PROCEEDINGS OF THE AUSTRALIAN RANGELAND SOCIETY

BIENNIAL CONFERENCE

Official publication of The Australian Rangeland Society

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Bastin, G., Sparrow, A., Scarth, P., Gill, T., Barnetson, J. and Staben, G. (2015). Are we there yet? Tracking state and change in Australia's rangelands. In: 'Innovation in the Rangelands. Proceedings of the 18th Australian Rangeland Society Biennial Conference, Alice Springs'. (Ed. M.H. Friedel) 5 pages. (Australian Rangeland Society: Parkside, SA).

The Australian Rangeland Society

VegMachine® in Queensland

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Keywords: VegMachine, ground cover, monitoring, remote sensing

Abstract

The VegMachine software was developed in 2002 by a national team of RD&E providers, and funded by Meat and Livestock Australia (MLA). The software was designed primarily as a vegetation cover monitoring tool for graziers and agencies, using remotely sensed data to summarise and benchmark cover change over long periods at user specified locations. As such, it was ahead of its time, and even today, few comparable platforms exist. A large part of the software's use and development has occurred in Queensland, and this paper summarises that history including recent moves to an online tool.

Over 12 years, VegMachine has been trialled in a variety of programs by a number of Queensland agencies and pastoralists. It has been used to monitor and interpret rangeland change, engage pastoralists, and assess eligibility for NRM funding. It underwent major software and training material upgrades between 2008 and 2010. It can interrogate any suitably formatted raster time series, but in Queensland has focussed largely on Queensland Ground Cover Program products.

This range of experience has provided a number of insights about the use of landscape scale time series data in rangeland management. Most notably;

- NRMs have adopted the software very effectively, but largely for project assessment.
- Grazier adoption has been limited, for reasons of both supply and demand.
- A simple online form of the tool would dramatically widen pastoralist access and use.
- It would however require quality support materials and networks.

In 2014 work began on an online VegMachine tool. The online tool will deliver similar analysis to the PC software but should improve access by individual land holders and NRM groups, and integrate with existing programs like Grazing Best Management Practice. The system will provide an effective set of training and support materials online and allow for future expansions and upgrades.

Introduction

VegMachine is a windows software application for vegetation cover monitoring. It was built as a tool for graziers and agency staff to extract local information from regional remotely sensed vegetation cover datasets. While the tool has been used nationally, much of its use and development of has been in Queensland. This paper summarises VegMachine's history in Queensland.

How does VegMachine work?

VegMachine essentially allows users to view and interrogate monitoring data from time series remote sensing at management-relevant scales. VegMachine users draw a polygon around an area of interest (e.g. paddock) in the software mapping. The software overlays this polygon on a temporal

series of raster cover images then graphs mean cover index values inside the polygon against each date in the image time series. On the same graph the user may plot changes in cover over the surrounding landscape in the same time period for comparison and benchmarking. Local knowledge of management history is critical in interpreting this graph, since it can often explain differences between site and broader landscape cover trajectories, and so allow users to separate the respective impacts of climate and management in the area of interest.

A history of VegMachine in Queensland

2002-2008

The original VegMachine software was built in an MLA funded collaboration between the Queensland and Northern Territory governments and the CSIRO (Karfs et al. 2004, Peel et al. 2006). This project trialled VegMachine on grazing properties, including six around Quilpie in south west Queensland. Participants were provided with software, training, and customised property scale datasets, and interviewed over the course of the work to track their use patterns and opinions about the system. From 2006 to 2008 software support continued at Quilpie and expanded to a further 16 properties across western Queensland. The expanded program adopted bare ground index imagery (Scarth et al. 2006) as its core cover product, but followed largely the same model as the original Quilpie work.

Results from this period were mixed. Graziers were quite positive about the potential of the software to inform their management, and the ability to personally access to the software. However because data were annual and better addressed longer term rather than recent change, few users accessed the software regularly and stayed familiar with it. Where VegMachine played a part in management decisions, it was largely to corroborate other information (Peel et al. 2006).

2009-2010

From 2009, Queensland's VegMachine work shifted both its geographic and operational focus. Geographically, new work focussed in the Fitzroy Basin. Partly in response to the previous work, we also moved to delivering software to extension staff rather than graziers. This new approach streamlined data preparation because a single regional data set could be distributed to multiple extension staff. It also negated the need for grazier training, with land managers expected to access the software through extension staff.

A number of workshops and one-on-one meetings delivered VegMachine analyses to interested graziers, and a subsequent agricultural survey (Australian Bureau of Statistics 2011) showed that estimated rates of pastoral ground cover monitoring with satellite were 28 times higher in the Fitzroy region than in the rest of the country. The largest driver of adoption though was the Fitzroy Basin Association's (FBA) use of VegMachine to assess NRM funding requests from the grazing community, and in this period, VegMachine became a standard part of all project evaluations in the region.

Nationally, this period also saw an upgrade of the software, and the development of dedicated training materials. The upgrade corrected known issues with the software and added new functionality including a printable VegMachine report. The training materials included a software manual and training notes, and have since been used in more than 20 group training events.

2011-2015

In recent years the software has been used largely by NRM groups to assess and compare NRM funding applications. It has been widely used by FBA and NQ Dry Tropics Ltd (NQDT) and more recently trialled by Burnett Mary Regional Group. To date, over 300 funding applications have included VegMachine analysis in the FBA and NQDT regions.

Work is now beginning on an online version of VegMachine, which should be completed by early 2016. The online tool will target both pastoralist and agency users. It will provide similar analysis to the current PC software, but with the benefit of more timely data updates and more direct access for pastoralists. It will also include online training materials and a number of training workshops in the FBA region.

Findings and future directions

VegMachine has been world leading software, and there are still few viable alternatives for pastoralists to interrogate large spatio-temporal cover datasets without resorting to complex and/or expensive software solutions. Having been used in Queensland now for more than a decade, by both graziers and agency staff, and for a variety of purposes, we have drawn a number of conclusions about VegMachine's past and future deployment. They are listed below.

1. NRMs have been the biggest adopters of the software. This has been motivated by their need for VegMachine style assessment across large numbers of on-ground projects, and provided incentive to resource uptake by their staff.

2. By comparison, grazier adoption has proven difficult to maintain. There are two main reasons for this, the prohibitive costs of supporting many individual users over such large areas, and the difficulty for graziers to maintain proficiency (and consequently access) to software that might only be used annually on any given property.

3. An open online version of VegMachine would negate many of the costs of supporting large numbers of grazier clients. It would allow easier and timelier data delivery to individual properties, and reach more interested users than current resources allow.

4. Online delivery will still need to address the issue of maintaining user proficiency and interest over the longer term. To this end the online tool under development will be very simple, include online support materials, integrate with the existing extensions networks (e.g. Grazing BMP, Spatial Hub), and include a "one-click" paddock-by-paddock analysis as the baseline property monitoring tool.

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