

**BALANCING THE ACT: DILEMMAS ASSOCIATED WITH THE ERADICATION OF *ACACIA MEARNSII* FROM THE GOLDEN GATE HIGHLANDS NATIONAL PARK, SOUTH AFRICA.**


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## INTRODUCTION

- There is an increasing awareness of the importance of wildlife protected areas like national parks as popular destinations for wildlife tourists (Teel et al, 2010) and also biodiversity conservation
- It is also becoming more apparent that these areas constitute an important source of livelihood to local communities due to the products they supply to these communities (Vodouhè et al, 2010).

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- Where communities directly depend on park based resources the crossing of park boundaries (which often leads to park-community conflicts) is inevitable.
- Yet, movement across park boundaries enhances the risk of bio-invasion, confirming Kaufman's (2013: 98) argument that "invasive and introduced species have everything to do with people, from their initial transportation to their spread and the vulnerability of some habitats to invasion."

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## RESEARCH QUESTIONS

- What is the geographical scale of *Acacia mearnsii* invasion in areas bordering the GGHP?
- Why do people from communities surrounding the GGHP depend on park based resources?
- What exactly are the causes of the conflict between these communities and the GGHP authorities and how can this conflict be addressed?

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STUDY AREA

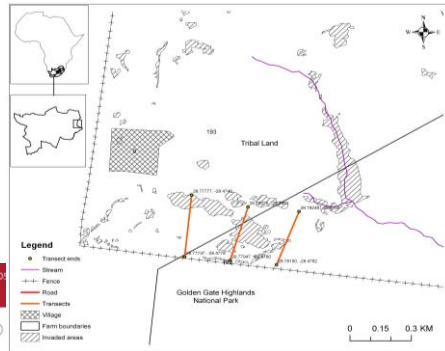


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STUDY AREA



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- Situated within the foothills of the Drakensberg mountains the area is characterized by a montane grassland ecosystem
- It partly comprises the former homeland (called Qwaqwa) set up for the Sotho speaking people during the apartheid era, commercial farms and wildlife conservation areas
- The area largely consists of poor rural communities
- Within the rural communities livestock is considered as one of the main sources of livelihood
- Ecosystems within the tribal area are generally degraded due to overgrazing
- Invasion by *Acacia mearnsii* is evident along the fringes of the park

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METHODOLOGY

- Spot 5 and Landsat 8 images were used to:
  1. assess the state of the environment along the park-tribal land fringes to determine the distribution of *Acacia mearnsii* and
  2. determine the general state of health of the vegetation in both the park and the areas adjacent to it in an objective way using NDVI values.

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- A comparison was done on the NDVI values and occurrence of the black wattle between the park and the area adjacent to it. The Kruskal-Wallis Test was used in the comparison.
- Vegetation surveying along three transects
- A questionnaire was used to collect data from park employees and the community found adjacent to the park and their perceptions compared statistically using Discriminant Analysis.

### DISCRIMINANT ANALYSIS

- $D = v_1 X_1 + v_2 X_2 + v_3 X_3 \dots v_i X_i + a$
- 
- Where D = discriminate function
- v = the discriminant coefficient or weight for that variable
- X = respondent's score for that variable
- a = a constant
- i = the number of predictor variables

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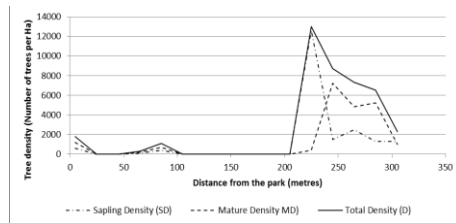
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## RESULTS

### VEGETATION SURVEY: TRANSECT 1



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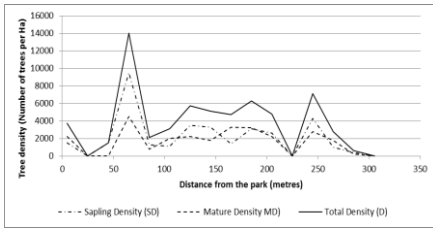


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**TRANSECT 2**

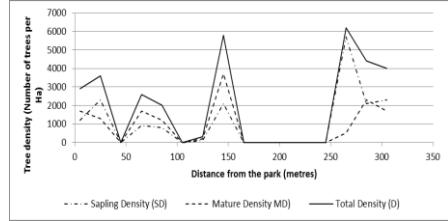


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**TRANSECT 3**



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**PARK INVASION**



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**ECOSYSTEM HEALTH - NDVI VALUES**

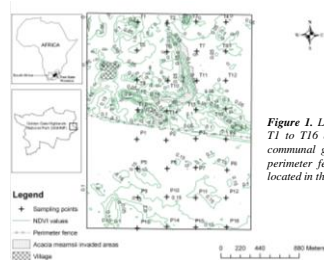


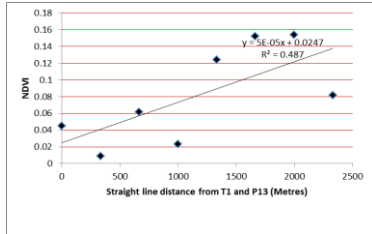
Figure 1. Location of sampling points: T1 to T16 are sampling points in the communal grazing areas (north of the perimeter fence) while P1 to P16 are located in the park (GGHNP).

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VARIATION OF NDVI VALUES: T1 – P13

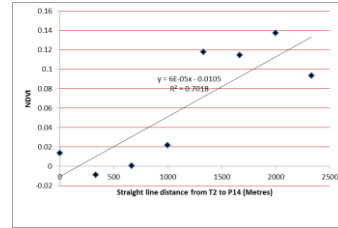


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VARIATION OF NDVI VALUES: T2 - P14



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- The vegetation is healthier in the park than in the tribal area adjacent to the park and the difference between the two areas is statistically significant. This is largely due to overgrazing in areas surrounding the park.
- Though vegetation is healthier in the park its state is not good enough for a typical grassland. In a typical grassland NDVI values range between 0.2 and 0.3
- In the adjacent communal grazing area the state of ecosystem health is further threatened by the black wattle.

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SOCIAL ISSUES

- Communities on tribal land rely on resources from the park (thatch grass, firewood, phytomedicines, pastures and sites for traditional rituals)
- Illegal access and potential conflict
- Different worldviews exist about *Acacia meamsii*. The species is an important resource to communities that live around the park.

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## DIFFERENCES AND POTENTIAL SOURCES OF CONFLICT

### Category 1: Perceptions about whether the black wattle is an environmental problem or a resource

- Is the black wattle a problem in your area? (Yes/ No)
- Is the black wattle a resource in your area? (Yes/ No)
- Should the black wattle be conserved or eradicated? (Conserve/ Eradicate)
- Is it necessary to completely eradicate the black wattle? (Yes/ No)

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### Category 2: Perceptions about the impacts of the black wattle on the environment

- Prevalence of the black wattle promotes:
- soil erosion (Yes/ No)
  - drying of streams (Yes/ No)
  - silting of streams (Yes/ No)
  - suppression of growing of grass (Yes/ No)
  - displacement of native trees species (Yes/ No)
  - fire damage within the habitat (Yes/ No)
  - other environmental changes (Yes/ No)
  - no change in the environment (Yes/ No)

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### Category 3: Perceptions about the impacts of the eradication of black wattle on the environment

- Eradication of the black wattle promotes:
- soil erosion (Yes/ No)
  - drying of streams (Yes/ No)
  - silting of streams (Yes/ No)
  - suppression of growing of grass (Yes/ No)
  - displacement of native trees species (Yes/ No)
  - fire damage within the habitat (Yes/ No)
  - other environmental changes (Yes/ No)
  - no change in the environment (Yes/ No)

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#### Category 4: Perceptions about how the black wattle spreads

How does the black wattle spread?

- Seeds are dispersed by wind (Yes/ No)
- Seeds are dispersed by livestock through ingestion (Yes/ No)
- Seeds are dispersed by people (Yes/ No)
- Seeds are scattered when the fruit splits (Yes/ No)
- Seeds are dispersed by running water (Yes/ No)
- Roots extend underground (Yes/ No)

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#### VARIABLE CATEGORY 1: PERCEPTIONS ABOUT WHETHER BLACK WATTLE IS AN ENVIRONMENTAL PROBLEM OR A RESOURCE

- For category 1 variables, the overall Chi-squared test was not significant (Wilks  $\lambda = 0.830$ , Chi-square = 3.066, df = 4, Canonical correlation = 0.412,  $p < .001$ ).
- None of the variables can be used to differentiate the belligerent stakeholders since the model explains only 16.97% of the variation in the grouping variable.

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#### VARIABLE CATEGORY 2: PERCEPTIONS ABOUT THE IMPACTS OF THE BLACK WATTLE ON THE ENVIRONMENT

- For category 2 variables, the overall Chi-squared test was highly significant (Wilks  $\lambda = 0.071$ , Chi-square = 44.889, df = 3, Canonical correlation = 0.964,  $p < .001$ ).
- This indicates that responses on perceptions about the relationship between *Acacia meamsii* and soil erosion, silting of streams and other environmental changes differed remarkably between the two groups.

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#### VARIABLE CATEGORY 3: PERCEPTIONS ABOUT THE IMPACTS OF THE ERADICATION OF BLACK WATTLE ON THE ENVIRONMENT

- Chi-squared test for category 3 variables was significant (Wilks  $\lambda = 0.105$ , Chi-square = 38.248, df = 4, Canonical correlation = 0.946,  $p < .001$ ), indicating the highly differentiating power of variables.
- The variables that caused the biggest differences between the belligerent groups are proneness of streams to siltation and proneness to fire damage as a result of eradication of *Acacia meamsii*.
- The two variables explain 89.49% of the variation in the grouping variable, signifying their importance as grouping variables.

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#### VARIABLE CATEGORY 4: PERCEPTIONS ABOUT HOW THE BLACK WATTLE SPREADS

- The overall Chi-squared test was not significant (Wilks  $\lambda = 0.786$ , Chi-square = 4.453,  $df = 1$ , Canonical correlation = 0.462,  $p < .001$ ).
- None of the variables can be used to differentiate the belligerent stakeholders.

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#### SUMMARY OF RESULTS

- There is a marked difference between GGHNP and the tribal areas regarding ecosystem health as shown by NDVI values and distribution of *Acacia mearnsii*
- *Acacia mearnsii* is spreading into the GGHNP and is a threat to the park
- Perceptions related to category 2 and category 3 variables contributed most to the differences between the perceptions of park authorities and tribal communities.
- These perceptions relate to responses of the belligerents on increase of soil erosion, silting of streams, drying of streams, suppression of native species.

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- Ecoagricultural landscaping (Scherr and McNeely, 2008) and relocation of communities is a possible solution provided it assumes an integrated approach involving all critical stakeholders
- Commercialization of *Acacia mearnsii* eradication programmes is another option if carefully planned

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#### MANAGEMENT IMPLICATIONS AND CONCLUSIONS

- Environmental education (EE) programmes need to target the reasons for the differences in state of ecosystem health between the park and the surrounding areas as well as the differences between the perceptions of the two categories of stakeholders
- To minimize conflict EE programmes should examine the effects of the black wattle on stream discharge, displacement of native trees and the susceptibility of areas invaded to fire damage, as well as soil erosion, decrease of stream discharge and suppression of native plants

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#### WAY FORWARD AND CHALLENGES AHEAD - DILEMMA

- Provision of access to park resources without worsening bio-invasion
- The moral justification of relocating people from their homeland in order to promote conservation has been widely questioned (Cernea and Schmidt-Soltau 2003).
- Ecological role of *Acacia mearnsii* in natural and agro-ecosystems (habitat for other species, pollinators)
- Importance of *Acacia mearnsii* in rural livelihoods – the only source of energy available for the poor
- Choice of methods of eradication
- Importance of *Acacia mearnsii* in soil protection
- Commercialization of eradication of *Acacia mearnsii*

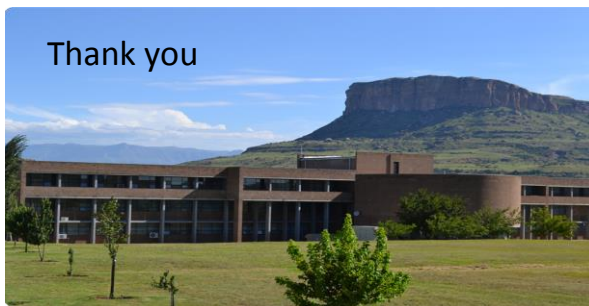
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