Kruger’s Elephants

Rudi van Aarde
Protected Areas in South Africa

- About 7% of the land set aside as formally protected areas, 56% as 19 national parks and 44% as 390 provincial parks;
- 558 formally protected estates in South Africa (mostly IUCN category 2);
- About 17% (205 000 km²) of the land covered by privately owned informal protected areas (game farms, etc., mostly IUCN category 6).
There are too few!
There are too many!
They are ill or may be ill!
They breed too fast, or too slow!
They threaten our well-being!

Parks have Problems !!
But the real problems might be ecological

- Parks are fragments of the natural landscape and distributional ranges of species;
- Parks are isolated and embedded in matrices of unnatural landscapes;
- Parks have huge area and edge effects;
- Most Parks suffer from a history of management interferences that altered ecological processes.
Protected areas in South Africa

- Doubled in area since 1974;
- Protects species and allow for ecological processes;
- Sufficient but not efficient;
- Plagued with limitations imposed by ecological realities.
Conservation & Politics

- Space limited;
- Political and financial development models in conflict with conservation needs;
- Conservation has a colonial tradition that ignores the needs of people;
- Rates of environmental change exceeds the adaptive potential and ecological plasticity of species.
LOOK MOM, THERE'S A TREE
I SAY WE SCRAP THE CONTRACEPTION IDEA.
Jumbo birth control drives bull elephants wild

Ellen Barrett, Johannesburg

This first field trials of an elephant bull have been suspended. The trials, taking place in South Africa's Kruger National Park, have thrown normally orderly elephant herds into turmoil. A team of scientists, taking part in research in Berlin, have used human oestrogen to continue the conservation of elephants at Kruger. While this new method has shown promise, it remains to be seen if it will work in the field.
Elephant culling controversy back on the agenda

State considers options as number support for culling from scientists and wildlife managers who see no alternative to putting a stop on uncontrolled growth in poaching off parks with finite natural resources.
Years after culling vs. Population growth rate.

Statement on Elephant Science Roundtable, Cape Town, Wednesday 18 January 2006

Scientists participating ….. in Cape Town today advised the Minister of Environmental Affairs & Tourism, Marthinus van Schalkwyk, that there is no compelling evidence to suggest the need for immediate, large-scale reduction of elephant numbers in the Kruger National Park.

Even so, in some protected areas….., elephant density, distribution and population structure may need to be managed locally to meet biodiversity and other objectives.
The Art of Wildlife Management

- Catatonic – *do what ‘needs’ to be done but never learn*
- Reactive – *Firefighting*
- Passive adaptive – *Change in response to experience*
- Active adaptive – *Plan and alter management as a scientific experiment* (Walker 1998).
Measure back lengths

Estimate shoulder height

Assign ages

Age at first calving

Calving interval

Age at last calving

Fecundity

Age structure

Survival rates

Intrinsic growth

A Rapid Method to Estimate Population Variables for African Elephants

of a mega-Park
the elephant
Defining a ‘Megapark’

A unit of space that encapsulates ecosystem services (e.g. water catchment, migratory patterns and that stabilizes biological diversity)
Defining a ‘Metapopulation’

- A population of subpopulations that operates as an entity
- Subpopulations are separated by distance
- Demography of subpopulations differ
- Dispersal occur between subpopulations
Traditional Approaches

Impact

Elephant numbers
Modern Approaches

Impact

Elephant spatial use

Conservation science and elephant management in southern Africa

P.L. van Aarde, T.P. Jackson and S.M. Perreira
Population trend for Kruger’s elephants
- 1967 to 2011 -

Additional information provided by SM Ferreira, SANParks
Elephant numbers in Kruger
1998 to 2012

(Robson & van Aarde 2014 In preparation)
Population growth rate as a function of detrended elephant numbers (1998-2012)

\[ r^2 = 0.44; F_{1,12} = 9.57; P < 0.01 \]

(Robson & van Aarde 2014 *In preparation*)
District specific population trends in Kruger

Information provided by SANParks

~450 mm

~750 mm

Density

- 0.39
- 0.50
- 0.56
- 0.75
- 0.77
- 0.92
Reproductive variables for Kruger’s elephants (based on REPAs)

Mean yearly age at first calving for 2009, 2010 & 2011

- **North**: 10 years
- **Central**: 12 years
- **South**: 14 years

Mean yearly calving intervals for 2009, 2010 & 2011

- **North**: 4 years
- **Central**: 4.5 years
- **South**: 5 years

*Note: The diagrams show the distribution of mean ages and intervals across different districts.*
Will the population be regulated without management interferences?


Additional information provided by SM Ferreira, SANParks
Asymptotic densities as a function of rainfall

Arid savannas < 700mm

r² = 0.95, F₁,₃ = 62.56, P = 0.004

Mesic savannas > 700mm

r² = 0.22, F₁,₅ = 1.426, P = 0.28
What are the implications of all of this?

- Demographic responses suggest that functional heterogeneity is regained;
- Increase in effective area of Kruger and closure of water may provide for the spatial structuring of the population into sub-populations;
- The paradigm shift in management provides an ecological framework for conservation management.
Temporal trends in elephant density within and beyond Areas of Concern (1998-2012)

$r^2 = 0.42; F_{1,13} = 9.55; p = 0.009$

$r^2 = 0.89; F_{1,13} = 109.4; p < 0.0001$
Temporal variability in September NDVI follows a similar pattern within and beyond Areas of Concern.

Correlation coefficient = 0.99

* Error lines are standard deviation
Probability of use based on dynamic Brownian bridge movement models of 32 breeding herds satellite tracked from June 2012 to March 2014