



# ***Predicted impacts of climate change on South Africa savannas***

**Claire Davis<sup>1</sup> and Dr. Emma Archer**

**<sup>1</sup>School of Geography, Archaeology and Environmental Studies,  
University of the Witwatersrand.**



# Introduction

- Growing research interest
- Expected numerous structural and functional variables will respond
- **Central problem:** how to determine the responses
- 'Reduced form' ecosystem function model developed by Scholes (2006)

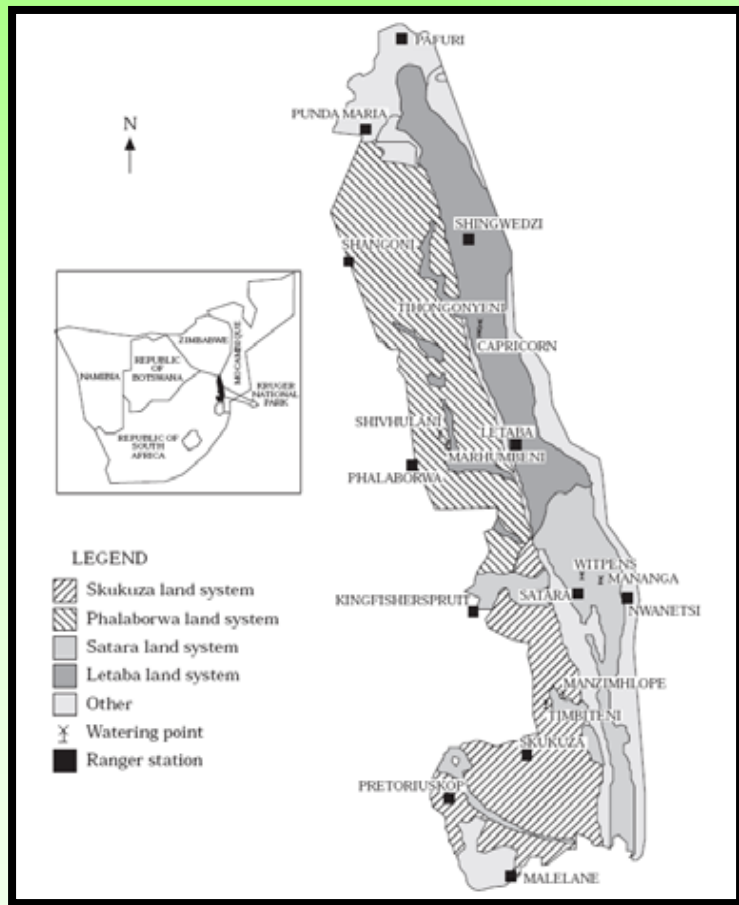
# Presentation structure

- State 3 major findings
- Project aim
- Methodology
- Results – graphic outputs
- Discuss the implications of results

# Major Findings

1. ↑ Temperature and rainfall may result in the conversion of savannas to open-grassland savannas.
2. Elephants are seen as major modifiers of vegetation change.
3. Fire mediates the effects of climate change.

# Aim



Thrash 1997, 619

To develop a predictive understanding of the ways in which the Skukuza and Satara savanna systems of the Kruger National Park, South Africa will respond to future climatic changes.

# Methodology

In which ways will the vegetation structure and herbivore population dynamics of KNP be influenced by changing:

## Rainfall

6 Statistical downscaled GCMs (CSIRO, MIROC, ECHAM, HadCM3, MRI\_CGCM, and GFDL), ([www.csag.uct.ac.za/gisdata](http://www.csag.uct.ac.za/gisdata))

## Temperature

MM5 and PRECIS regional climate models ([www.csag.uct.ac.za/gisdata](http://www.csag.uct.ac.za/gisdata))

## Carbon Dioxide

A2 and B2 scenarios from SRES

Projected monthly anomalies

**Least change** from current conditions:

MRI\_CGCM  
MM5  
500ppm

**Greatest change** from current conditions:

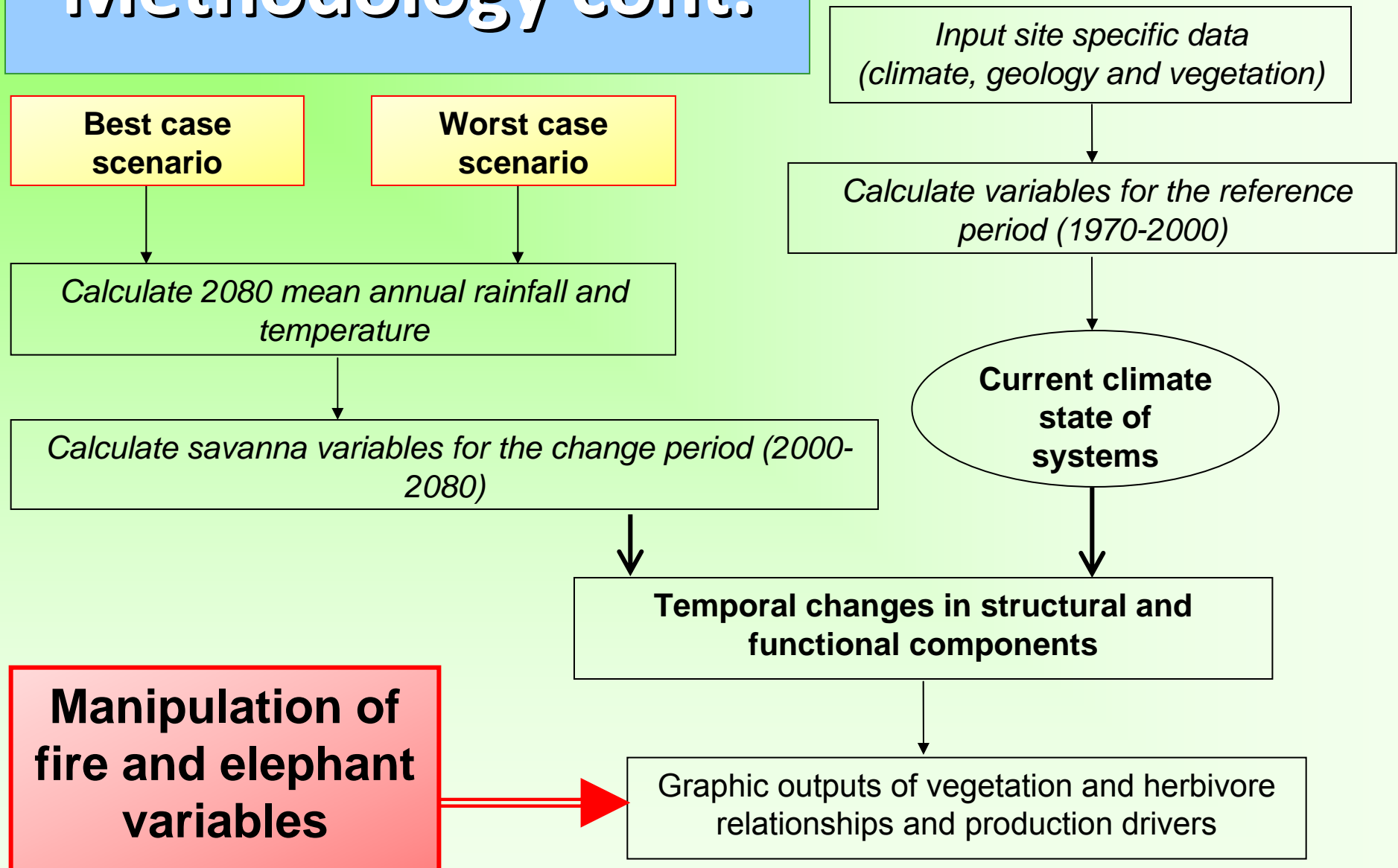
ECHAM  
PRECIS  
700ppm

'Best case scenario'

'Worst case scenario'

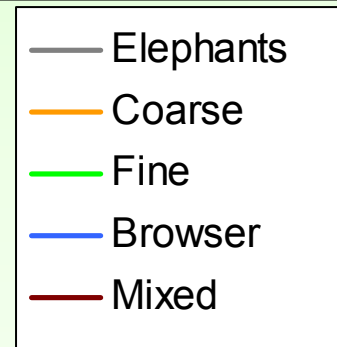
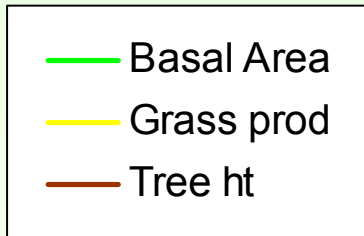
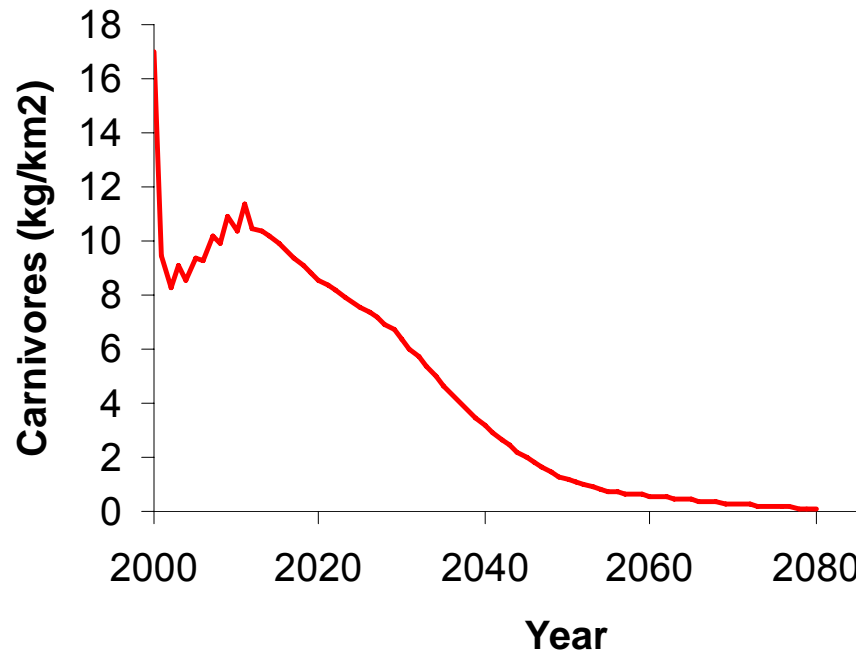
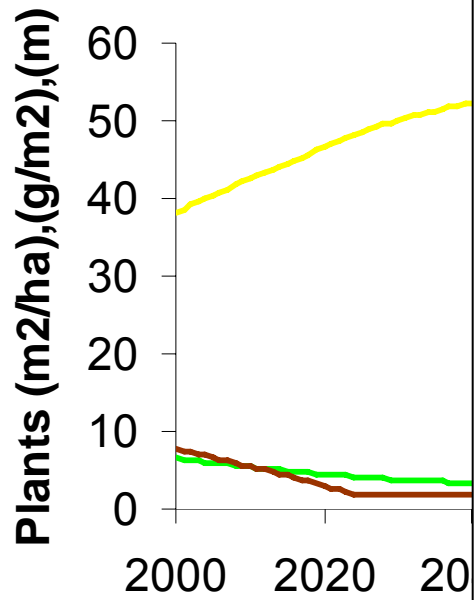
# Methodology cont.

*Ecosystem function model  
(Scholes 2006)*



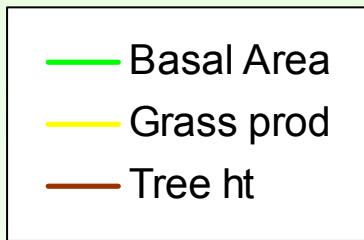
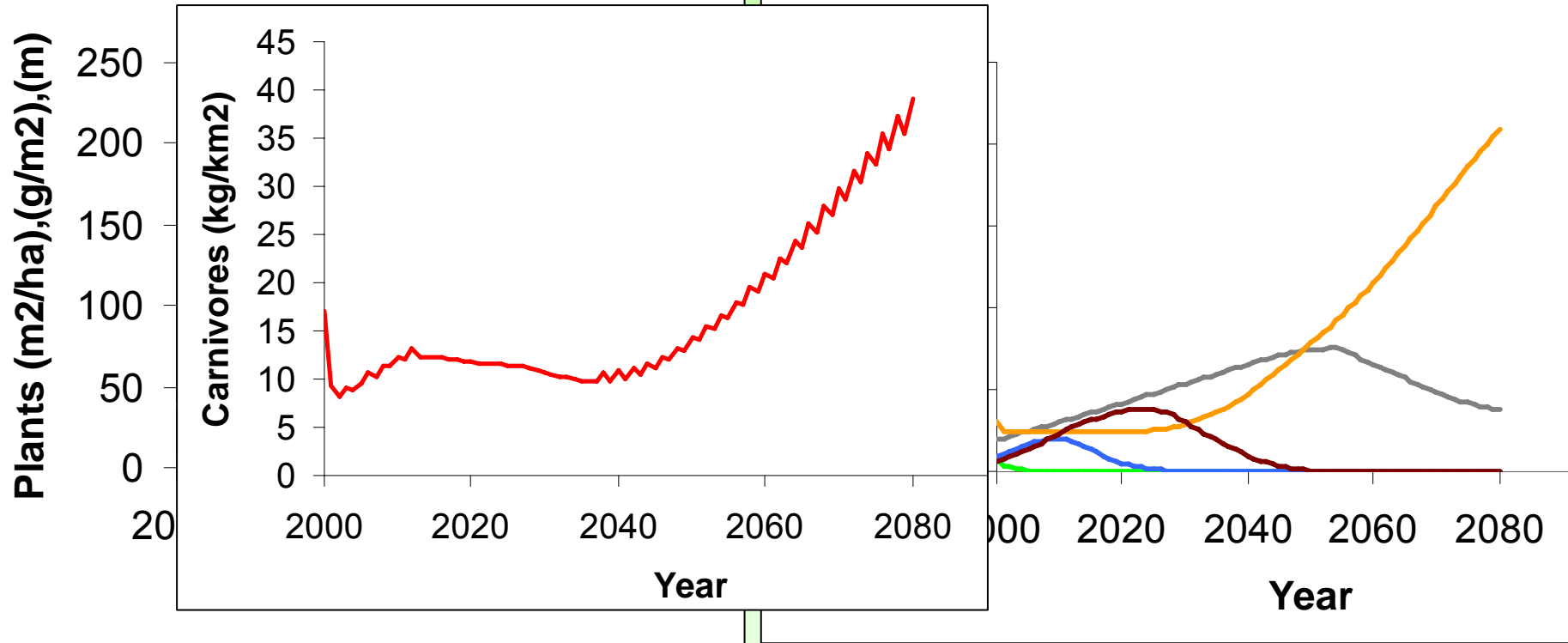
# Results: Skukuza

'continuation of current climate conditions'



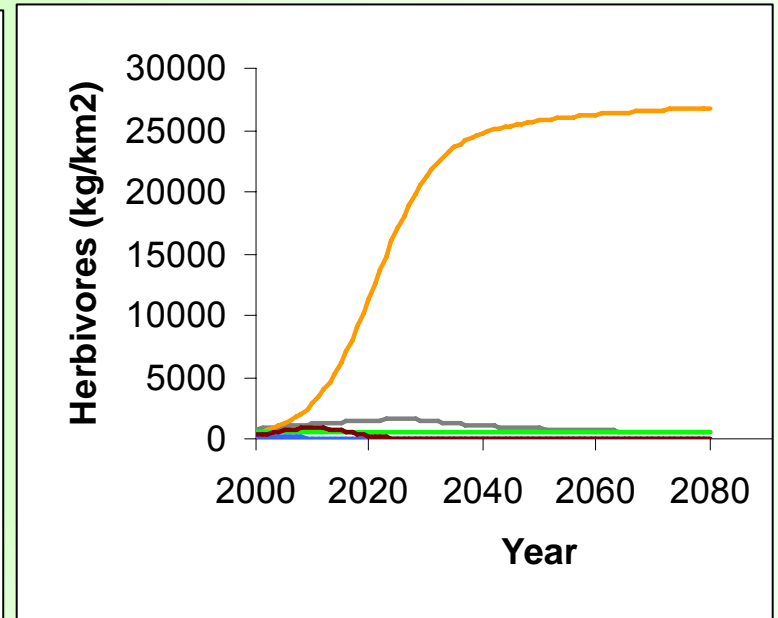
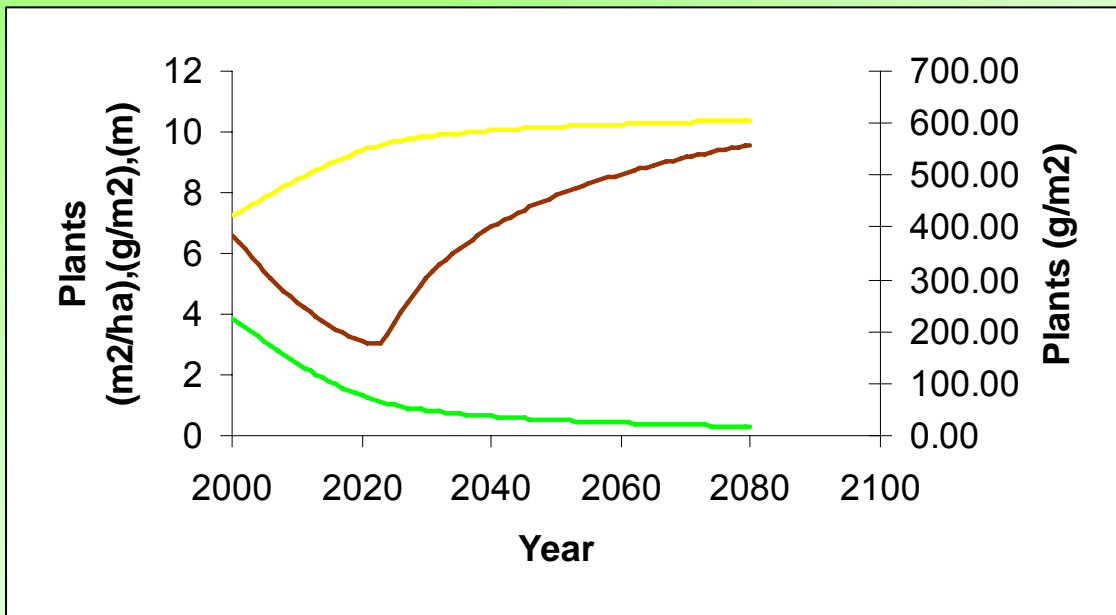
# Results: Skukuza

'worst case climate change scenario'



# Results: Satara

'continuation of current climate conditions'

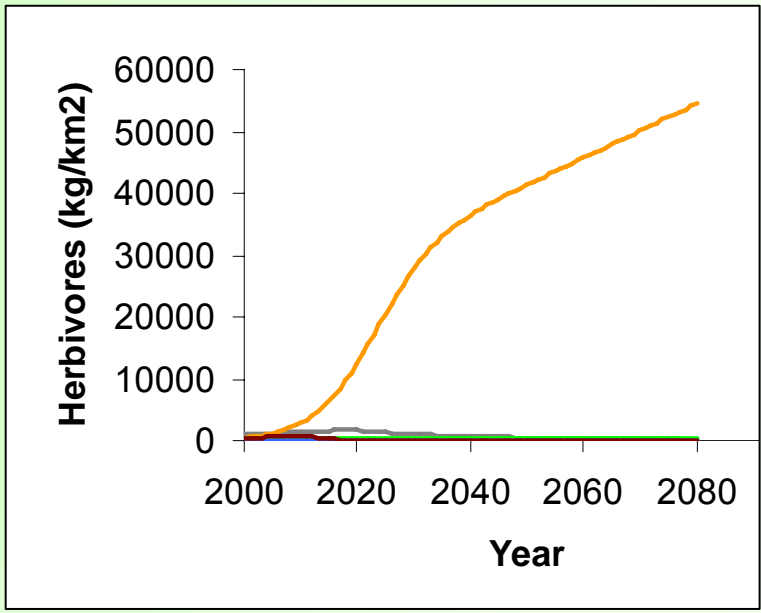
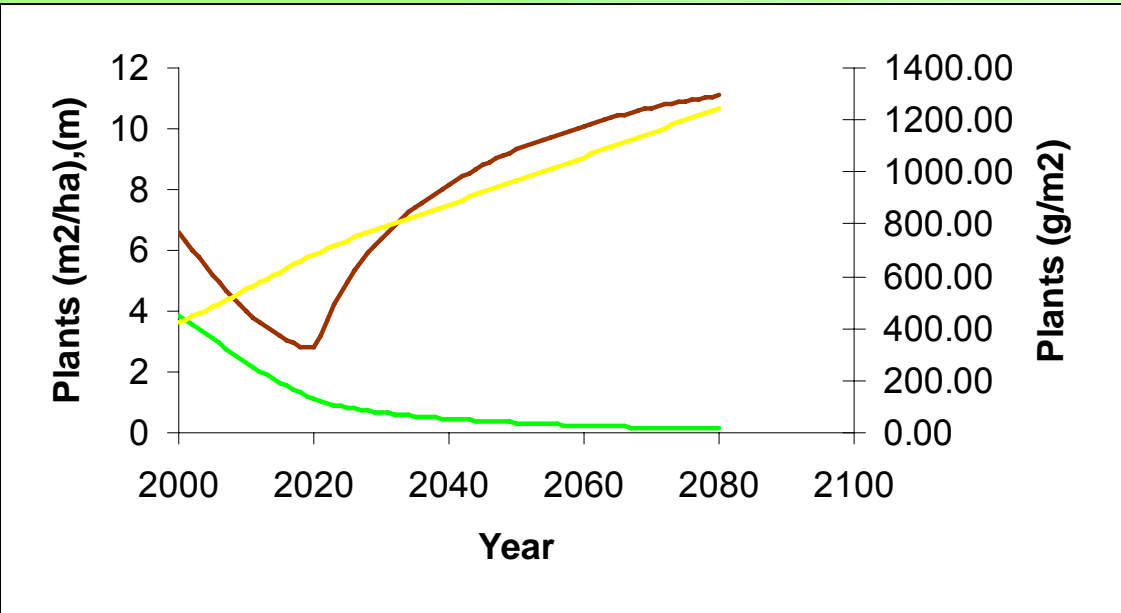


- Basal Area
- Grass prod
- Tree ht

- Elephants
- Coarse
- Fine
- Browser
- Mixed

# Results: Satara

'worst case climate change scenario'



- Basal Area
- Grass prod
- Tree ht

- Elephants
- Coarse
- Fine
- Browser
- Mixed

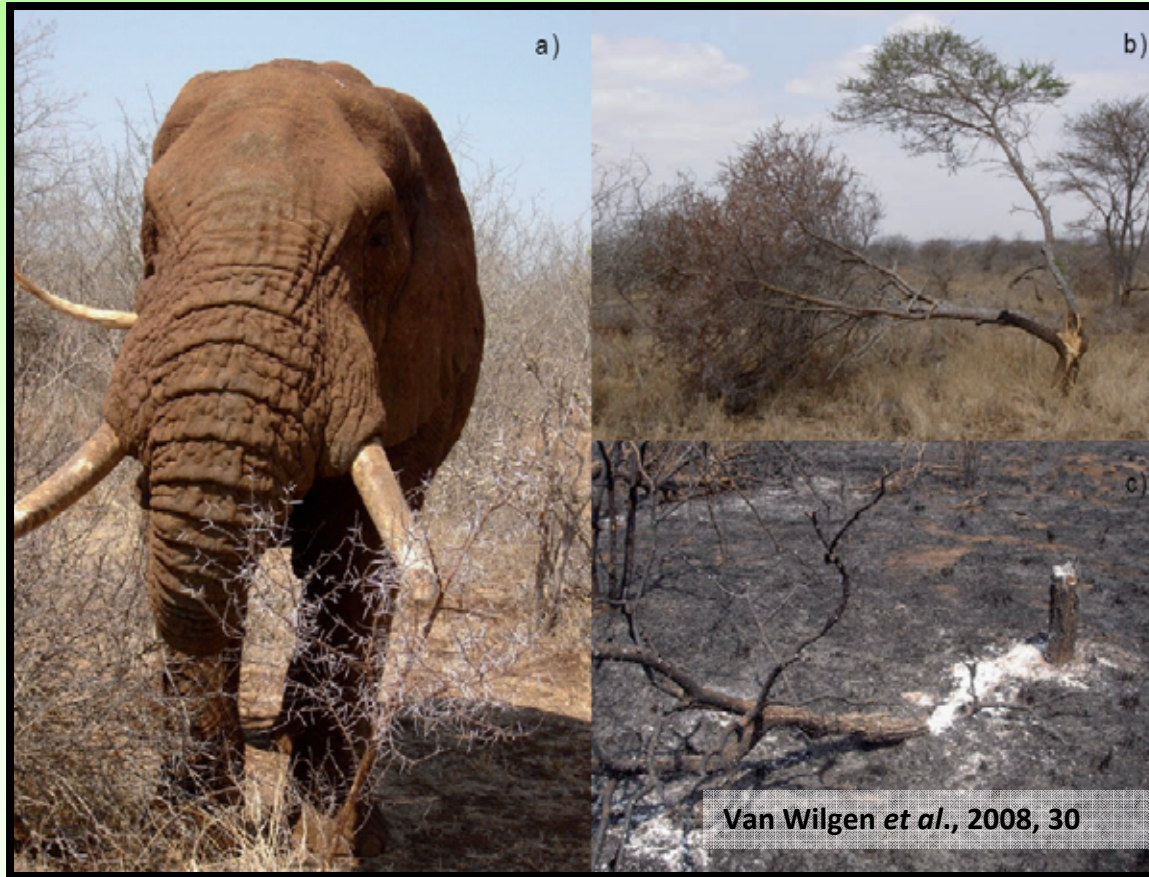
# Discussion

## *Finding 1*

- Tree:grass ratio will be altered
- Significant implications for herbivore guild composition
- Same degree of climate change applied to different savannas elicits different responses
- **But** can climate change alone account for the decline in tree production?

# Impacts depend on the management of elephants and fire

## *Finding 2 &3*

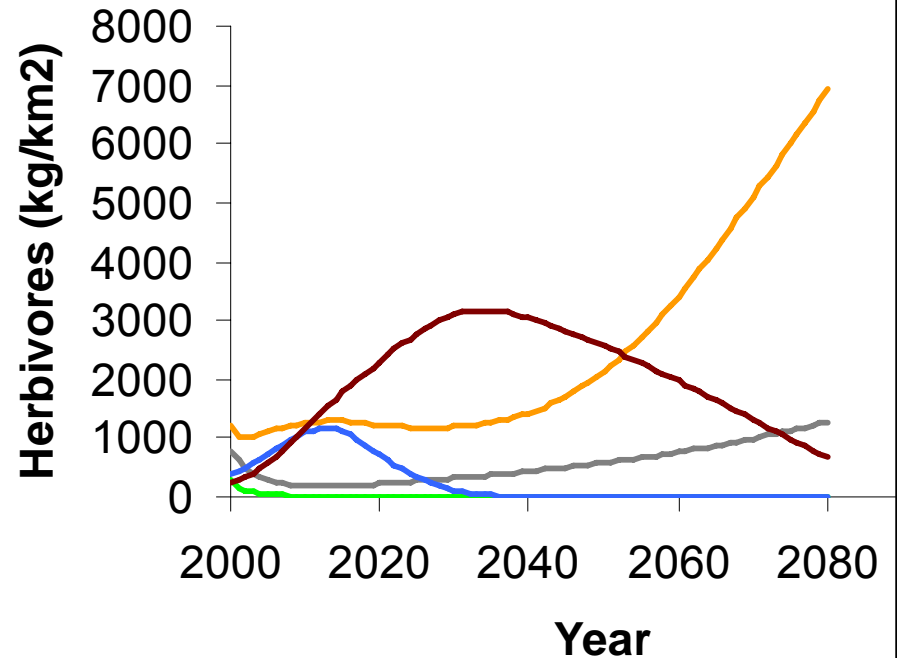
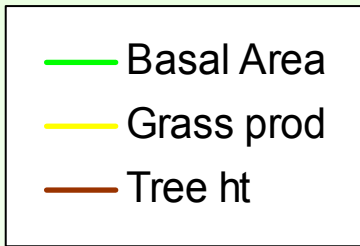
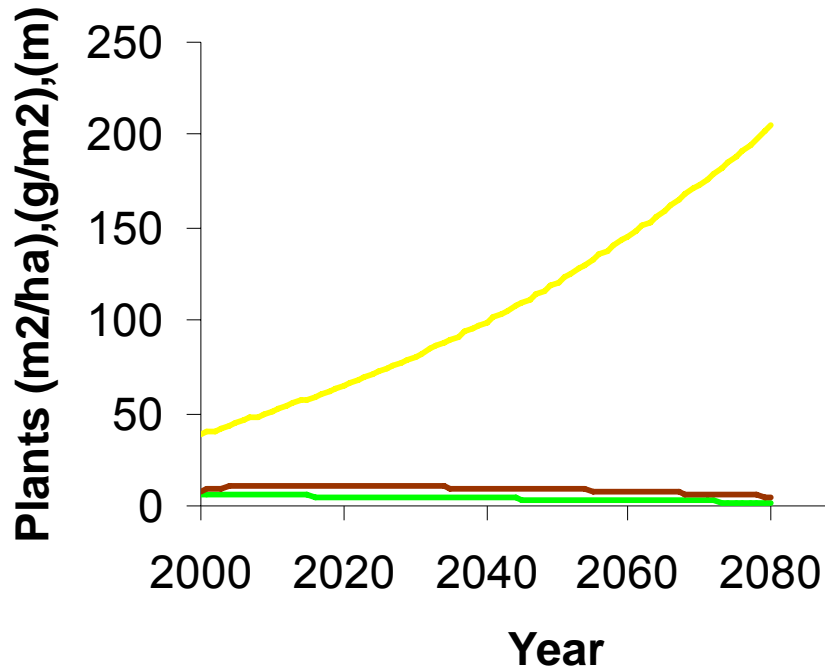


Van Wilgen *et al.*, 2008, 30

# Results: Skukuza

'worst case climate change scenario'

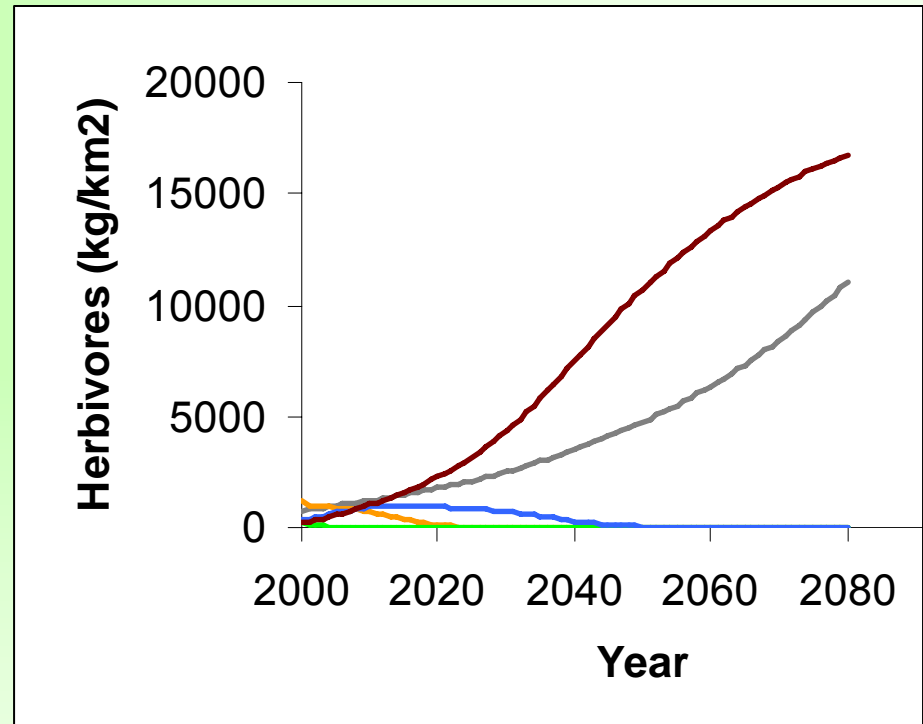
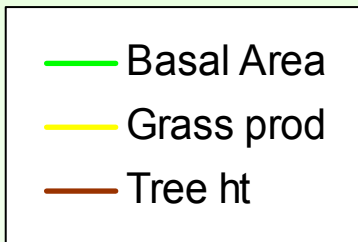
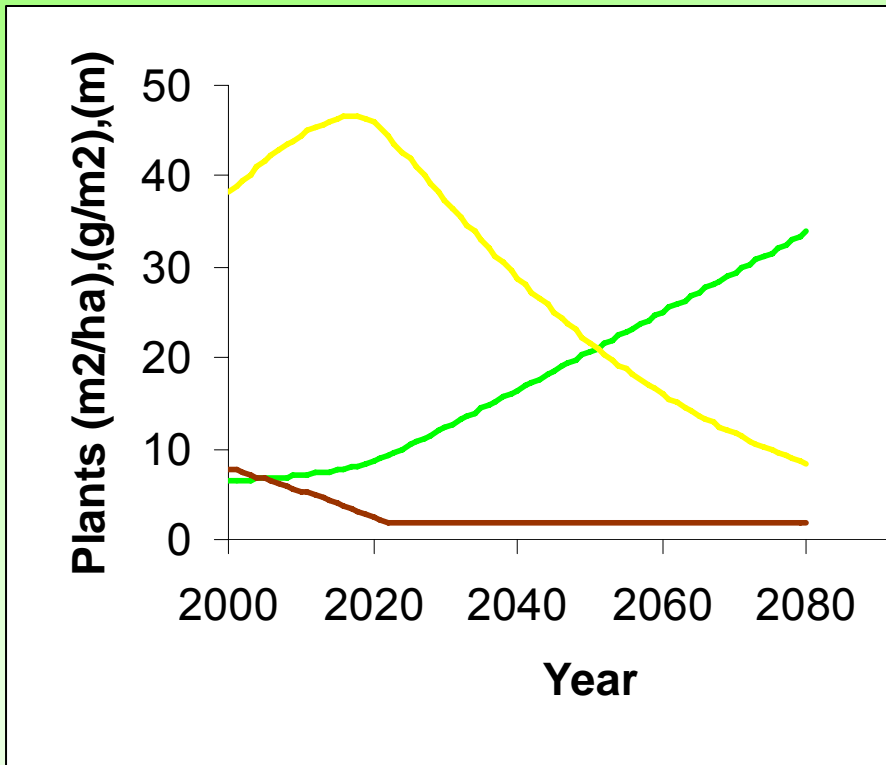
Culling quota of 14% reduced by 1% annually



# Results: Skukuza

'worst case climate change scenario'

## Removal of fire



# Discussion

- Elephant population control measures are necessary in Skukuza
- Removal of fire demonstrates that CO<sub>2</sub> has a significant impact on tree production
- ***Impacts of climate change on African savannas depends on the management of fire and elephants***

# Preliminary evaluation of ecosystem function model

- The current state of both savanna systems was well represented
- Investigate assumption that fire intensity of 3000 W/m/s translates to fuel load of 300g/m<sup>2</sup> in both regions
- Problem with representation of fine grazers
- Tree architecture of savannas was not considered

# Conclusion

- Dynamics of savannas cannot be investigated in isolation
- Climate change poses new challenges for conservation
- Models provide a primary basis to investigate the impacts of climate change



**Thank you**

**Questions?**

### **Acknowledgements**

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