Contributions of Study Abroad programmes to monitoring elephant utilization of savanna woodlands

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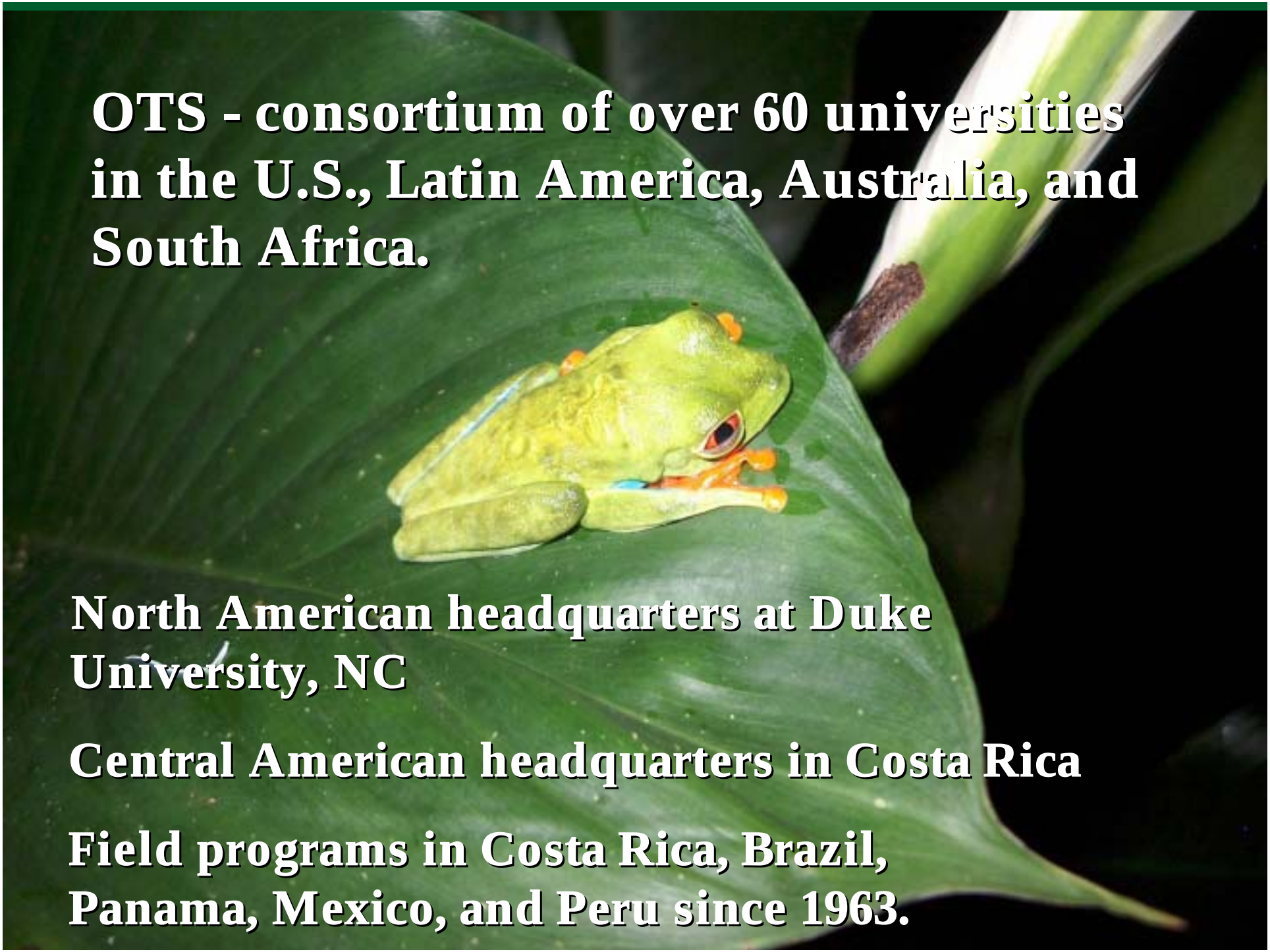
Organization for Tropical Studies



OTS - consortium of over 60 universities in the U.S., Latin America, Australia, and South Africa.

North American headquarters at Duke University, NC

Central American headquarters in Costa Rica

Field programs in Costa Rica, Brazil, Panama, Mexico, and Peru since 1963.

HISTORY OF SOUTH AFRICA PROGRAM

2000 - OTS joined with

Kruger National Park

University of Cape Town (UCT)

University of the Witwatersrand (Wits)

- develop a semester abroad undergraduate program in South Africa.

Funded by the Andrew W. Mellon Foundation.

3 courses since 2004:- currently busy with 4th

Four Courses:

South African Ecosystems and Diversity

Conservation and Management of Protected Areas in South Africa

Field Research in Savanna Ecology

History and Culture of South Africa

Faculty led projects
2 days in the field;
7 – 10 projects

Independent Projects
IP #1 3-5 days of field work
IP #2 5-9 days of field work

Contributions to monitoring

1. Elephants and woodlands
   - Impact of elephants on community composition & vegetation structure

Key Q's: Which communities are impacted?
What are the associated impacts on biodiversity?
What are the rates of change?

2. Species level impacts:
   - Assess impact on **common** & **rare** / vulnerable species
   - Assess plant LHS to determine their resilience.
   - LHS studies, demographic profiles, long term monitoring of individuals

Key Q's: Which species are most vulnerable to utilization?
Methods for assessing vulnerability?

3. Interactions with other herbivores and fires

A. Community level impacts:
Mapungubwe National Park

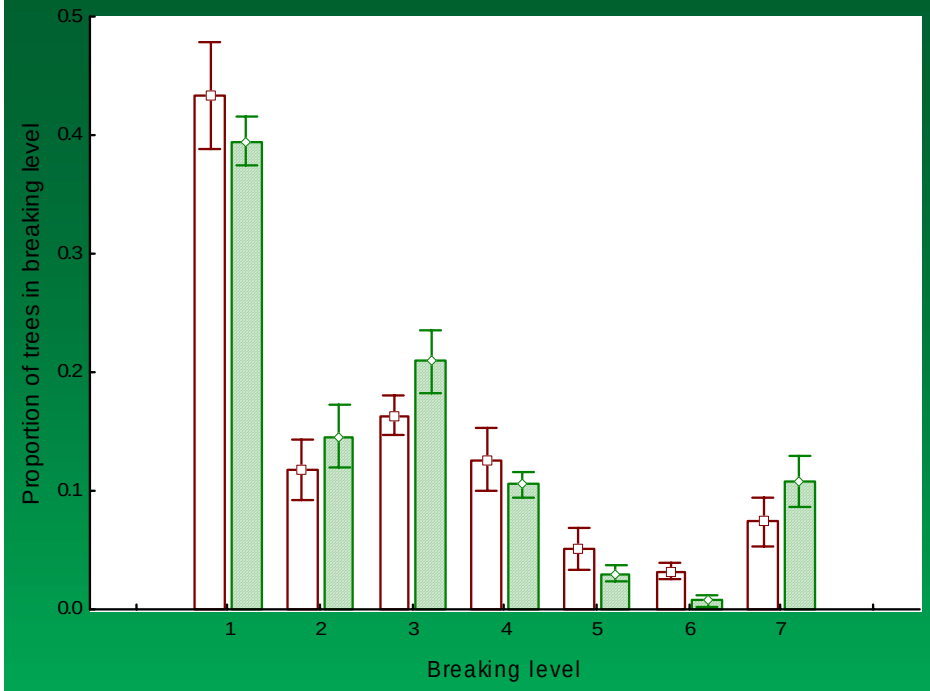
Christopher Cosgrove, Luke Schutz, Alexander van Dijk, Julie Coetzee, Vellie Ndlovu

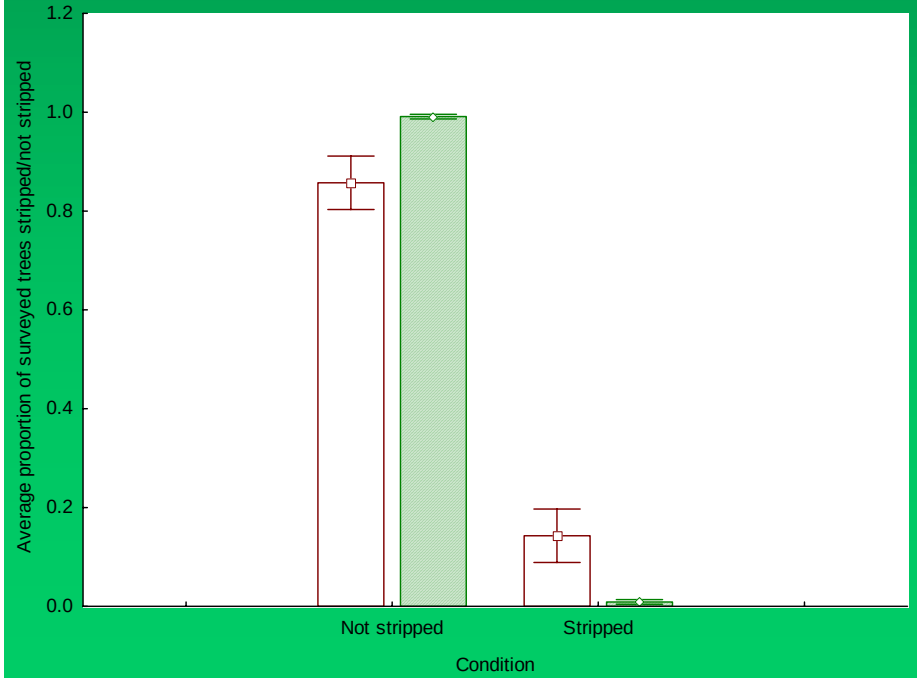
- Sampled heavily utilized communities:
  - Riverine forest & *Commiphora* woodland
- 50m nested transects
  - Height; DBH
  - degree of impact (stripping, breaking and toppling);
  - degree of recovery (sprouting, bark closure)

Targeted heavily utilized communities:

Commiphora woodland

Riverine Vegetation





	Commiphora woodland	Riverine forest
Breaking	No overall difference	
Stripping	L	H
Toppling	H	L

Gallery Forest

	Breaking	Resp	Stripping	Bark regr	Toppling	Resp
Acacia tortilis	=	>50%	=	100%	-	-
Croton megalobotrys	+	>60%	-	>25%	-	-
Faidherbia albida	-	>50%	+	>75%	-	-
Acacia xanthophloea	-	0%	+	>75%	-	-

Commiphora woodland

	Breaking	Resp	Stripping	Bark regr	Toppling	Resp
Commiphora africana	+	<10%	-	-	+	0
Commiphora edulis	=	0%	-	-	=	0
Colophospermum mopane	+	<10%	-	-	-	0
Terminalia prunoides	-	0%	-	-	+	0

Summary

- Elephants are selecting for certain species
  - Breaking: *Croton megalobotrys*, *Commiphora africana*, mopane
  - Stripping: *F. albida*, *A. xanthophloea*

- Some spp more resilient than others
  - Breaking: *Croton megalobotrys*, *A. tortilis*
  - Stripping: *F. albida*, *A. xanthophloea*

- *C. africana* most prone to toppling, no recovery

B. Changes in vegetation structure & biodiversity consequences

Max Edkins, Erik Fyfe, Chris Barichievy, Nicholas Tye, William Bond, Andrew McKecknie,

How does changes in vegetation structure influence biodiversity?

- Most plants are resilient
- Greater influence on vegetation structure = Indirect impacts

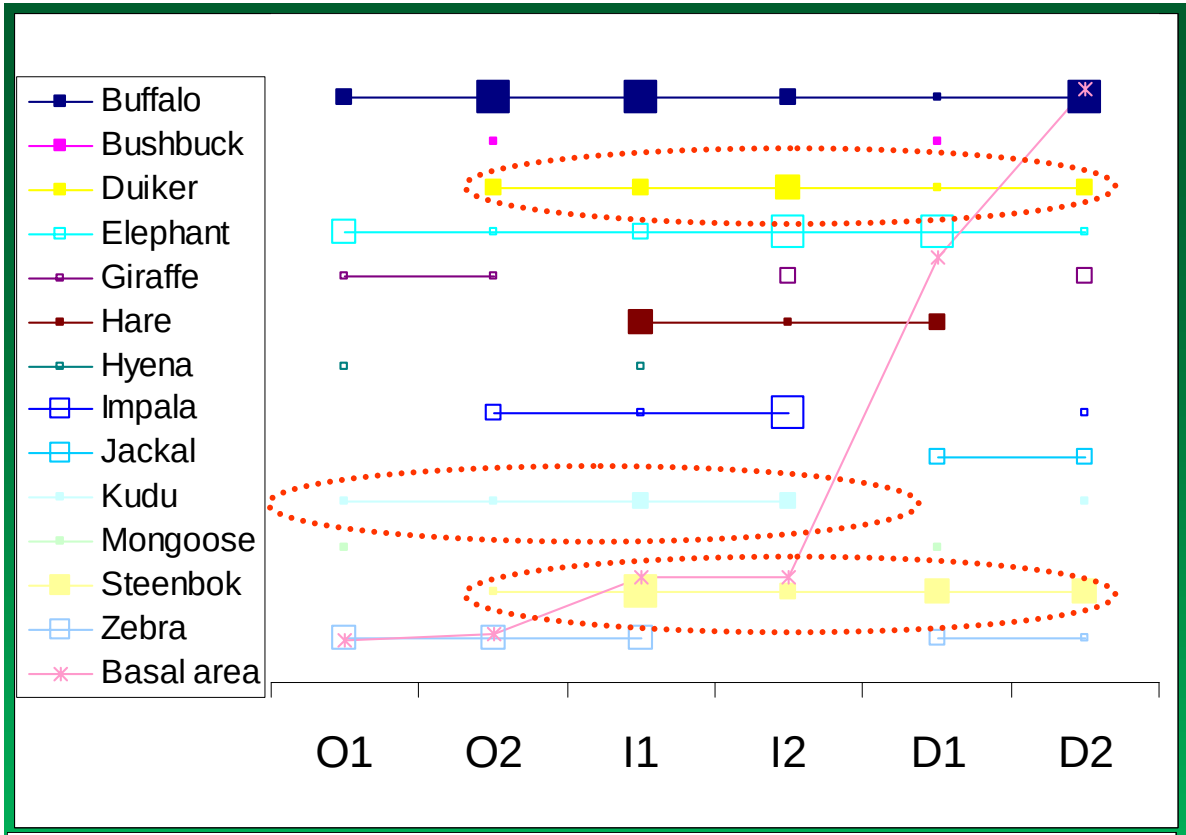
Methods

6 transects

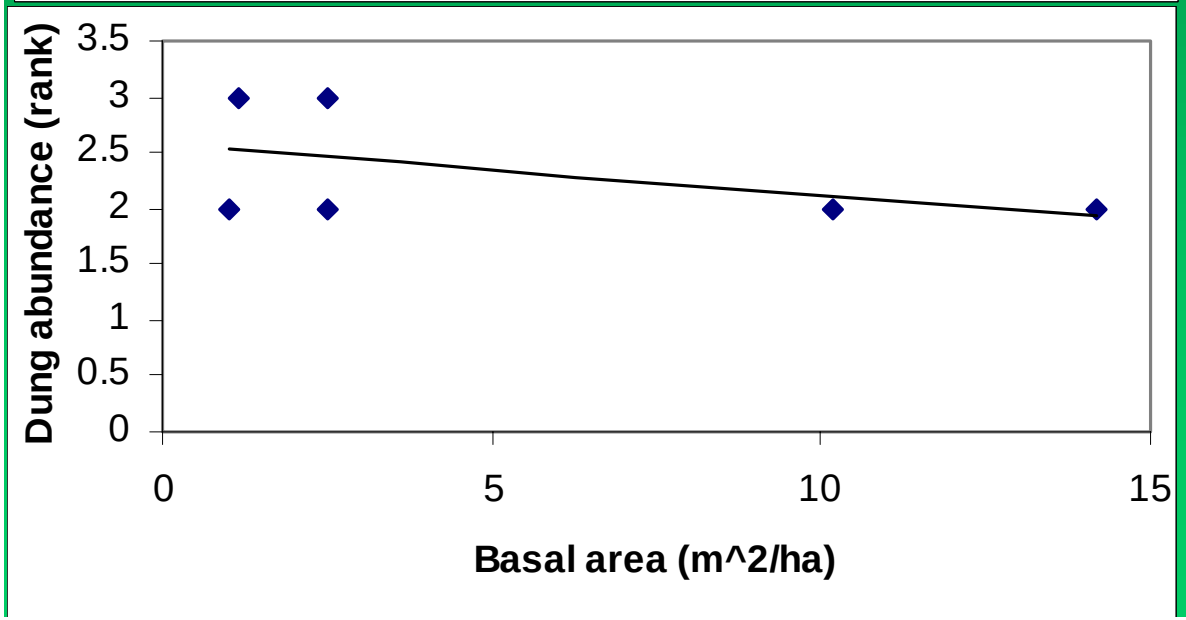
3 density levels: 2 open, 2 intermediate, 2 dense

Assessed

- Vegetation structure & composition,
- Dung counts
- Bird counts
- Sweep netting for insects

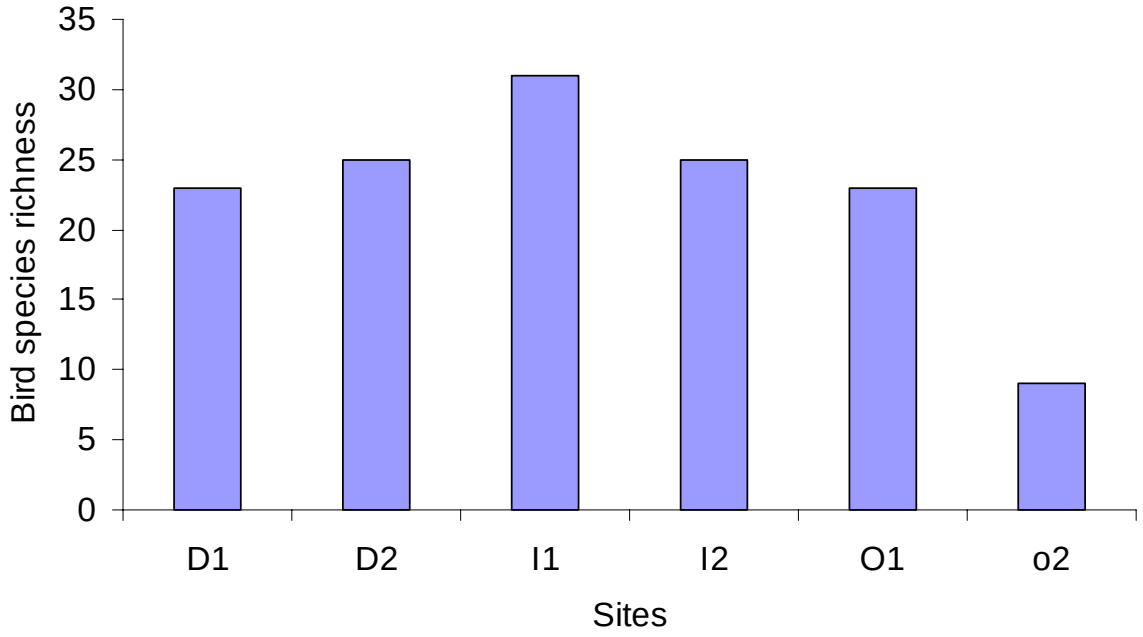


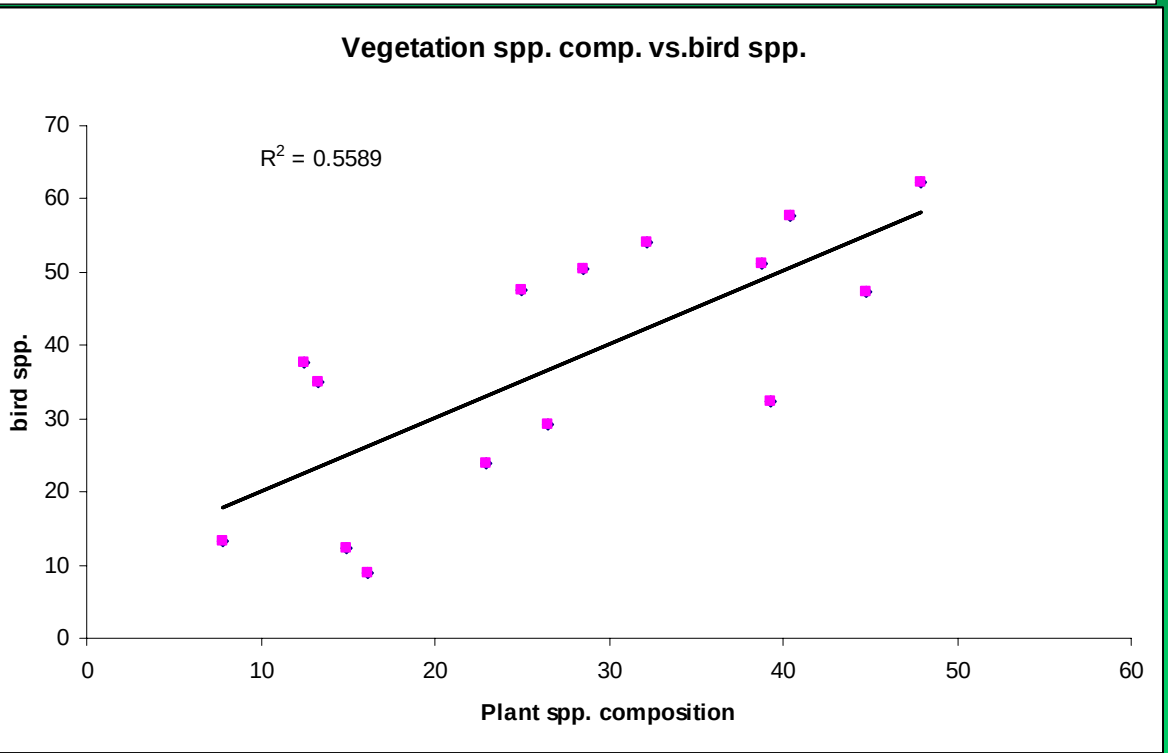
No clear pattern, except perhaps in Steenbok, Duiker and Kudu



Suggests a slight decrease in large mammal numbers in areas with tall trees

r^2=0.45, p>.05





Bird counts

Open sites support less spp?

But:-

turnover of species,

strong association bird & vegetation communities!

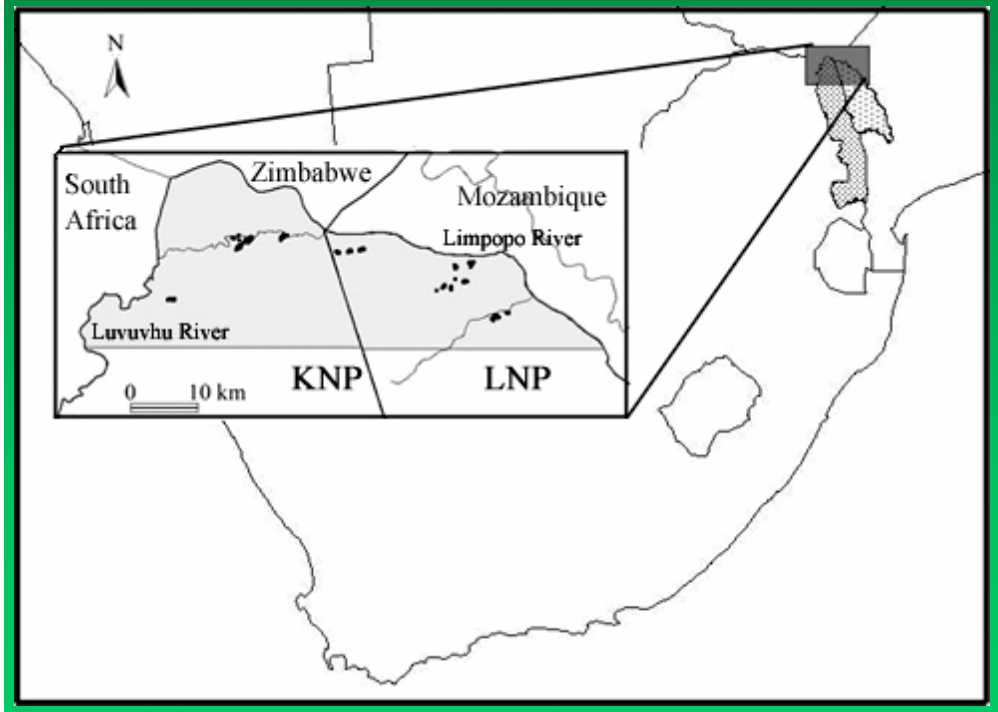
$p<0.001$

Structure vs diversity: Summary

- Crude, but changes in vegetation structure don't seem to affect diversity significantly;
- But do see turnover of species:- maintain heterogeneity!

C. Species specific studies: Baobabs (*Adansonia digitata*)

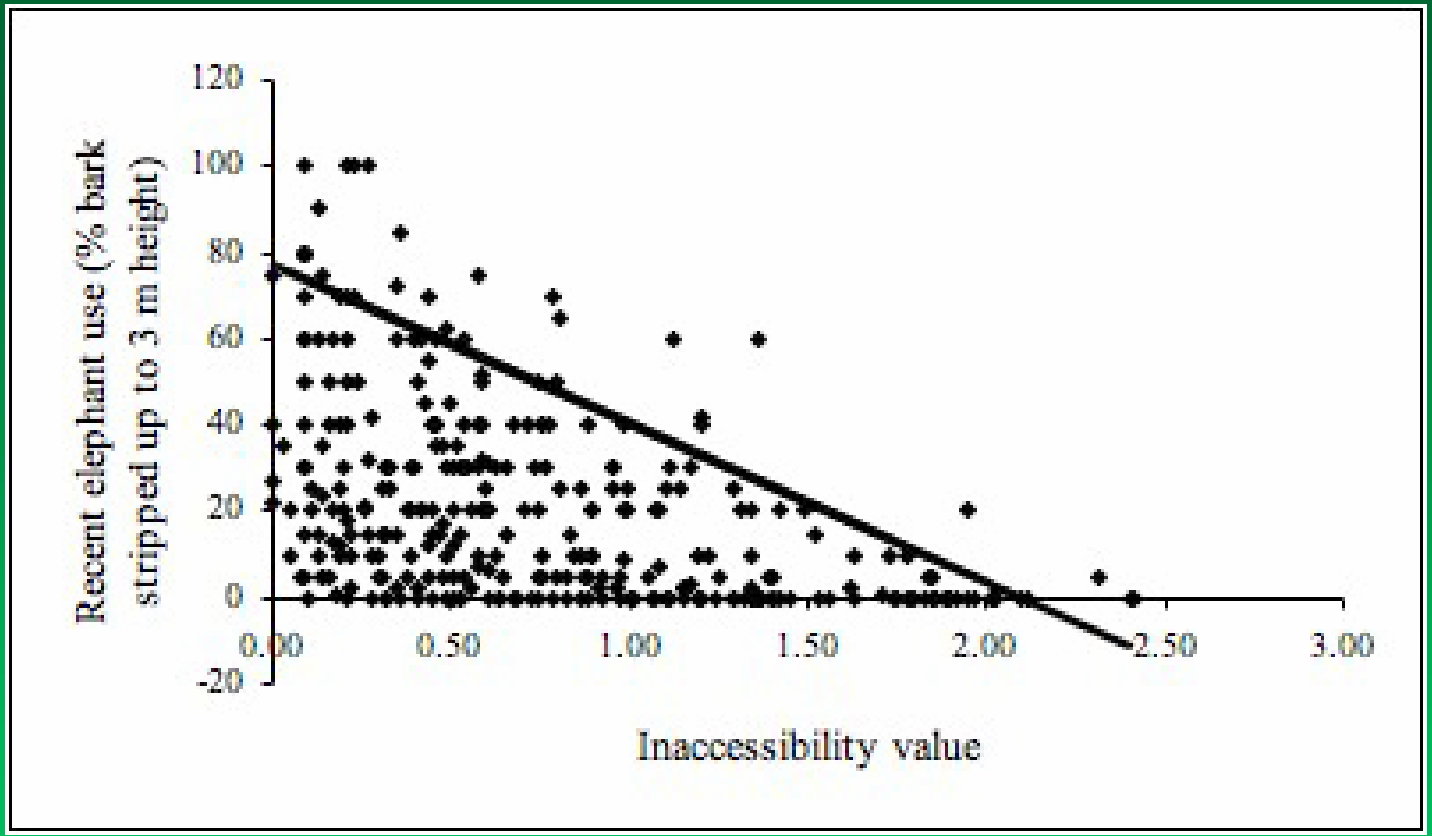
Jacob Cram, Max Edkins, Janie Hauser, Kyle Harris, Michael Chazan, Lucas Masinda, Michelle Hofmeyer



Key Questions:

- Do baobab refugia exist?
- What are the recruitment patterns?
- How do elephants influence baobab demography?

Refugia?

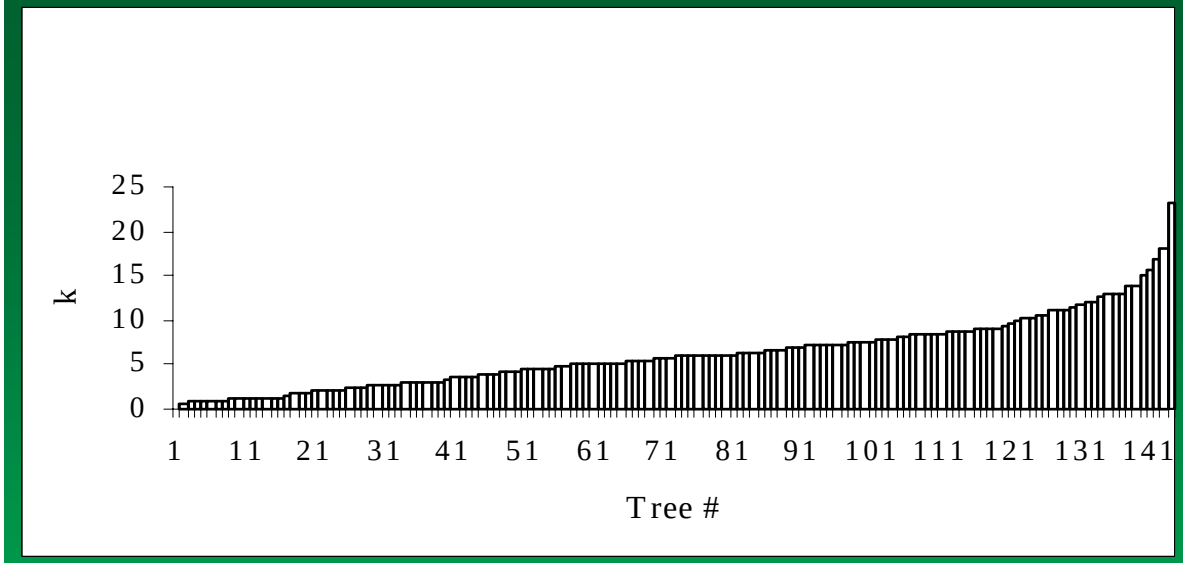


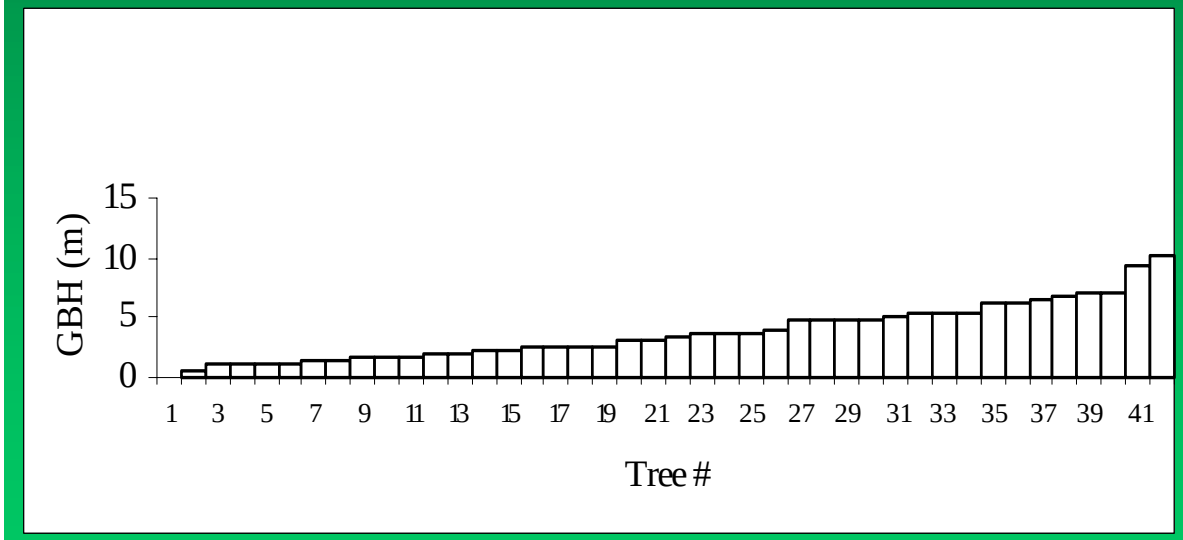
Regression analysis at the 90th quantile ($y = -36.8x + 77$, $p<0.001$)

Inaccessibility = rockiness & slope

7 º slope cutoff = < 100% bark stripped

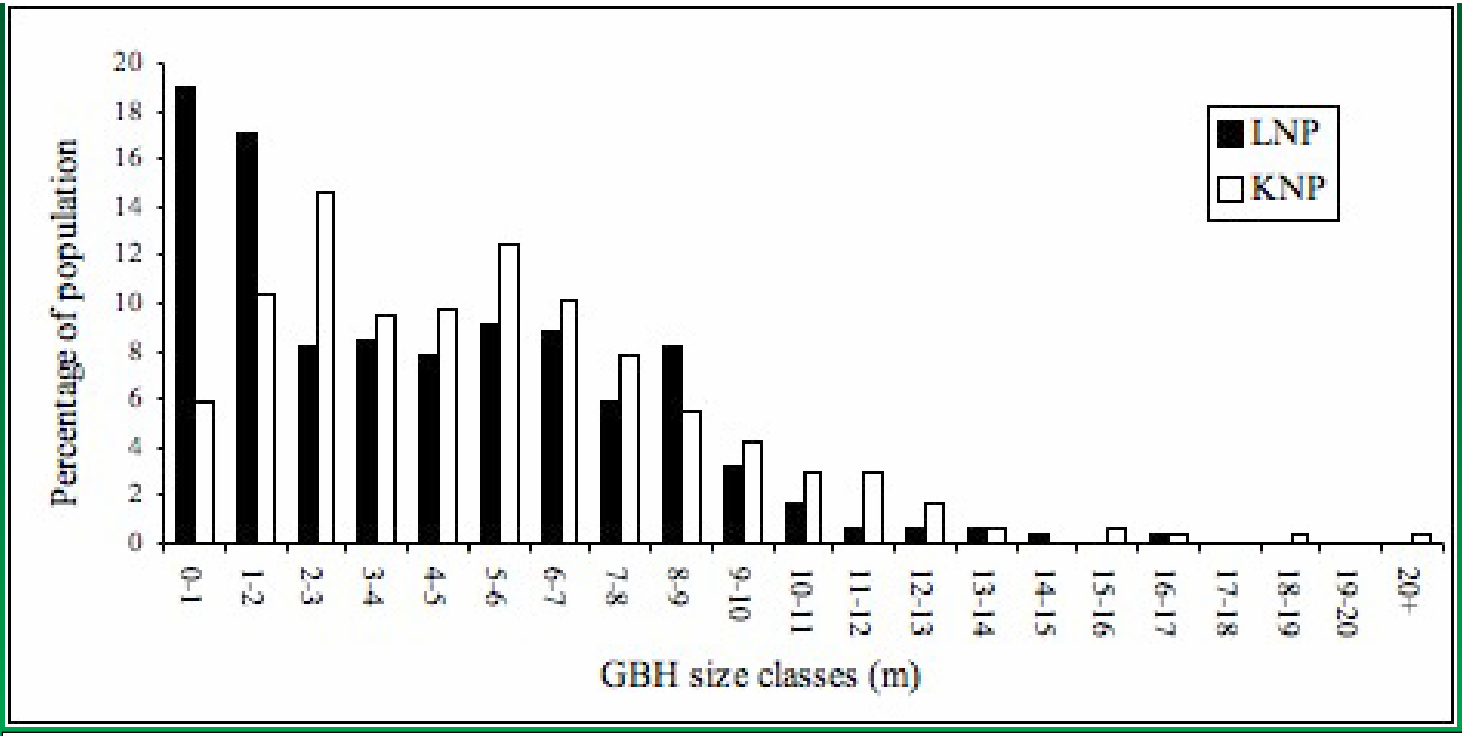
18 º slope cutoff = < 20% bark stripped

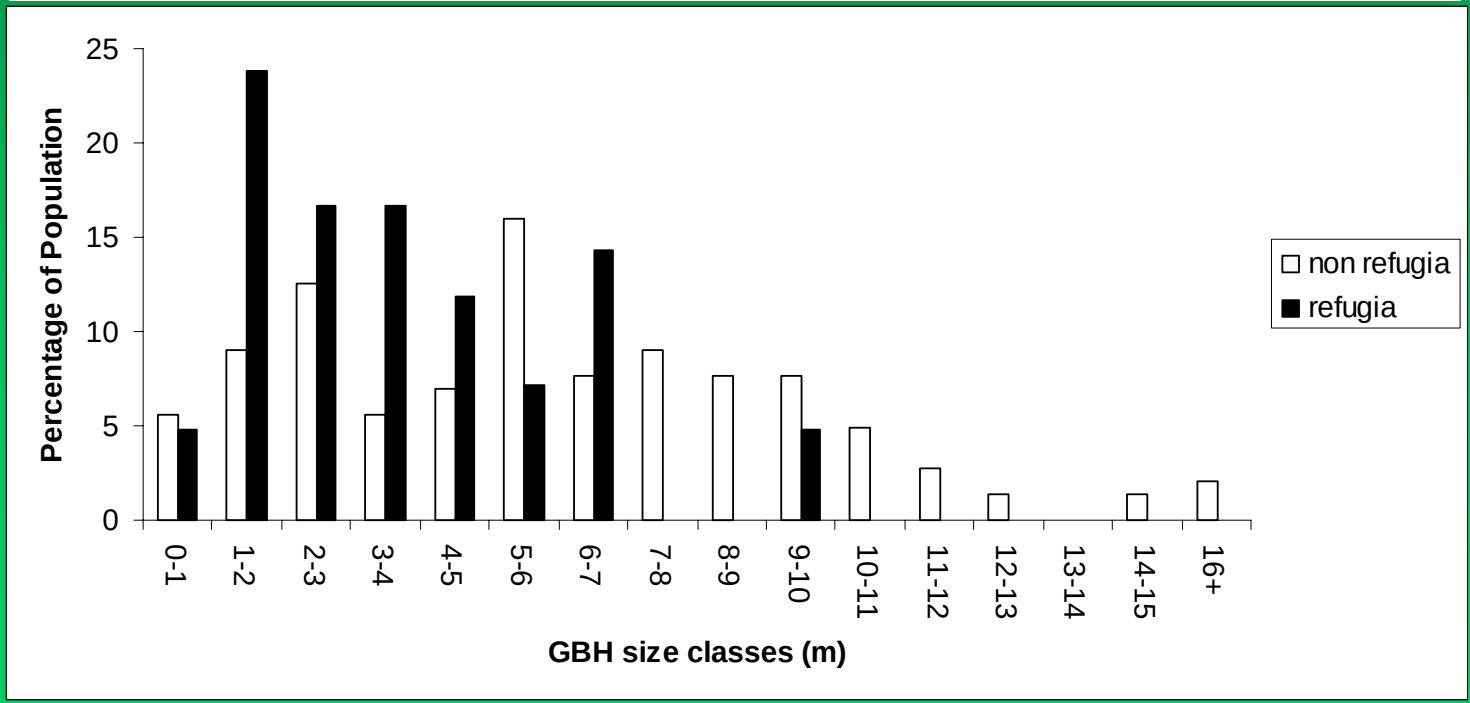


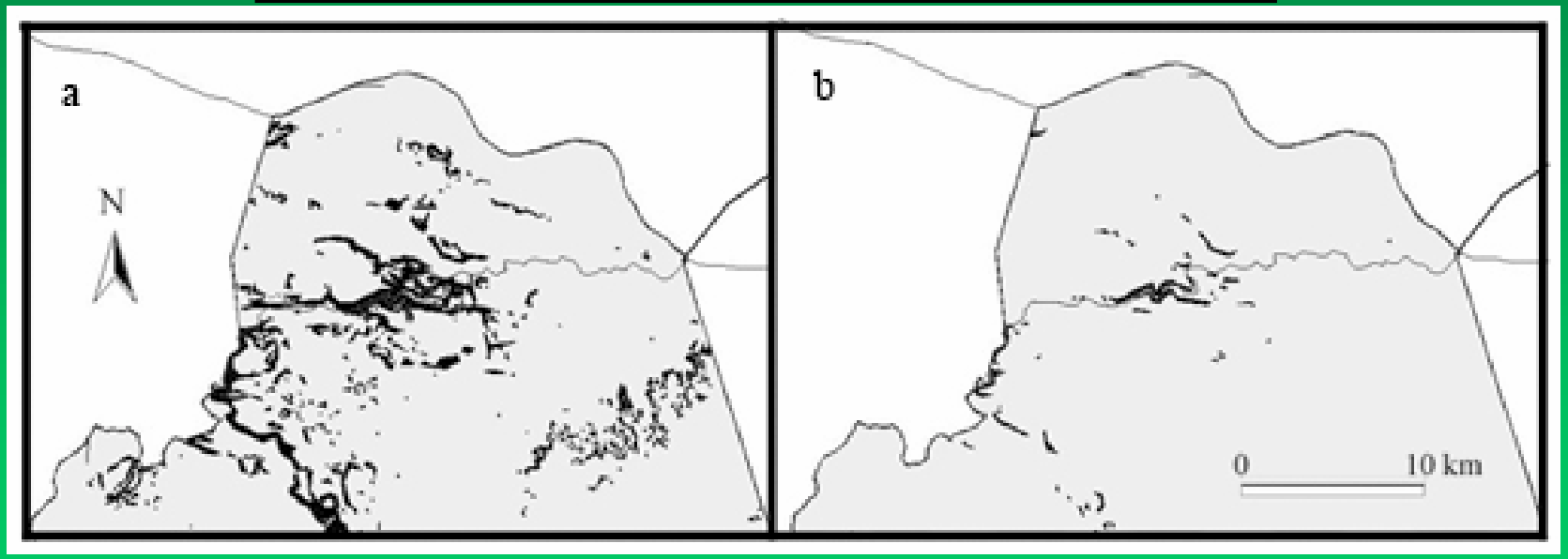


Demographic patterns

Continuous recruitment?


Percentage of population
20
18
16
14
12
10
8
6
4
2
0
LNP
KNP
0-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
13-14
14-15
15-16
16-17
17-18
18-19
19-20
20+
GBH size classes (m)


Percentage of Population
25
20
15
10
5
0
non refugia
refugia
0-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
13-14
14-15
16+
GBH size classes (m)



Baobab refugia in KNP

(a) 7 º slope cutoff = < 100% bark stripped = 8% of North KNP

(b) 18 º slope cutoff = < 20% bark stripped = 1% of North KNP

VALUE OF OTS RESEARCH DATA

OTS South Africa project data are available (raw data, metadata, written reports, electronic versions of data and reports).

Data from projects form the inspiration for subsequent study and for the foundation of sustained monitoring projects.

Data from OTS projects from past years (42 years in Costa Rica) are often the only baseline data available to assess changes in species abundance, habitat characteristics, and land use practices.