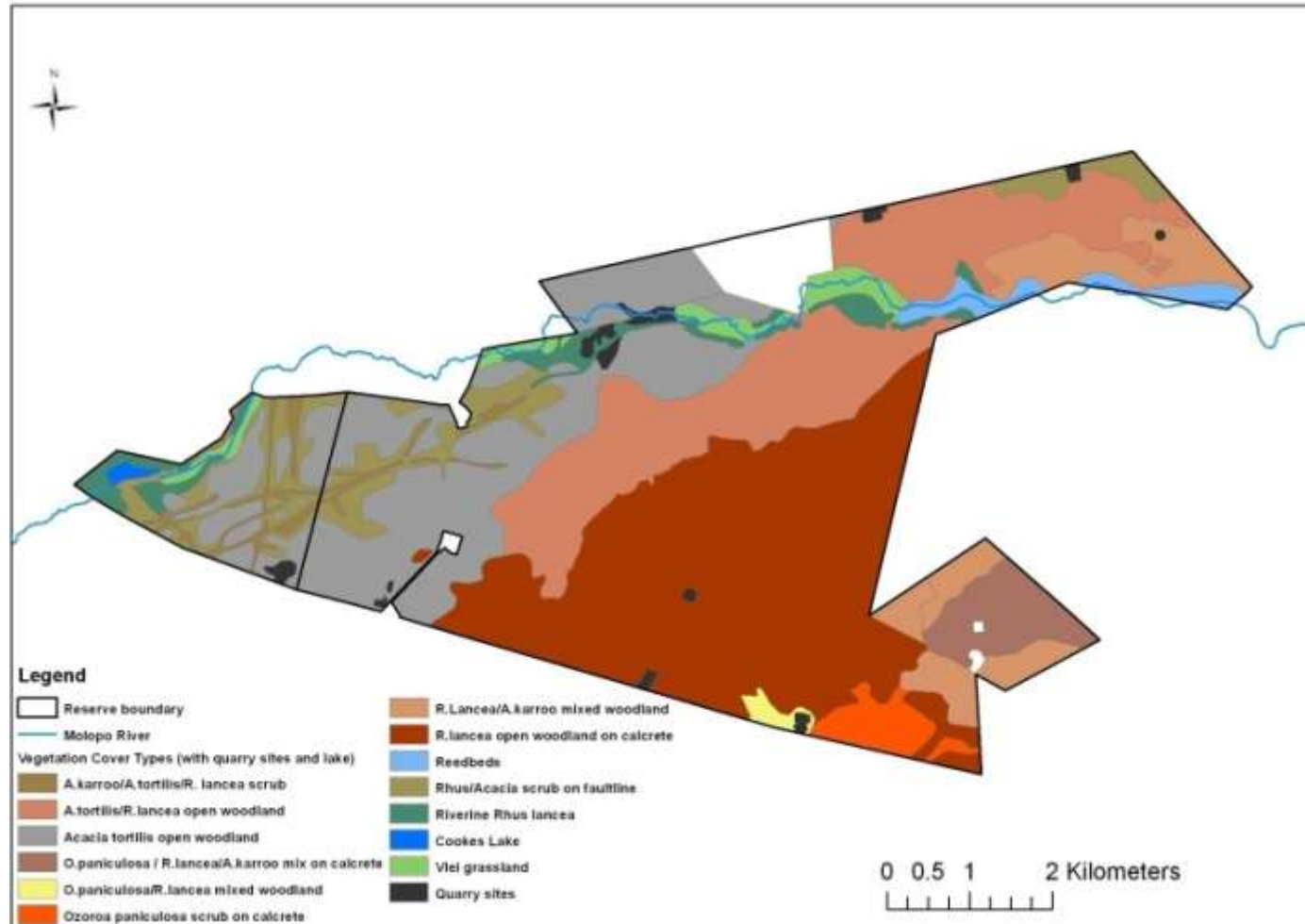


- Semi-arid savanna - mixed bushveld(Acocks 1975)/Dry *Cymbopogon-Themeda* Veld (Mucina and Rutherford 2006)
- Annual rainfall 400 – 550 mm

Study Area (2)

Vegetation cover types (Adcock 1991)

- *Rhus lancea* open woodland on calcrete soil (33.6%)
- *Acacia tortilis*/*R. lancea* open woodland (21.9%)
- *A. tortilis* open woodland (18.7%)
- Main grasses:
 - *C. plurinodis*
 - *T. triandra*
 - *E. muticus*
 - *E. lehmanniana*
 - *S. pyramidalis*



Study Aim and Questions

- **Aim:**

- **To quantify the vegetation cover at Open and Closed water point sites**

- **Questions:**

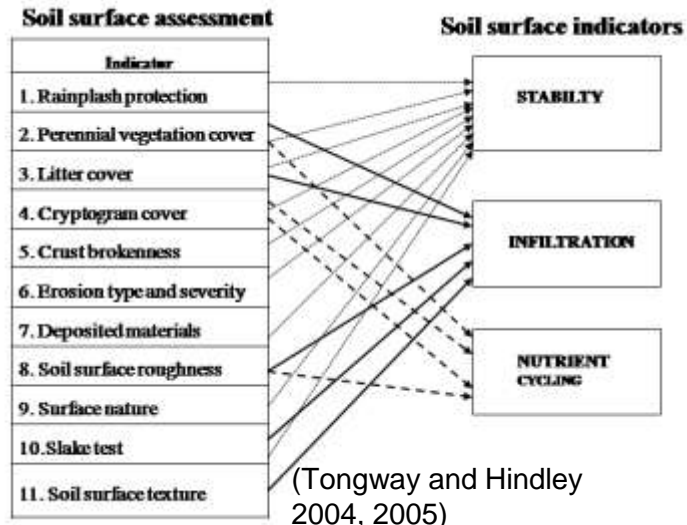
- How does vegetation cover compares between operating and non-operating water points which are near and away from natural water between season?
- What is the relationship between distance from water points and landscape zones (bare soil, grass, shrubs, thickets)?

Hypotheses

- The vegetation cover is lower at water points which are far from natural water than those which are nearer
- Bare soil decreases with increasing distance from the water point; whereas grass cover, both shrubs and thicket density increases with increasing distance

Materials and Methods(1)

- **Data collection**
 - **LFA organization data** - Four 100 m transects radiating from a water point following cardinal directions
 - Record patches (resources accumulates) and inter-patches (resources are may be lost)
 - **Soil surface assessment (SSA)**
 - **Dry** (Aug/Sep09) and **wet** (Feb10) season surveys



Materials and Methods (2)

- **Data analysis**

- **Landscape organization indices**

- Landscape zones (mean length), Patch and inter-patches (mean width)
- MS Excel spreadsheet template (Tongway and Hindley 2005)

- **Statistical test (Spearman correlation)**

- Relationship between landscape zones - distance from water

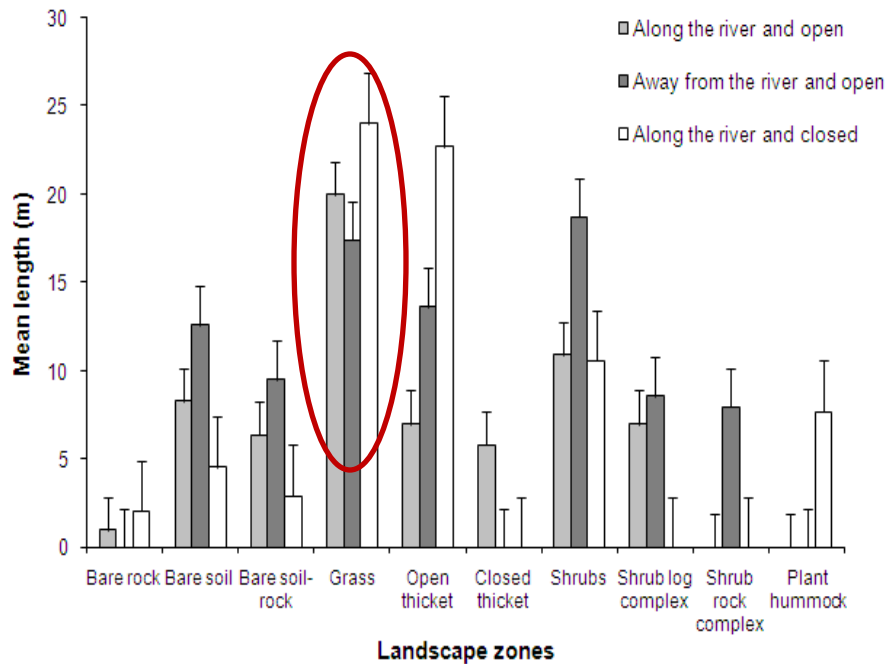
- **SSA – indicator based assessment of function**

- **Stability (S):** ability of soil to withstand erosive forces, and to reform after disturbance
- **Infiltration (I):** how the soil partitions rainfall into soil-water, and runoff water
- **Nutrient Cycling (NC):** how efficiently organic matter is cycled back into the soil

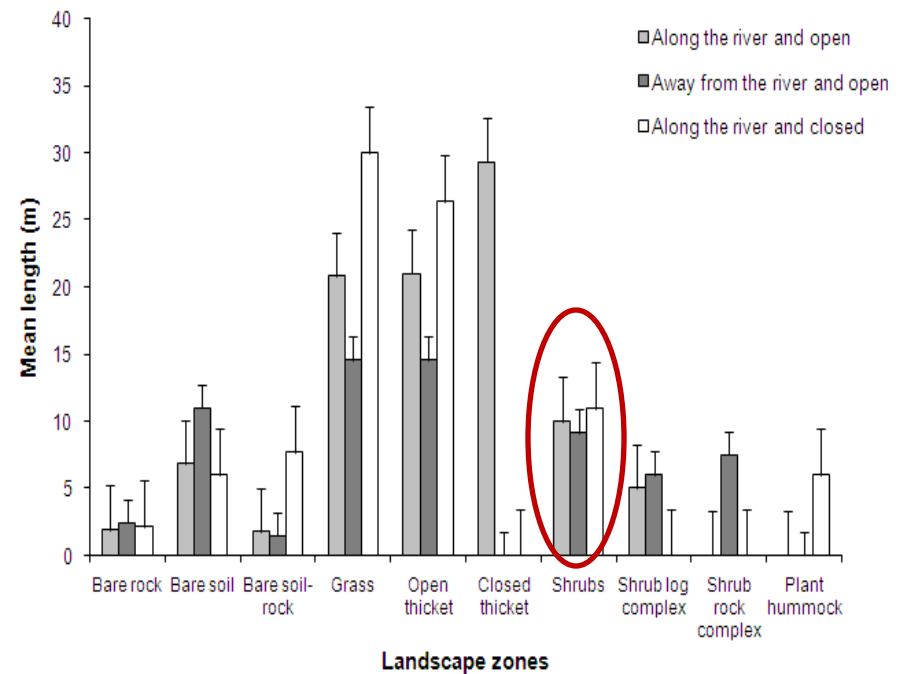
Results: LFA

Landscape zones - Mean length (m)

Dry season



Wet season

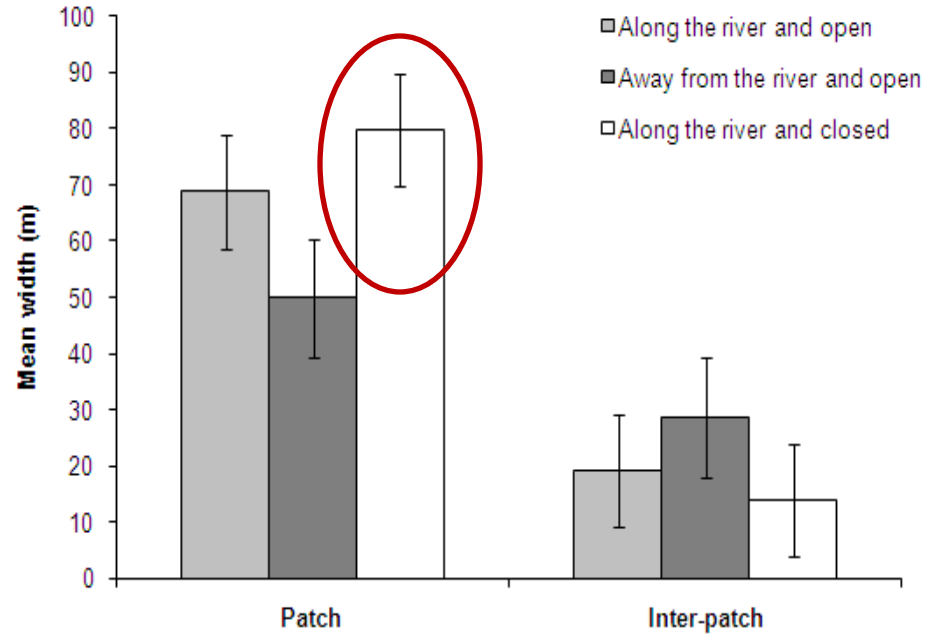
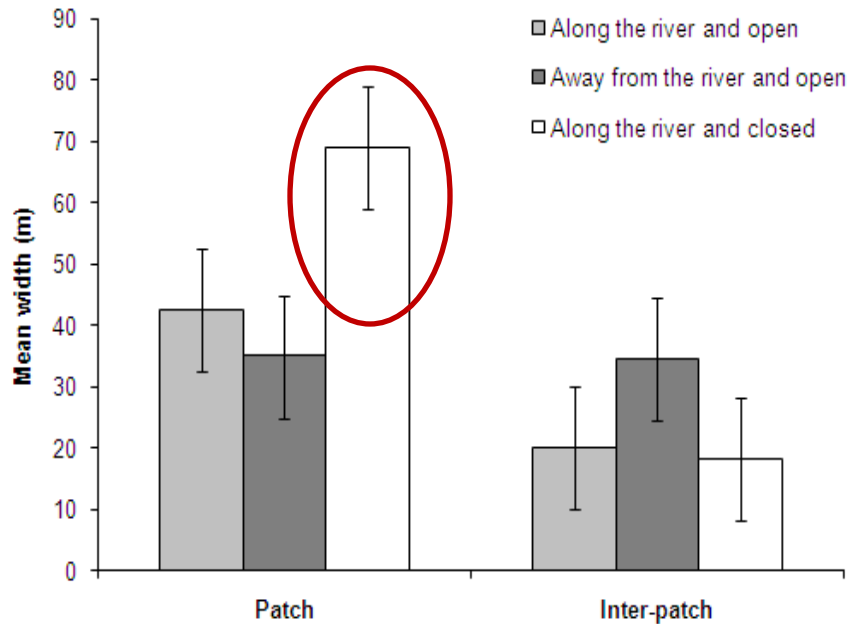


Grass, bare soil; open thicket, shrubs: longer mean lengths

Patch and inter-patch – Mean width (m)

Dry season

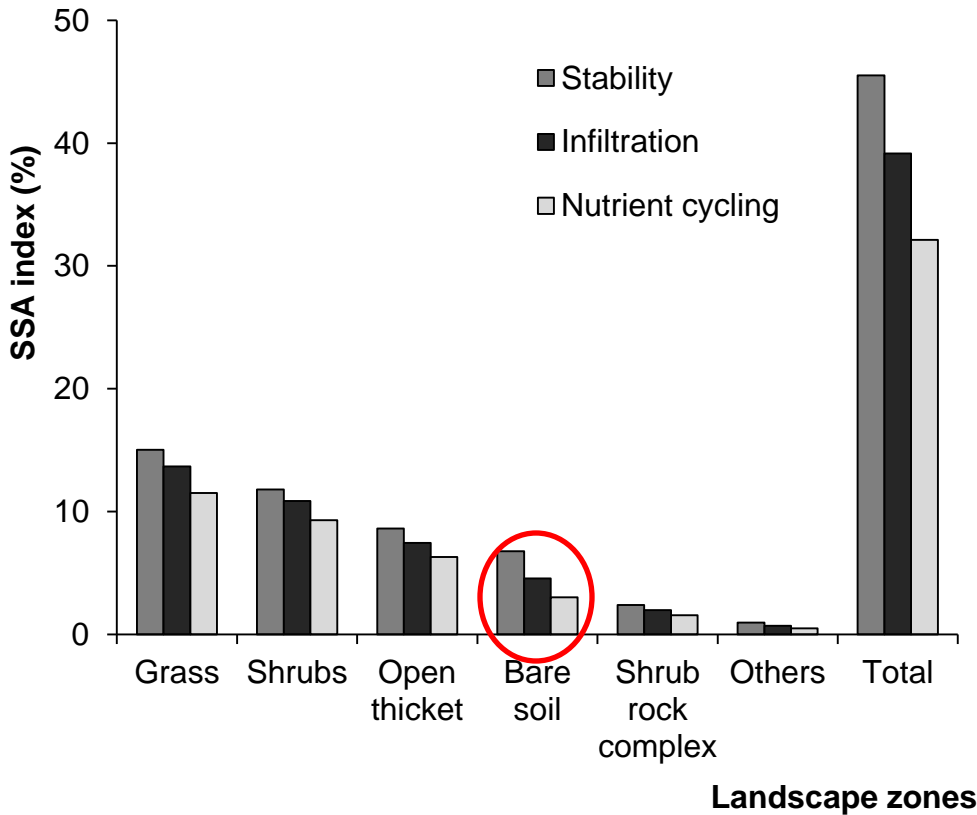
Wet season



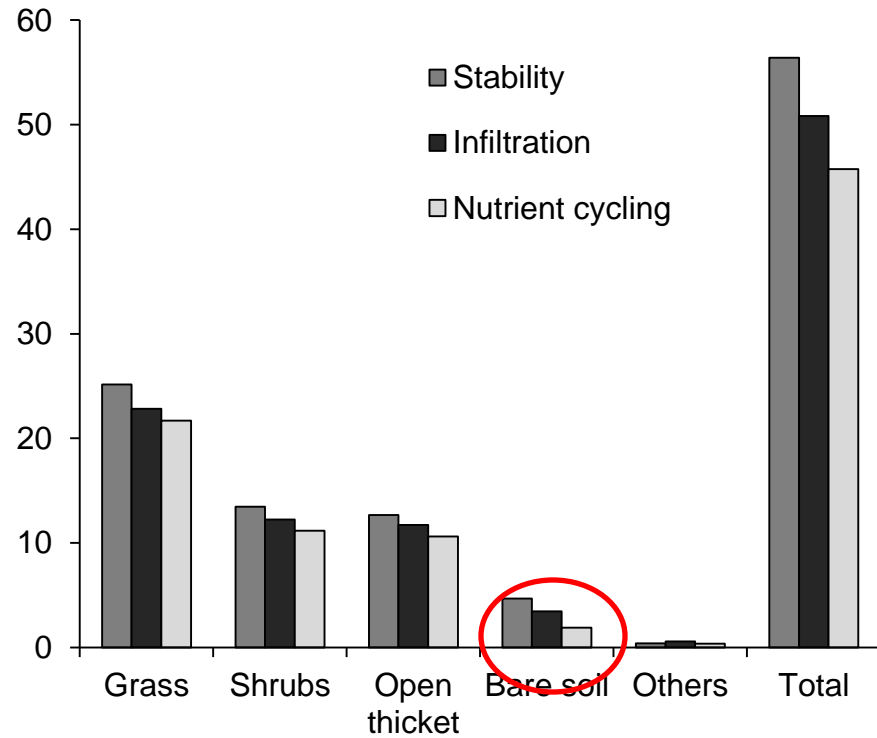
Results: SSA

Open away from the River

Dry season



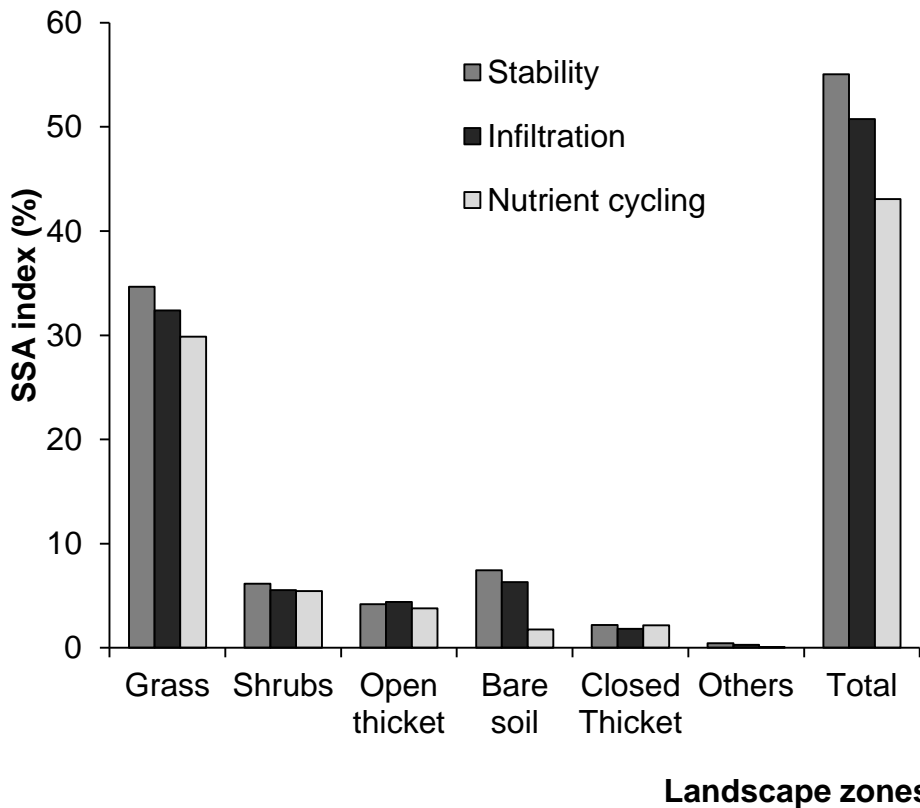
Wet season



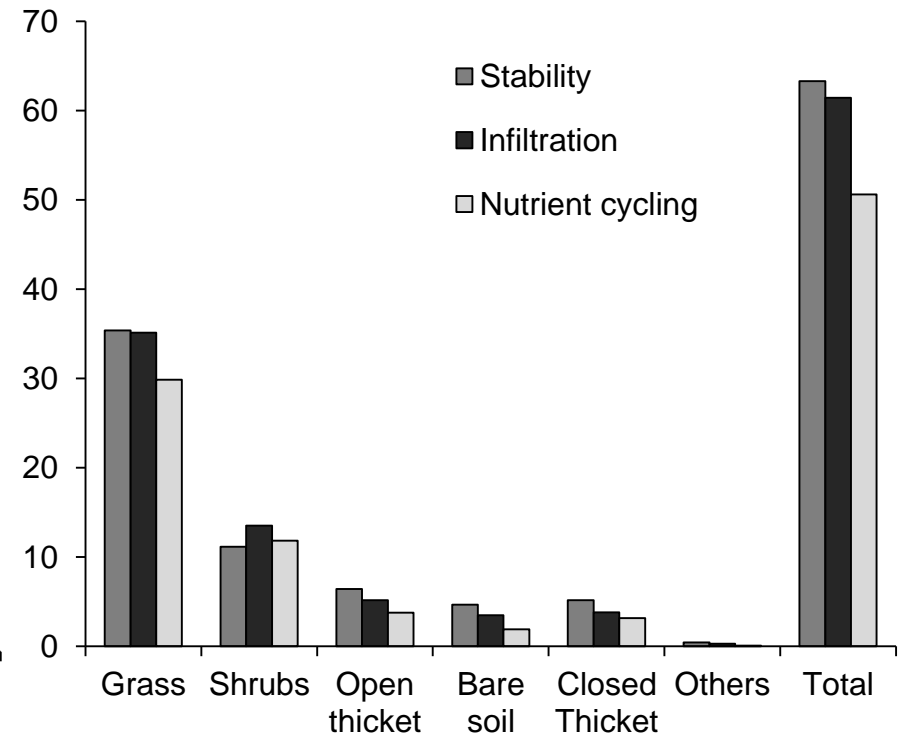
**Grass: greater potential in resource accumulation.
Reduced functionality**

Open along the River

Dry season



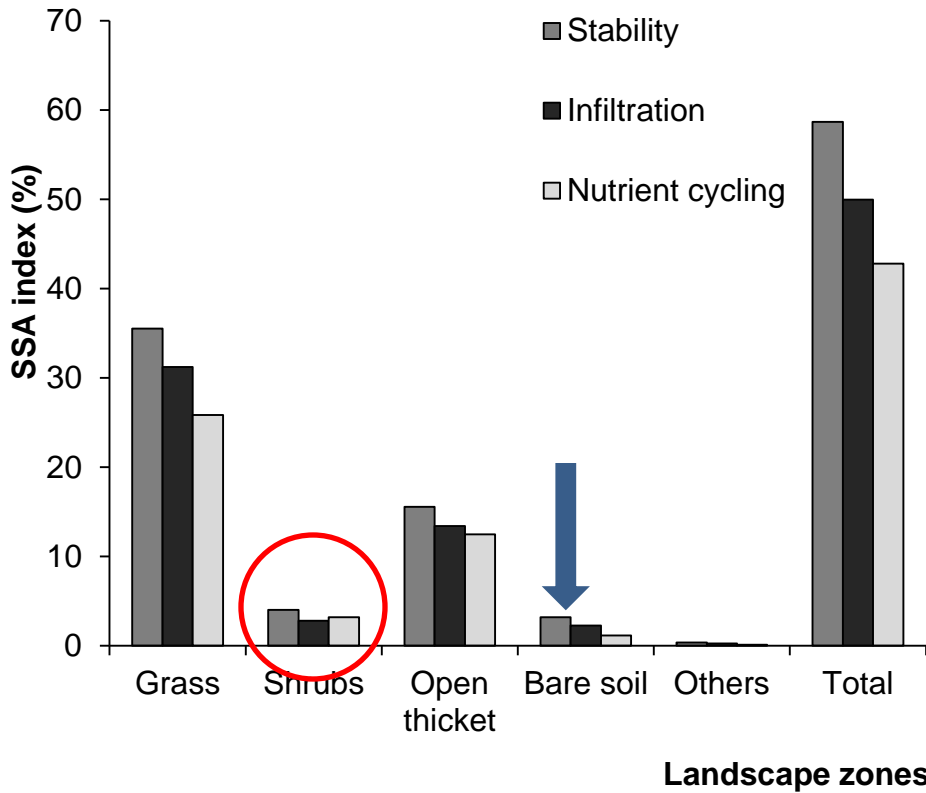
Wet season



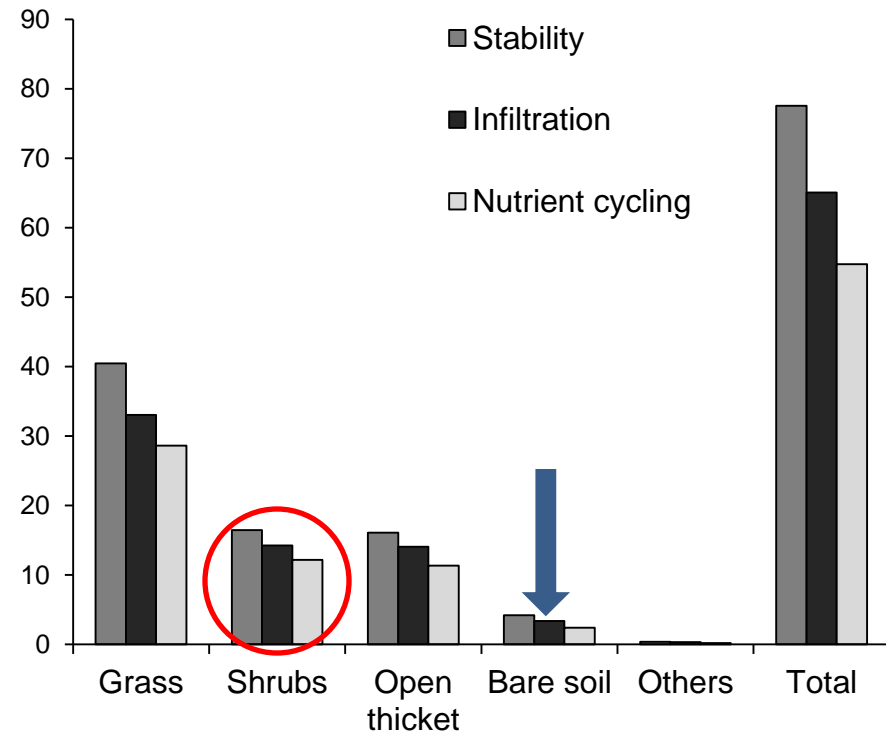
Similar pattern, slightly more resource accumulation during wet season

Closed along the River

Dry season



Wet season



More functionality

Relationship – Landscape zones & Distance from water point

Landscape zone	Bare soil (rho, p)	Grass cover	Open thicket	Shrubs
OPAWR	-0.062, 0.050 (negative)	-0.218, 0.045 (negative, strong)	0.045, 0.299 (positive, weak)	0.133, 0.002 (positive, strong)
OPALR	-0.024, 0.747 (weak)	0.029, 0.204 (weak)	0.186, 0.002	0.307, 0.004
CLALR	0.068, 0.366	0.019, 0.793	-0.084, 0.045 (strong)	0.092, 0.033

Discussion

- Similar pattern between seasons – more vegetation cover in wet season (as expected)
- More vegetation cover at OPALR and CLALR
- Low vegetation cover at OPAWR – more animal activity
- Vegetation cover – potential to accumulate resources at all water points
- Reduced functionality at OPAWR
- Vegetation cover increasing with increasing distance from water

Conclusions

- Water points status and location influences vegetation cover and functionality
- More utilization – closer to water points
- Reduced functionality at OPAWR
- Vegetation cover increased with increasing distance from water point

Recommendations

- The number of artificial water points away the river should be reduced or removed
- Water points should be opened near the river – attract animals to underutilized areas
- Opening and closing of water points should be informed by:
 - Changes in vegetation cover; rainfall; animal distribution
- Follow-up study



**Thank You For Your
Attention!**

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