



University of Kentucky  
UKnowledge

---

International Grassland Congress Proceedings

21st International Grassland Congress / 8th  
International Rangeland Congress

---

## Fire and Vegetation Change in Coastal Grasslands, South Africa

Kevin P. Kirkman  
*, University of KwaZulu-Natal, South Africa*

B. P. A. Dalton  
*, University of KwaZulu-Natal, South Africa*

Follow this and additional works at: <https://uknowledge.uky.edu/igc>



Part of the [Plant Sciences Commons](#), and the [Soil Science Commons](#)

This document is available at <https://uknowledge.uky.edu/igc/21/1-2/43>

The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

---

This Event is brought to you for free and open access by the Plant and Soil Sciences at UKnowledge. It has been accepted for inclusion in International Grassland Congress Proceedings by an authorized administrator of UKnowledge. For more information, please contact [UKnowledge@lsv.uky.edu](mailto:UKnowledge@lsv.uky.edu).

## Fire and vegetation change in coastal grasslands , South Africa

K .P . Kirkman and B .P .A . Dalton

*Biological and Conservation Sciences , University of KwaZulu-Natal*

*Private Bag X01 , Scottsville 3209 , South Africa . E-mail kirkmank@ukzn.ac.za*

**Key words :** fire , grassland , savanna , management

**Introduction** Successional progression from grassland dominated to tree dominated vegetation is common in both arid and humid areas . Factors influencing the successional processes vary depending on environmental conditions , with fire playing an increasingly important role with increasing rainfall . The influences of fire on these successional processes were investigated in the iSimangaliso Wetland Park (IWP) , located on the east coast of South Africa . This area experiences annual summer rainfall in excess of 1000 mm , with a mean maximum temperature in January of 25° C and frost free winters with a mean maximum of 18° C in July . Land use (and associated fire regime) in the area has changed in recent decades from rural shifting agriculture to commercial forestry plantations (during the 1950s) , conservation areas or wilderness areas . Fire and groundwater have been recognized as the main determinants of the coastal grasslands where regular inundation encourages a sedge rich hygrophilous grassland and above this , exclusion of fire results in succession through to forest scrub savanna and Dune Forest (Taylor 2003 ; Weisser & Marques 1979 ; Weisser & Muller 1983) . Where large areas have been afforested with *Pinus elliottii* , the use of fire in the surrounding grasslands was prohibited . In the wilderness area , active management has been kept to a minimum , and fires , whether natural or anthropogenic , have not been extinguished . This resulted in regular and extensive fires in the wilderness areas .

**Materials and methods** Aerial photography from 1937 , 1975 , and 2000 was georectified , digitized , and analyzed using a GIS to examine broad vegetation changes in the natural vegetation adjacent to the plantations (zero to low fire frequency) and in the wilderness area (high fire frequency) . Sites of comparable size and catenal position were located in each area . Vegetation changes , and the direction of change , were quantified on these sites . Vegetation was classified as grassland , scattered trees or dune forest .

**Results and discussion** In the low fire frequency areas adjacent to plantations , grassland and scattered trees decreased in extent from approximately 266 ha (39% ) and 249 ha (36% ) in 1937 to 61 ha (9% ) and 80 ha (11% ) in 2000 respectively , whereas Dune Forest increased from 111 ha (16% ) in 1937 to 503 ha (73% ) in 2000 . Dune Forest and Scattered Trees increased at the expense of grassland up to 1975 , after which Dune Forest increased at the expense of Scattered Trees . In the high fire frequency area , grassland was the dominant vegetation category in 1937 , however this category decreased in extent from approximately 1615 ha (55% ) to 970 ha (33% ) in 2000 . Dune Forest and Scattered Trees increased consistently from 732 ha (25% ) and 537 ha (18% ) in 1937 to 981 ha (33% ) and 997 ha (33% ) in 2000 respectively . Compared with the low fire frequency area where Dune Forest increased to dominate 60% of the vegetation these increases within the high fire frequency area are minimal . In the low fire frequency area Scattered Trees increased and then decreased with a change through to Dune Forest and Grassland decreased drastically . Within the high fire frequency area this change was not as drastic or as large . This difference still indicates a natural progression of these coastal grasslands to a woody dominated vegetation type but in the presence of regular disturbance , largely by fire , this progression is inhibited .

**Conclusions** The exclusion of fire from these coastal grasslands has a significant impact on the structure and composition of the vegetation , resulting in a complete transformation of the higher lying areas into a predominantly closed canopy dune forest . This transformation varied depending on proximity to higher lying areas and orientation within the catena where west facing sites showed the greatest degree of change . Lower lying sections tended towards scattered trees or a savanna-like vegetation type before ultimately progressing to Dune Forest . This implies that fire can be successfully applied or excluded as a management tool to manipulate vegetation composition and structure .

### References

- Taylor RH 2003 . Management of the grasslands of the coastal sections of the Greater St . Lucia Wetland Park . Grassland Workshop . *Ezemvelo KZN Wildlife GSLWP* , St . Lucia , pp . 1-13 .
- Weisser PJ & Marques F 1979 . Gross vegetation changes in the dune area between Richards Bay and the Umfolozi River . *Bothalia* 12(4) :711-721 .