



University of Kentucky  
UKnowledge

---

International Grassland Congress Proceedings

21st International Grassland Congress / 8th  
International Rangeland Congress

---

## Biotoools: Indicators for Biodiversity Outcomes of Grazing Practices in the Australian Rangelands

Alexander Kutt  
*CSIRO, Australia*

E. P. Vanderduys  
*CSIRO, Australia*

I. J. Gordon  
*CSIRO, Australia*

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/21/4-1/20>

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).

## Biotoools : indicators for biodiversity outcomes of grazing practices in the Australian rangelands

A .S . Kutt , E .P . Vanderduys and I .J . Gordon

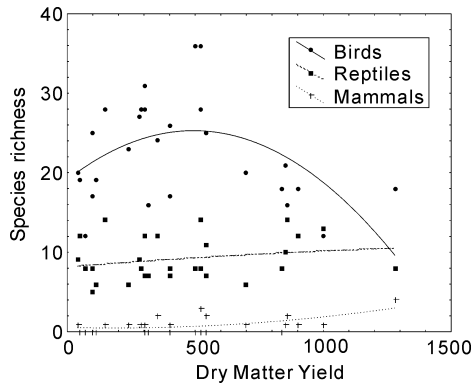
CSIRO Sustainable Ecosystems , Rangelands & Savannas Group , Davies Laboratory , PMB PO , Aitkenvale , Queensland 4814 , Australia . E-mail : alex .kutt@csiro .au

**Key words :** grazing , biodiversity , condition , metrics , sustainable , management , Queensland

**Introduction** Australia's tropical savanna rangelands are one of the most intact and best condition savannas in the world , and have significant biodiversity values ( e .g . habitat for 50% of Australia's bird fauna ) ( Woinarski *et al .* 2007 ) . Livestock grazing is the dominant land use ; therefore grazing land management will have a major influence on the ability of rangelands to maintain biodiversity . For graziers , maintaining rangeland condition ( perennial grass cover and capacity to produce forage ) is a goal for sustainable management . Historically , rangeland condition was presumed a surrogate for biodiversity condition , but it is now recognised that this is not entirely true ( Fisher and Kutt , 2007 ) . The Biotoools project is investigating the relationship between biodiversity pattern and a range of condition metrics , and is developing a framework for land managers to learn about biodiversity on their land , and gain new perspectives about their role as land stewards .

**Materials and methods** Twenty case study properties , throughout northern Queensland in the Northern Gulf , Southern Gulf , Burdekin Dry Tropics , Desert Channels and Far North Queensland regions , form the basis for this study . At each property 10-50 1-hectare sites were selected to represent a range of typical condition states ( variation in ground cover , fire pattern , tree density , vegetation diversity ) . At each site vertebrate fauna was sampled using trap and release , observation and active searching methods . The relationship between biodiversity , habitat variables and condition metrics was investigated to assess universal and idiosyncratic relationships across taxa , land types , management and region .

**Results** The relationship between bird , reptile and mammal richness , abundance and diversity indicated varying and inconsistent relationship between typical measures of land condition ( e .g . dry matter yield , perennial ground cover , tree basal area , stem counts ) . For example , bird species richness showed a quadratic relationship with dry matter yield , whereas mammal and reptile species richness was positive and linear ( Figure 1 ) . A test of four typical condition metrics ( Stocktake=rangeland condition , Patchkey=soil and hydrological function , BioCondition=habitat values , Landsat=temporal ground cover trends ) , indicated that only the metric specifically designed to assess biodiversity condition , was able to account for variation in species composition across a range of site condition states ( Table 1 ) .



**Figure 1** Relationship between ground cover ( as dry matter yield ) and fauna species richness at 50 sites in the Northern Gulf region .

**Table 1** Analysis of similarity between four land condition classifications , each with four categorisations ( A to D , with A indicating " good " , and D " poor " ) and bird , reptile , mammal and plants species composition at 60 sites in the Desert Uplands region . The general relationship and the comparison between the most contrasting condition states ( A vs D ) are presented .

Classification	n	Birds	Rept	Mamm	Plants
Stocktake ( A vs D )	4	ns ns	0 .12* ns	ns ns	ns ns
Patchkey ( A vs D )	4	ns 0 .64**	ns ns	ns ns	ns ns
BioCondition ( A vs D )	4	0 .16** 0 .78***	0 .10* ns	0 .08** 0 .35**	0 .13** 0 .75**
Landsat trend ( A vs D )	4	ns ns	ns ns	ns ns	ns ns

(\* = P<0 .05 , \*\* = P<0 .01 , \*\*\* = P<0 .001)

**Conclusions** Traditional measures of rangeland condition were not directly related to biodiversity condition . We argue , therefore , that their use is not equated with sustainable environmental management . The Biotoools project provides more accurate information on land condition and biodiversity , thereby providing a tool to help land stewards manage and monitor biodiversity values . Going forward , one key challenge for the Biotoools project is to find the balance between information that is simple enough for all land managers to use , but is able to capture ecological complexity .

### References

- Fisher , A and Kutt , A . ( 2007 ) . Biodiversity and land condition in tropical savanna rangelands . *Tropical Savannas CRC* , Darwin .  
Woinarski , J , Mackey , B , Nix , H . and Traill , B . ( 2007 ) . *The Nature of Northern Australia* . ANU Press , Australia .