VEGETATION RESPONSE TO CLEARING OF EXOTIC INVASIVE PLANTS ALONG THE SABIE RIVER, SOUTH AFRICA

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DECLARATION

I hereby certify that the research submitted in compliance with the requirements for the degree of Masters in Science in the School of Animal, Plant and Environmental Sciences at the University of the Witwatersrand is the result of my own original investigation, except where acknowledged.

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ABSTRACT

The Reconstruction and Development Programme's Mpumalanga Working for Water Programme (WWP) has cleared exotic and commercial weed species from the riverine environment since 1994. This study serves as an assessment of the impact and modification caused as a result of invasion and the subsequent clearing of the exotic vegetation on flora in the riverine zone of the Sabie River Catchment. The experimental design compares the before and after clearing effects and includes altitude and invasion intensity variables. The investigations included: *in situ* soil seed banks, environmental modification, vegetation structure, species diversity and effectiveness of clearing.

Clearing and invasion by exotic species altered soil chemical, physical and ground cover parameters. The extent of these modifications was dependent on the extent of invasion and clearing done within the community. Clearing of exotic species however, acted as an additional disturbance to that caused by invasion. Environmental modifications that occurred with clearing and invasion within the study were positively related to percentage soil organic matter, and ground cover (soil, litter, vegetation).

Invasion by exotic species alters the vegetation structure, the extent of which was directly related to the invasion intensity. The main source of vegetation structure modification is attributed to tall growing exotic species such as *Eucalyptus grandis* and *Solanum mauritianum*. Both of these species dominated the indigenous vegetation, *E. grandis* by expanding the upper canopy and *S. mauritianum* by dominating the mid canopy. Clearing of invasive vegetation resulted in an additional disturbance proportional to the extent of invasion intensity. Invasion did not result in any large changes to the vegetation at low intensity but clearing at this intensity increased the disturbance and altered the vegetation structure.

Soil seed banks were limited in the number of species and dominated by two exotic species. The soil seed bank of woody species related positively to the community species richness. The total soil seed bank density did not relate to invasion intensity or clearing thereof but propagules of individual species within the soil seed banks did. The seeds of the exotic species, *Acacia mearnsii* and *S. mauritianum*, illustrated burial as prerequisite for persistence in the soil seed bank. *A. mearnsii* and *S. mauritianum* seeds were found to have half-life's of up to 25 years and 13 months

respectively.

The species richness and diversity varied only marginally because of invasion and clearing. Species alpha diversity increased with clearing due to weedy and pioneer species establishment. Beta diversity effectively highlights the species turnover with clearing and invasion.

Success in eradication of exotic species had mixed results. Clearing of high invasion sites was effective but in lower invasion categories a number of exotic individuals were missed. Clearing effectiveness was good for certain species such as *E. grandis* and *Pinus patula*, but poor for others such as *S. mauritianum*. Coppicing is a significant issue for *E. grandis* and *S. mauritianum.* The persistence of individuals (coppicing & missed individuals) coupled with very large persistent seed banks has repercussions for the clearing programme, as it may prevent effective eradication.

Initially the WWP has been successful in removing exotic vegetation, however there is a failure to address the regenerative properties of some exotic species. Unless a rigid schedule of follow up clearing treatments occurs, an even larger invasion problem could exist.

Key words: *Acacia mearnsii,* clearing, *Eucalyptus grandis*, exotic species, soil seed banks, regeneration, *Solanum mauritianum*, species diversity, vegetation structure, environmental modification.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

Appendix 1. Category 1 – 3 Declared Weed and Alien Invader Plants in South Africa in terms of the Regulations pertaining to the Conservation of Agricultural Resources Act 43 of 1983 as amended.

Appendix 2. Study site co-ordinates.

Appendix 3. Probability values for percentage ground cover estimates of soil, litter, grass, herbaceous vegetation, rock and depth of litter for the three way ANOVA's on invasion (INV), altitude (ALT) and management (MAN). *d.f.* = 1,32 for all main effects and interaction terms.

Appendix 4. Differences in soil physical characteristics tested by three-way ANOVA's with repeated measures (depth) for altitude (ALT), invasion intensity (INV) and clearing (MAN). *d.f.* = 1,32 for all main effects and interaction terms. Bold text indicates $P > 0.05$.

Appendix 5. Soil elements as oxides, (mean ± S.E.) found under different altitudes, invasion intensities and management treatments for both A (0 -10 cm) and B (10 - 20 cm) horizons. Means with the same superscript letter within row are not significantly different ($P < 0.05$, Ryan's Q).

Appendix 6. Probability values for soil chemical elements (XRF data) from three way ANOVA's with repeated measures (depth) for altitude (ALT), invasion intensity (INV) and management / clearing treatments (MAN). *d.f.* = 1,32 for all main effects and interaction terms. Bold text indicates $P > 0.05$.

Appendix 7. Probability values for soil trace elements (XRF data) from three-way ANOVA's of altitude (ALT), invasion (INV) and management (MAN) for soil depths 0 - 10 cm (A) and 10 - 20 (B). *d.f.* = 1,32 for all main effects and interaction terms. Bold text indicates $P > 0.05$.

Appendix 8. Soil organic matter, pH and soil physical characteristics tested for significant differences using three-way ANOVA's for altitude (ALT), invasion (INV) and management (MAN) for soil horizons, 0 - 10 cm (A) and 10 - 20 (B). *d.f.* = 1,32 for all main effects and interaction terms. Bold text indicates $P > 0.05$.

Appendix 9. Regression relationships of invasive species basal cover and density with aerial cover used to determine pre-clearing invasion intensity in plots cleared of exotic species. -, indicates no data available, #, indicates regression relationship used.

Appendix 10. Mean and S.E. for pre- and post-clearing aerial cover of total exotic vegetation and two exotic weed species, *E. grandis* and *S. mauritianum*. Values with the same superscript letter are not significantly different using Ryan's Q post-hoc test ($p < 0.05$).

Appendix 11. Means and S.E. for percentage aerial cover of total, indigenous, exotic vegetation and various common species from plots under different experimental categories. -, not present. Values with same superscript letters indicate no significant differences using Ryan's Q post-hoc test.

Appendix 12. Letter from the Directorate: Plant and Quality Control, National Department of Agriculture on seed identification.

Appendix 13. Species list, presence/absence and richness per experimental category for all seeds and capsules greater than 1 mm in diameter found in the litter and soil, down to 4 cm depth of burial.

Appendix 14. Mean and S.E. for all species of seed and capsules found in the soil seed bank for litter, 0 - 2 cm and 2 - 4 cm depth of burial for each treatment category in the experimental design. Values with the same superscript letter are not significantly different using a one way ANOVA and Ryan's Q post hoc test ($p < 0.05$).

Appendix 15. Regression equations of seed half life for seeds of *A. mearnsii* and *S. mauritianum* under greenhouse and field trials for varying light, water and depths of burial. * indicates $P < 0.05$.

Appendix 16. Key species codes for Constrained Canonical Analyses (CCA) Plots.

Appendix 17. Mean and standard error for woody plant species alpha diversity. Values with the same superscript letter within rows are not significantly different using Ryan's Q post-hoc multiple comparison test ($P < 0.05$).