Assessing the impacts of *Acacia mearnsii* (black wattle) on grazing provision and livestock production in South Africa

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INTRODUCTION

Many of South Africa's natural ecosystems have been invaded by alien plants, which pose a major threat to biodiversity and natural ecosystems (Robles and Chapin, 1995). Invasive alien tree species and shrubs negatively affect ecosystems in various ways, and often result in a decline in benefits that people derive from the functioning of these systems – or ecosystem services. The reduction in stream flow, water availability, the loss of potentially productive land for crops and the reduction in the grazing potential of our rangelands are all consequences of degradation by alien species (Scott et al., 1998). This study investigated the ecological impacts of the invasive alien plant species, *Acacia mearnsii,* on the function and productivity of rangelands in South Africa and their ability to sustain livestock production.

AIM

The central aim of this research is to develop a deeper understanding of the ecological impacts of *A. mearnsii* invasions on the functioning and productivity of rangelands in South Africa and their ability to sustain livestock production.

OBJECTIVES

1) To determine where invasive alien species are impacting on livestock production at a national level and what the nature of these impacts are;
2) To determine, at a local scale, the effects of invasive plant density on the growth form dominance of indigenous vegetation, and how this translates into impacts on forage quality and quantity; and
3) To determine the effects of alien plant invasion on local soil resources and conditions, a key supporting element of grazing production.

MATERIALS AND METHODS

- The first step was to identify magisterial districts in South Africa where livestock farming is a major activity using both present and historical statistical data on livestock numbers from the DAFF and potential national stocking rates (Scholes, 1998).
- The next step was to identify areas within these districts that have a high density *A. mearnsii* invasion and where the greatest potential livestock production impacts are being experienced, according to biomes, vegetation types and habitats using the GIS database and software (**Figure 1**).
- Experimental sites were identified and classified according to different levels of invasions from un-invaded, light invaded to dense invasion and cleared sites, which were selected within the same vegetation type.

Figure 1

VEGETATION ASSESSMENT

At each treatment site, five replicates of 30*100 m plots were selected and a veld condition assessment was undertaken using the line-point method (as described by Trollope, 1990) (**Figure 2**).

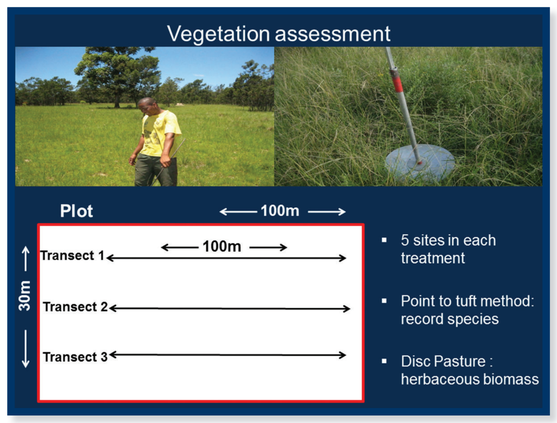


Figure 2

SOILS ASSESSMENT

Along each 100 meter transect, 10x1 m² quadrates were laid out at 10 meter intervals. A visual soil surface assessment was conducted at each quadrate using the landscape functional assessment method (as described by Tongway and Hindley, 2004). This method uses several indicators to assess the biogeochemical function of the landscape (**Figure 3**).

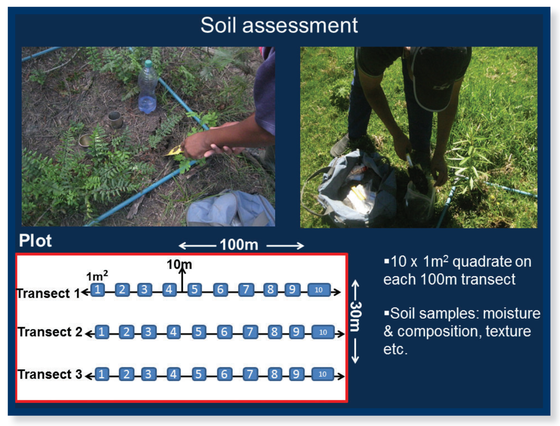
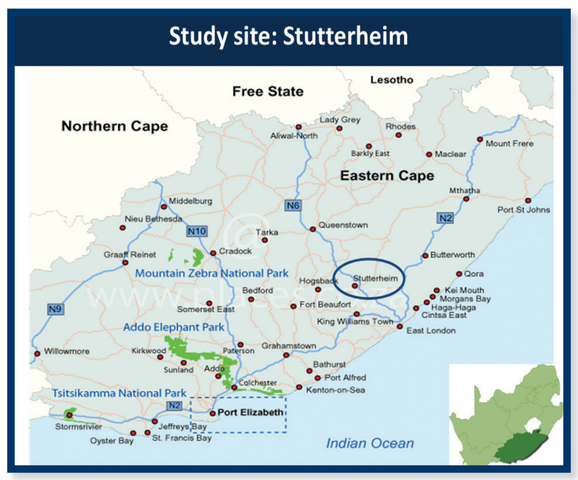


Figure 3

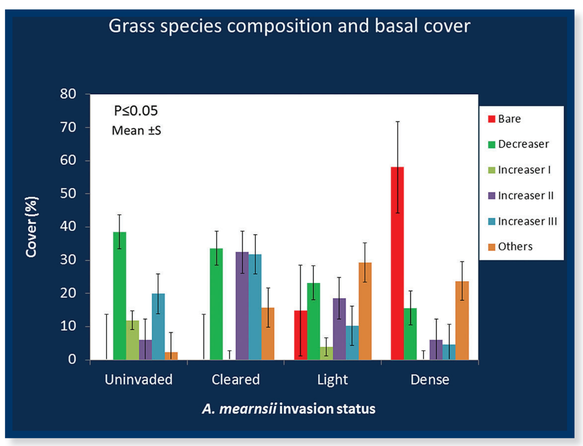
STUDY AREA

The Stutterheim region was identified as an ideal area for investigating local level impacts. Field trials examined various sites with differing levels of invasion within a single vegetation type (**Map 1**).

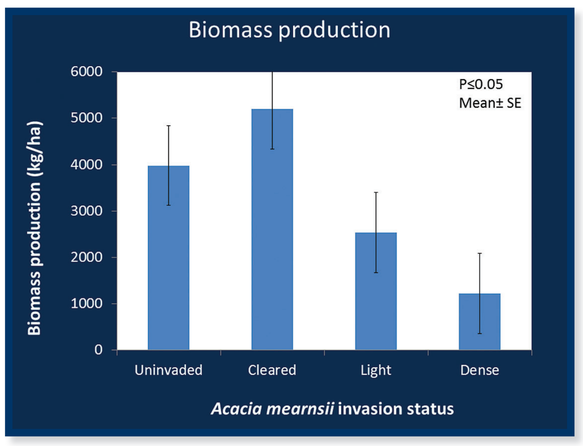


Map 1

RESULTS:

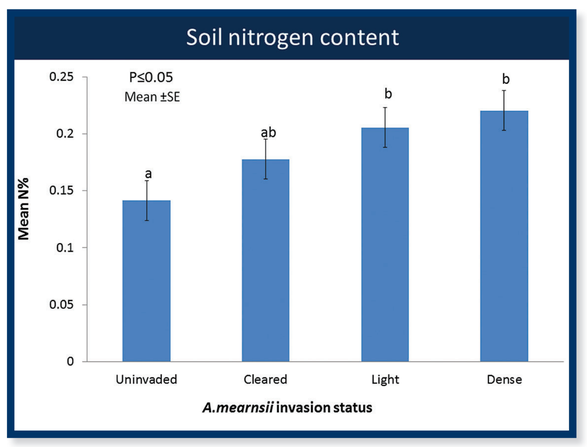


Graph1: Grass species composition and basal cover

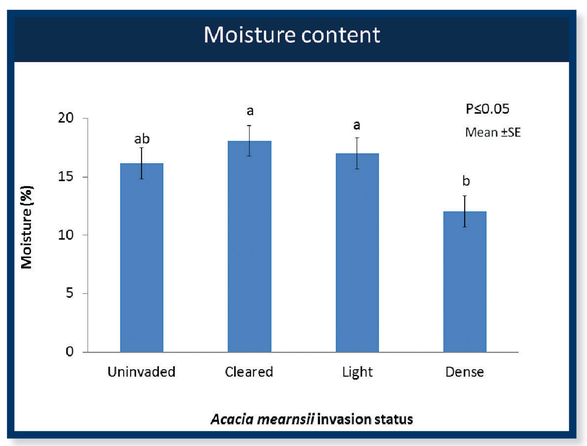


Graph 2: Biomass production

The study found that high density invasions of Acacia mearnsii have negative effects on the productivity of rangelands.



Graph 3: Soil nitrogen content



Graph 4: Moisture content

CONCLUSIONS

High density invasions of *A. mearnsii* have negative effects on rangelands productivity.

Public works programmes focussed on the removal of *A. mearnsii* significantly, improves grazing resources and soil biological processes.

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REFERENCES

Robles, M. and Chapin, F.S. 1995. Comparison of the influence of Two Exotic species on Ecosystem Processes in the Bekerley Hills. Pacific Southwest Forest and Range Experimentation Station, Bekerley Califonia.
Scott, D.F., Le Maitre, D.C. and Fairbanks, D.H.K. 1998. Forestry and Stream flow Reductions in South Africa: A Reference System for Assessing Extent and Distribution. Water SA, 3(24).
Scholes, R.J. 1998. The South African 1:250 000 maps of areas of homogeneous grazing potential. ENV-P-C 98190 Division of Water. Environment and Forestry Technology, CSIR, Pretoria.
Tongway, D.J. and Hindley N.L. 2004. Landscape function analysis: Procedures for monitoring and assessing landscapes. CSIRO sustainable ecosystems.
Trollop, W.S.W. 1990. Development of a technique for assessing the veld condition in the Kruger National Park using key grass species. *J. Grassland Society South Africa*, 7: 4–51.

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