A Monitoring System to Aid Decision Making in Grassland Management in Arid Areas of China

Zhongling Liu
University of Inner Mongolia, China

Adrian Williams
Pendragon Dryland Management Services, Australia

Dunyuan Hao
University of Inner Mongolia, China

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

A monitoring system to aid decision making in grassland management in arid areas of China

Liu Zhongling[1] , *Adrian Williams*[2] *and Hao Dunyuan*[3]
[1] *Institute of Nature Resource , University of Inner Mongolia , Hohhot , Inner Mongolia .*[2] *Pendragon Dryland Management Services , Bridgetown , WA , Australia . E-mail : adrianrw1@ yahoo .com .au*[3] *Department of Mathematics , University of Inner Mongolia , Hohhot , Inner Mongolia*

Key words : dynamic grassland , rangeland monitoring techniques

Introduction In 2004 a grassland monitoring system was devised and established in sub-project areas of the Alxa League Environmental Rehabilitation and Management Project (ALERMP) , Inner Mongolia-a project funded by AusAID , and managed by Cardno Acil . The aim of the system was to better inform managers of the effects of grazing management decisions . The objectives of the monitoring system were to provide : (1) precision in biomass and soil cover estimates , (2) an assessment of the dynamic changes occurring within grassland and their causes , and (3) an assessment of soil changes .

Materials and methods Site selection in September 2004 followed the usual search for representativeness' within the chosen grassland type . Two 50m tapes were laid out on the chosen site such that they crossed at right angles at their centres . One was laid across the slope while the other lay up and down slope . Vegetation patch types (shrub , grass , bare soil) were measured and recorded along each 50m transect , from which cover% was calculated . The transects were utilised for Landscape Function Analysis after the method of Tongway (2003) . The second part of the site layout was a 10m x 10m square whose right top (north east) corner coincides with the intersection of the 50m transects . Two parallel transects 10m x 2m were located within the 10m square . A measuring tape was laid along the 10m midline of each of these transect . Using the beginning of the tape (0 . 00m) as a reference , the location of every shrub within each 10m transect was recorded , along with its species name , plant height and two plant widths taken at right angles . Plant location was recorded as distance along the tape and distance offset from the tape right or left . Grass plants were recorded where they fell immediately under the measuring tape . The ends of all transects were permanently marked . At subsequent annual monitoring , the transects and individual plants were exactly relocated . The Alxa sites included 11 pairs of fenced and unfenced (grazed) sites . Biomass was measured by destructive sampling (quadrats for grasses or representative plants for shrub species) , and related to the plant densities on the central 10m x 10m site . Exact relocation of sites allowed measurements of individual plant growth , deaths and recruitment . Sites were recorded in September in 2004 , 2005 and 2006 .

Results and discussion Concentrating on the 5 pairs of fenced and unfenced sites in Right Banner , seasonal conditions 2004-2006 were found to affect the rate of overall plant recruitment ($p<0.01$) , plant deaths ($p<0.05$) , and edible biomass changes ($p<0.05$) . Within the monitoring period , plant recruitment , plant deaths , biomass changes 2004-2005 and soil cover in 2006 were not significantly affected by grazing . Grazing 2004-2005 was noted to affect the sum of the volumes (Height x Width x Width) of certain plant species within transects , particularly *Reaumuria soongorica* , *Potaninia mongolica* and *Caragana stenophylla* , but did not appear to affect the sum of the plant volumes of the grasses *Stipa glareosa* or *Cleistogenes soongorica* . Grazing had a marginally significant effect on biomass changes 2005-2006 ($p=0.08$) .

Conclusions The system described makes possible an understanding of grassland dynamics and the causes of change . Such a system would be a useful tool in assessing and promoting wise and sustainable grassland use . It would be an aid to studying grassland rehabilitation , and assessing when and at what intensity grassland could be re-opened following a grazing ban .

Reference

Tongway , D J . , (2003) . Reading the landscape : a training course in monitoring rangelands by landscape function analysis . *CSIRO* , Canberra .