

Fire, Biodiversity and Soil in the Drakensberg

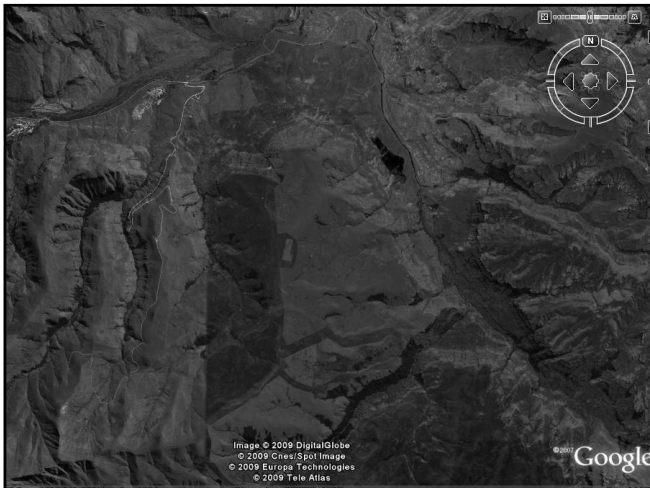
Twenty Years of Research on the Brotherton Burning Trials

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Agricultural Research Council



Background

- Cathedral Peak research station – institution renowned for work on hydrology, vegetation ecology, fire, plant diversity, small mammals and birds



History

- Established in 1980 by Dr Ed Granger
- Managed and surveyed by Colin and Terry Everson from 1980 – 1990
- Taken over by Ezemvelo KZN Wildlife in 1990
- Very little research for next ten years
 - Part of one MSc, and one honours
- Threats to close trial

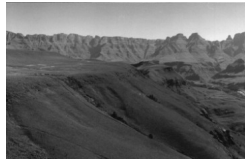


Season	Frequency	Morris et al. '99 (1980-1990)	Uys et al. '04 (2001)	Short et al. '03 (2001)	2004 survey
	No burn	✓	✓	✓	✓
Spring	Annual	✓	✓	✓	✓
	Biennial (hot)	✓	?	✓	
	Biennial (cool)	✓	?		✓
	Five yearly	✓	✓	✓	✓
Summer	Biennial	✓	✓		
Autumn	Annual	✓	✓		✓
	Biennial	✓	✓		✓
	Annual Gromoxone then burn	✓			
Alternate spring/autumn	18-monthly	✓			✓
Winter	Annual	✓	✓	✓	
	Biennial	✓	✓		



Other work

- Tiller and seedling dynamics of Themeda (TM Everson)



- Curing rates of grass sward (Eversons et al.)



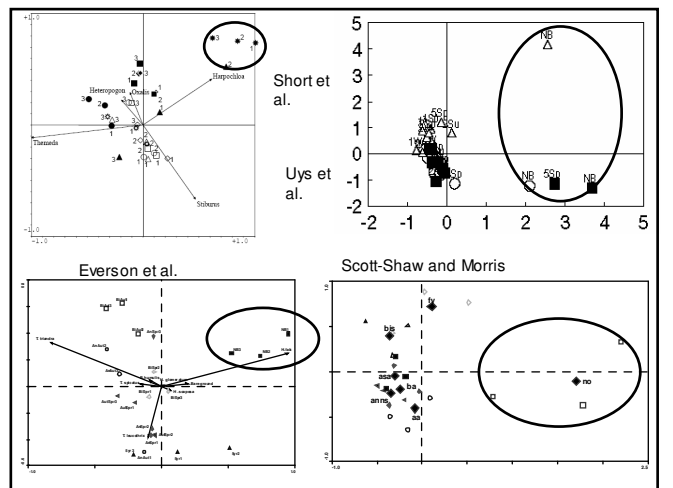
2004 survey

- Soils properties, landscape functioning and basal cover – Alan Manson, Alan Short and Debbie Jewitt
- Invertebrate diversity – Charmaine Uys and Michelle Hamer
- Plant diversity and key species – Rob Scott-Shaw and Roger Uys
- Compositional trends – Everson and Everson

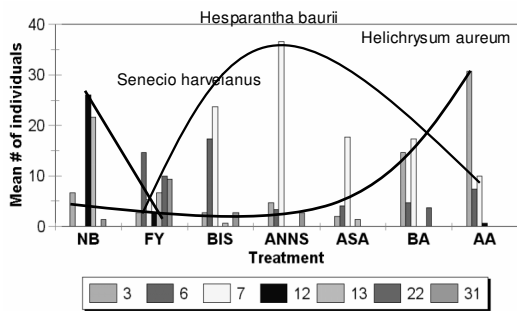


So what have we learned?

- Species composition
- Diversity
- Trends over time
- Soil chemistry
- Soil physical properties and landscape functioning



Montane indicator species

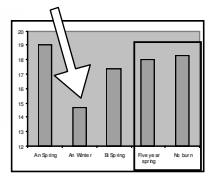
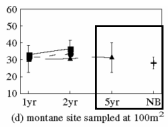
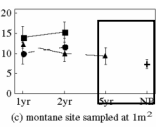


Scott-Shaw and Morris 2005

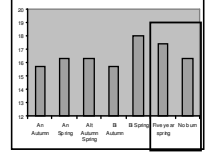
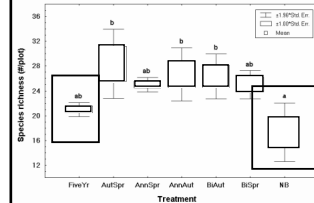


Plant richness

Uys et al (quadrat)



Short et al (Point)

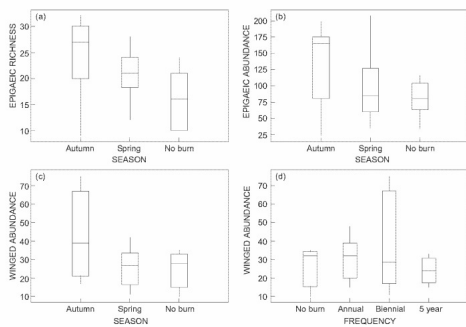


Everson et al (point)

Everson et al. (Dry weight rank)



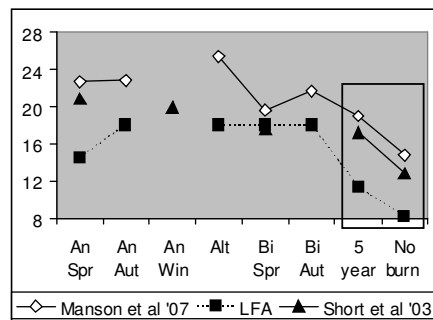
Invertebrate richness



Uys and Hamer 2007



Basal cover

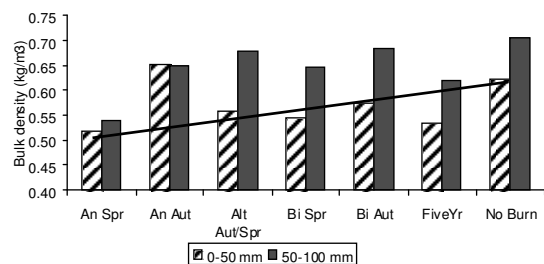


Soil

- All significant effects in top 5 cm
- No effects on organic matter
- Bulk density higher in annual autumn
- C:N lower with no burning (but no difference in C alone)
- Acidity lower in frequently burned sites
- K, Mg and Ca higher in frequently burned sites

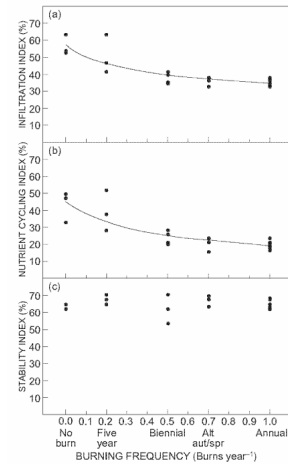


Bulk density



Carbon sequestration

- Total C in top 20cm is 122 Tonnes/ha
- Total C in entire soil profile - >200 T/ha?



Bottom line

- Most effects at burning intervals of five years or longer
- Frequent burning maintained stable system
- Infrequent burning changed species composition – need infrequently burned areas to increase landscape (beta) diversity
- Very little grazing
- Very low bulk density so high infiltration potential
- High Carbon storage



Thanks

Alan Manson, Ian Rushworth, Craig Morris, Richard Lechmere-Oertel, Jon and John, Maloti-Drakensberg Transfrontier Project, Ezemvelo KZN Wildlife and their staff, Cathy Stevens, Michelle Hamer and Charmaine Uys, Roger Uys, Rob-Scott-Shaw, Debbie Jewitt, KZN Department of Agriculture and Environmental Affairs, Colin and Terry Everson, UKZN, CSIR

