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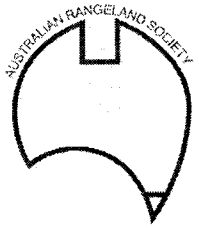

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MONITORING WOODY WEED COVER IN NSW RANGELANDS

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ABSTRACT

Woody weeds are native shrubs which grow to high densities in rangelands and compete with grasses, consequently reducing the availability of fodder, lowering grazing capacity and ultimately reducing the productivity of rangelands. The problem is being monitored using satellite imagery which maps the extent, density and change in woody cover over time. Landsat imagery is acquired for two dates for each area. A computer classification produces woody vegetation cover images which are ground-truthed. Both dates are then combined in a geographic information system (GIS) to produce a change map showing increases and decreases in woody cover. Field days are arranged with landholders to distribute maps and discuss management strategies. A positive response from landholders and government agencies indicates the planning and management potential of the woody cover data.

INTRODUCTION

This project maps the distribution, density and change in woody weed cover over time for rangelands of the Western Division of New South Wales. Woody weeds which are considered a pest include turpentine (*Eremophila sturtii*), narrow-leaf hopbush (*Dodonaea attenuata*), broad-leaf hopbush (*Dodonaea viscosa* var. *angustifolia*), budda (*Eremophila mitchellii*), mulga (*Acacia aneura*), punty bush (*Senna artemisioides* var. *nemophila*), and silver cassia (*Senna artemisioides*). These species occur in association with the bimble box - white cypress pine (*Eucalyptus populnea - Callitris glaucophylla*) community. More than 20 million hectares of the Western Division are already affected by woody weeds (Hassall *et al.* 1982), so the problem needs to be monitored to determine the impact of shrub increase on pastoral lands.

METHODS

Full-scene digital Landsat Multispectral Scanner (MSS) images are obtained for two dates generally 10 to 20 years apart. These are acquired for dry periods to enable maximum discrimination between land cover types. Spectral values are derived for green vegetation, dense woody cover and bare soil, and each image is classified with these spectrally separate classes using the Vector Classifier (McCloy 1977). The classification produces a woody cover image based upon the proportion of total reflectance that the different land cover types contribute. The resulting classified image represents the density of woody cover, and is rescaled from zero to the maximum percentage woody cover recorded from field data.

Both the historical and recent woody cover images are ground-truthed against aerial photographs for approximately 40 sites within each Landsat image. The sites vary in land system types and woody cover densities and, for the recent image, are located adjacent to tracks for accessibility. Aerial photographs are taken from a gyrocopter and each site's position is recorded with a GPS receiver, which allows the photographs to be located within the image. Percentage woody cover is estimated from the photographs and compared to the woody cover estimates obtained from the classified image. Adjustments are made to the spectral values if necessary and the classification is re-run until most sites are within 10% of the photo estimates.

The two woody cover images are combined in a GIS and a change image is derived which shows percentage increase and decrease in cover over time. The woody cover data are classified into several classes for presentation. The map types produced are: woody cover for individual dates, woody cover change, and emergent woody cover. Map products at scales of 1:500,000 and 1:250,000 are produced, and show property information and roads with the woody cover data. Digital data in GIS format and

maps are distributed to regional offices, and field days are organised during which information on woody weed management is extended. Property maps are supplied with statistics which detail the area affected (in hectares) for each woody cover class.

RESULTS

The majority of sites sampled are within the 10% tolerance limit, although some sites which were adjacent to accurate sites had larger errors. It is not possible to correct these sites as they usually occur within the same land system type as the accurate sites. Significant increases in woody cover (>30% increase over ten years) were noted for the Bourke-Cobar area and were largely associated with an increase in mulga cover. Moderate increases (11 to 30%) occurred further west around Louth and Barnato, and decreases have occurred west and south of Barnato. Some of these decreases are attributed to wildfires rather than prescribed clearing. A number of landholders responded positively to the woody cover maps following a field day, and property maps showing current woody cover and changes were distributed to landholders for planning purposes.

DISCUSSION

A major constraint on selecting imagery was the availability of historical photography. The images had to be contemporaneous with photography and in a reasonably dry period to ensure the best classification results. The Vector Classifier is variable in its accuracy for all sites. Most sites are within 10% of the photo estimates, but some sites may have larger errors. The errors of most sites were reduced consistently by altering the spectral values of the bare soil land cover type. For some sites, however, the error values may have been exaggerated relative to the other sites and increased rather than decreased. These erroneous sites cannot be easily corrected, so minimising errors for most of the sites becomes the main objective of classification.

Improvements in the image processing methodology and fieldwork techniques have greatly streamlined the process of producing woody cover maps. One area can now be completed in less than six months. Strong responses from landholders and government agencies have indicated the potential of the woody cover data for planning and management purposes. The Vector Classifier remote sensing technique is useful for mapping woody weed cover in other land types provided the above constraints are considered.

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