

# THICKET FORUM

10-12 September 2012

**Quantifying the rate of natural vegetation recovery and changes in species composition on old lands for a small private nature reserve, Bathurst Eastern Cape**

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**RHODES UNIVERSITY**  
*Where leaders learn*

# Introduction

## Vegetation of Bathurst

- **Kowie River Thicket**
- **N-facing:** Vegetation is tall and dense with thorny and succulent shrubs below the canopy
- **S-facing:** moister with shorter thorny trees and shrubs

Hoare *et al.*, (2010) In Mucina and Rutherford

# Introduction

## Vegetation of Bathurst



*Euphorbia triangularis*



*Zanthoxylum capense*



*Cussonia spicata*



*Azima tetraacantha*



*Schotia latifolia*



*Ptaeroxylon obliquum*



*Surregada africana*



*Capparis sepiaria*  
var. *citrifolia*

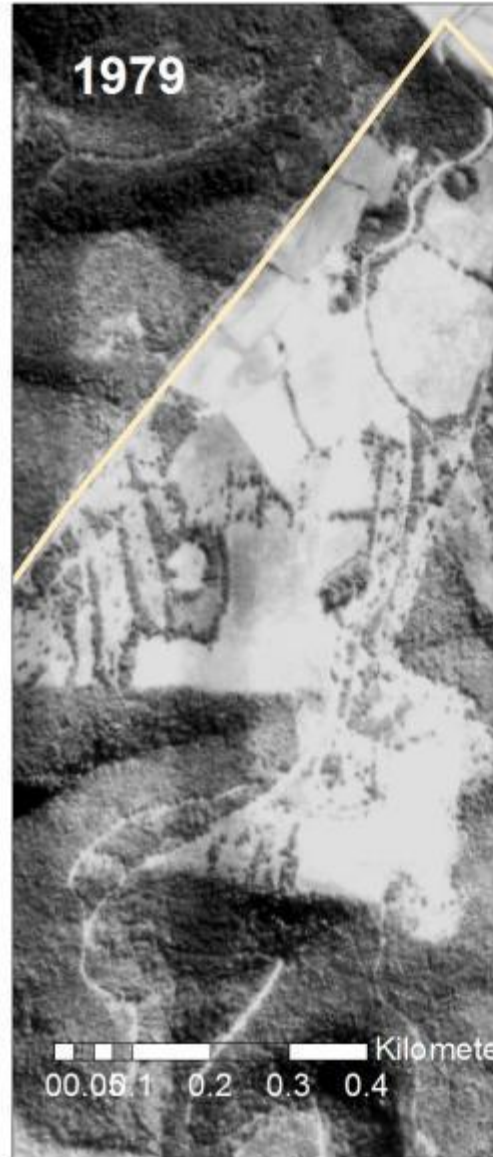
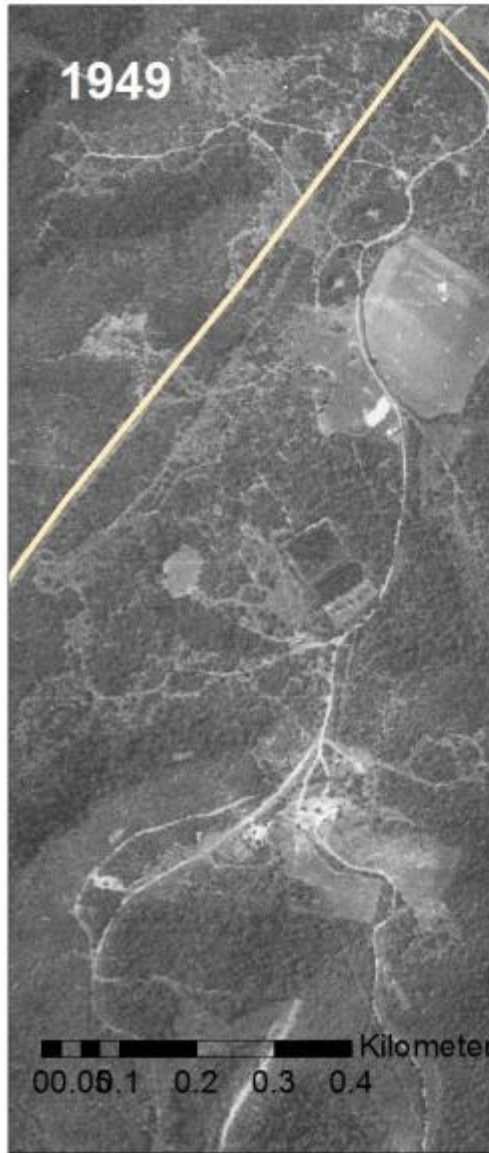


*Ozoroa mucronata*



*Ehretia rigida*

# History of the Study area



# Aim and key questions

To ascertain the rate and extent of natural vegetation recovery via succession in mesic subtropical thicket

- What are the differences in vegetation percentage covers between intact thicket and old lands?
- What are the differences in species composition?
- What are the differences in mean stem diameter and or basal area?

# Data collection

## Differences between old lands and intact thicket

- **Botanical**
  - 2x2 m plots
  - Stem diameters of woody trees and shrubs
  - Percentage cover



- **GIS**
  - Aerial imagery.
  - Georeferencing
  - Delineation of boundary
  - Plot co-ordinates.

*Schotia afra*

# Analysis

## Botanical

- **Percentage cover of vegetation**
  - Mean % cover of plant types and other cover types (Intact vs. Old lands)
- **Stem diameters of woody and succulent species**
  - Plants and stems per hectare
  - Basal area



*Schotia afra*

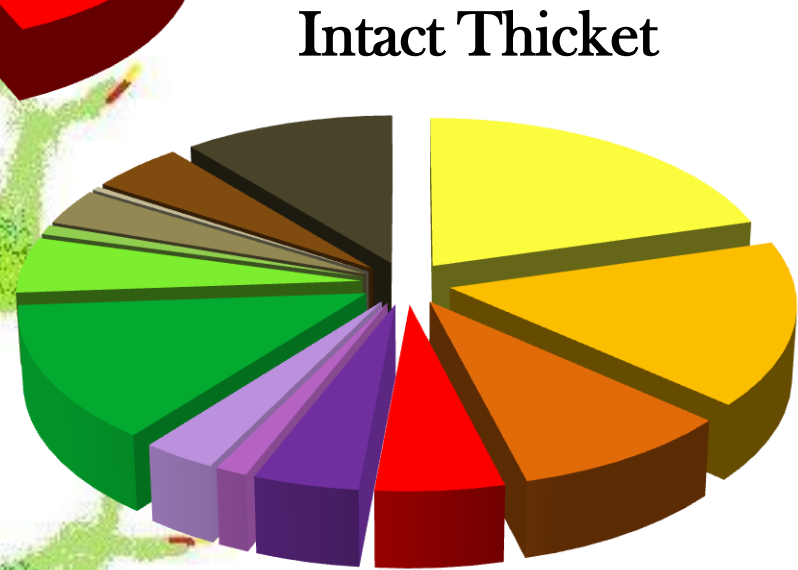
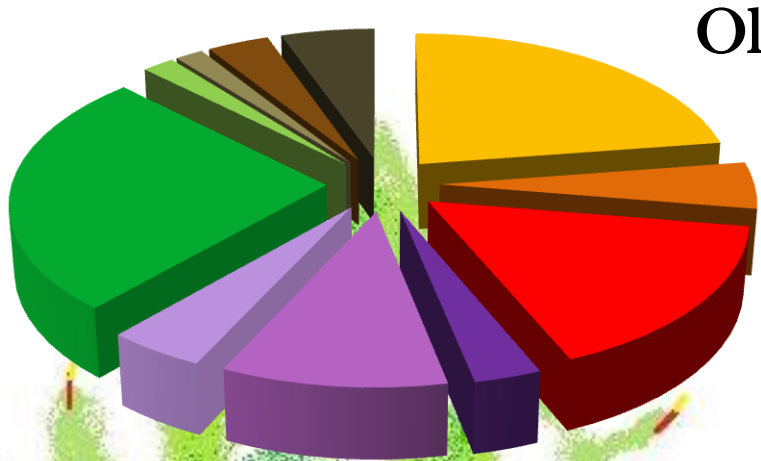
# Analysis GIS

- Created old land **polygons** on aerial images at  $\pm 10$  year intervals.
- Compared changing **areas** of old lands to measure rate of recovery over **time**.
- Used delineation of boundary as a **reference** for present day recovery.



# Results

## Average percentage cover



- Canopy trees
- Woody trees
- Succulent trees
- Woody shrubs
- Herbaceous shrubs
- Succulent shrubs
- Vines and Creepers
- Grass cover
- Bulbs
- Ferns
- Mosses and lichens
- Fungi
- Bare soil
- Litter cover

*Carissa haematocarpa*

# Results

## Correlation matrix (Old lands)

*Plumbago auriculata*

Table 1: Correlation matrix of vegetation percentage covers in old lands

	WT	ST	WS	HS	SS	VC	GR	PT	EP	TOTAL
WT	1									
ST	0.050912	1								
WS	-0.1936	-0.13878	1							
HS	-0.07455	-0.04998	-0.21288	1						
SS	-0.09061	-0.03131	-0.04441	-0.04447	1					
VC	0.340721	-0.03202	-0.17132	-0.01567	-0.03284	1				
GR	-0.26461	0.064867	-0.44437	-0.16917	-0.18389	-0.15843	1			
PT	-0.06198	-0.1097	-0.10951	-0.10364	-0.08455	-0.09225	0.191032	1		
ML	0.266433	-0.05158	-0.05005	0.054798	-0.0529	0.047971	0.125888	-0.0535	1	
TOTAL	0.54461	0.016018	0.069157	-0.03321	-0.04533	0.1771	0.303027	0.068071	0.443727	1

**Negatively correlated**

- Grasses and woody shrubs

**Positively correlated**

- Vines/creepers and woody trees

# Results

*Plumbago auriculata*

## Correlation matrix (Intact thicket)

Table 2: Correlation matrix of vegetation percentage covers in Intact thicket

	CT	WT	ST	WS	HS	SS	VC	GR	BL	PT	ML	LT	Total
CT	1												
WT	<b>-0.85306</b>	1											
ST	-0.77028	0.733333	1										
WS	-0.26745	-0.1075	0	1									
HS	0.127138	-0.11488	1	-0.31435	1								
SS	<b>-0.92737</b>	-0.03324	0	0.2571	-0.12342	1							
VC	0.181429	-0.257	<b>0.96225</b>	-0.28402	-0.10177	-0.09314	1						
GR	0.030009	0.008062	<b>-0.99048</b>	-0.04332	-0.2313	0.419148	0.31183	1					
BL	-0.07865	-0.39291	<b>-1</b>	<b>0.720577</b>	<b>-0.94772</b>	-0.5	-0.2551		1				
PT	<b>-0.94491</b>	-0.12452	0	0.090993	-0.21362	0.545455	-0.66406	<b>0.729063</b>	0	1			
ML	0.245663	-0.20304	0.213565	0.197004	-0.20054	-0.15003	0.230164	-0.13855	-0.23586	-0.36104	1		
LT	-0.01662	0.043798	0.559274	-0.16529	-0.00665	-0.23884	-0.10717	-0.54785	-0.2835	-0.49213	-0.25457	1	
Total	0.322583	-0.03254	0.595987	-0.15415	-0.23697	-0.0776	0.57326	0.249737	0.323419	-0.4084	0.035126	0.386899	1

**Negatively correlated**

- Canopy trees and succulent shrubs
- Canopy trees and ferns
- Bulbs and herbaceous shrubs
- Bulbs and succulent trees
- Grasses and succulent trees
- Woody trees and canopy trees

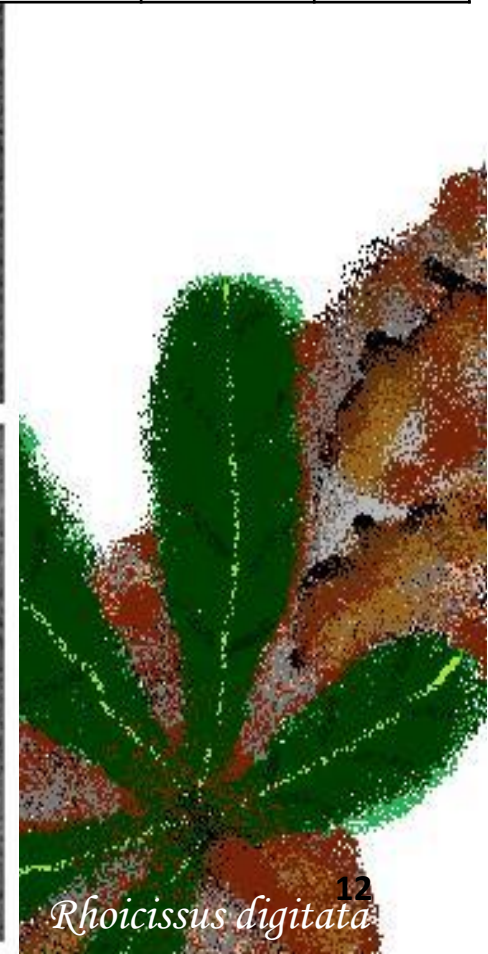
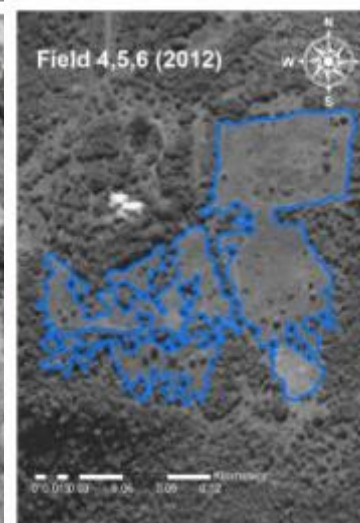
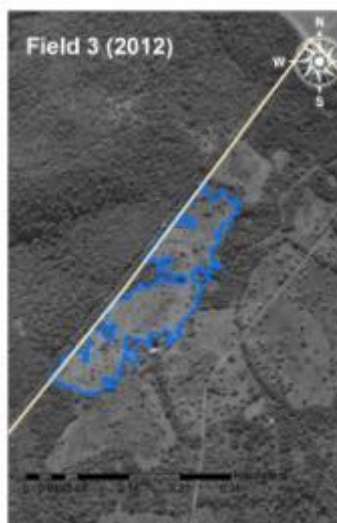
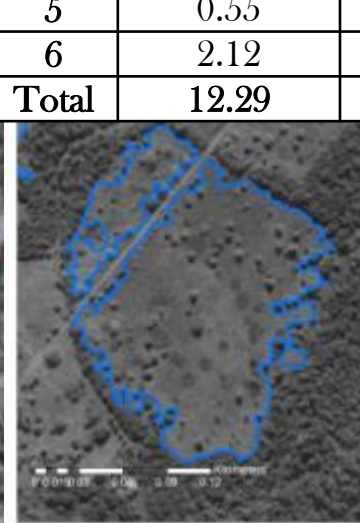
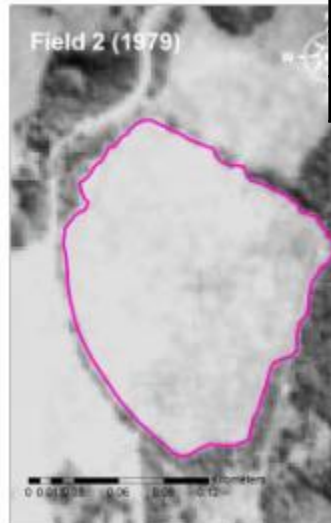
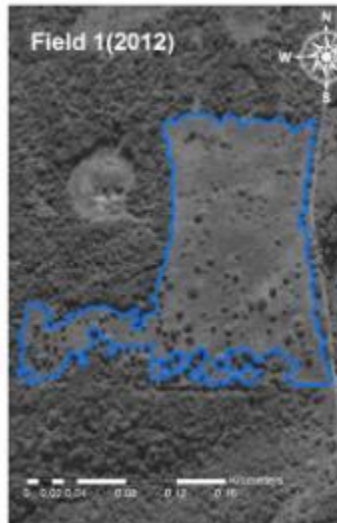
**Positively correlated**

- Bulbs and woody shrubs
- Vines/creepers and succulent trees
- Ferns and grasses

# Results

## Rate of recovery

	Area (Ha)		Recovery	
Field	1979	2012	% (1979-2012)	% per year
1	3.51	2.71	22.79	0.69
2	2.65	2.3	13.21	0.40
3	2.83	2.08	26.50	0.80
4	0.63	0.43	31.75	0.96
5	0.55	0.25	54.55	1.65
6	2.12	1.11	47.64	1.44
<b>Total</b>	<b>12.29</b>	<b>8.88</b>	<b>196.43</b>	<b>5.95</b>



# Conclusions

- Cover types (“guilds”) are high in their diversity for both intact and old lands.
- Grasses occur most in both old lands (1-100 %) and intact thicket (2-90 %)
- Succulent trees and shrubs are slow to colonize in old lands ( 11% present vs. 60%)
- Bulbs are not present in old lands.
- Moister South facing slopes have highest rates of recovery.



*Capparis sepriaria* var. *citrifolia*

A background image of an Aloe ciliaris plant, showing green, segmented leaves and a cluster of small, orange and yellow flowers at the top center.

# Acknowledgements

**I thank the Department of Environmental Affairs, (Natural Resource Management Programme) and the Gamtoos Irrigation Board for funding.**

**Rhodes Restoration Research Group and Mike Powell for the guidance to carry out this project.**

**All those who courageously assisted me with my field work.**

A woman with dark hair tied back, wearing a white short-sleeved shirt and dark pants, is walking through a field of tall grass. She is smiling and looking back over her shoulder. A tan tote bag is slung over her shoulder. In the background, there is a dense forest of green trees under a clear blue sky.

Questions

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