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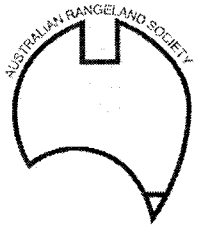

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BUSH FIRE MONITORING IN THE NORTH WESTERN RANGELANDS OF WESTERN AUSTRALIA

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ABSTRACT

Bush fire monitoring in the north-western rangelands of Western Australia was born out of a need to provide a tool to manage the natural resources of the area more effectively. Satellites, in particular the data from the NOAA-AVHRR, provide a very effective means of routinely monitoring fire. These data have also enhanced fire management as they can provide information on the fuel load *resulting from wet season growth,* curing *or drying of that growth and* hot spots *of active fires. This monitoring is achieved in near real time and is provided to the various regional authorities, enabling them to develop more responsive strategies to manage fire. As part of Vegetation Watch, NOAA-AVHRR data for the last five years have been used to provide an historical record of fire scars. From this, an understanding of annual patterns of burning is being gained, resulting in improved systems of controlled burning.*

The extent of bush fires in the north-west of WA appears to have been increasing over recent years, with potentially disastrous results to pastoral station infrastructure and stock, and to the area's rich biodiversity. It has therefore become imperative that bush fire processes are understood and recorded. FIRE WATCH is a system being developed by the Department of Land Administration and the Bush Fires Board to facilitate this (Smith et al. *1994).*

INTRODUCTION

Nearly all of Australia's rangelands can expect to be burnt at some time (Harrington *et al.* 1984) and only vegetation that can survive fire exists today (Hodgkinson *et al.* 1984). However, not all vegetation continues to exist after frequent burning. Much of Australia's vegetation has been further modified as a result of fire subsequent to the widespread change of climate some 15 million years ago (White 1994).

This change was accelerated after the arrival of Aborigines 40,000 years ago because of their use of fire stick farming. European settlement, 200 years ago, similarly resulted in a profound alteration to the vegetation of the continent (White 1994). It is this settlement which is now threatened by fire. Uncontrolled bush fires are potentially disastrous for communities which are located in susceptible areas. In much of the north-west of WA this threat occurs annually, and without effective systems for fire control, considerable financial burden and anxiety for the land owner can result. Too frequent or recurrent burning also has the potential to destroy the ecological diversity of an area (Beard 1990). Sensitive habitats and refugia must remain intact to ensure sustainable ecosystems. It is therefore of considerable interest to environmental agencies to promote responsible fire management practices.

METHOD

The FIRE WATCH initiative has been jointly researched and developed by Remote Sensing Services of the Department of Land Administration (DOLA) and the Bush Fires Board. NOAA-AVHRR data is acquired from a local receiver in Perth and routinely processed to correct for geometric, radiometric and atmospheric effects. Further processing includes:

- The use of the mid infrared band from night time passes to detect *hot spots* of active fires for reporting to the various controlling agencies.
- The NDVI from the day time passes, improved by applying sun and view angle thresholds, is used to estimate *fuel load* build-up during the wet season. Cloud-free NDVI images are generated by combining NOAA overpasses over a 14-16 day period.

- An inverse function of the NDVI is used to produce the *curing index*, a technique adapted from similar research in the southern agricultural areas (Paltridge and Barber 1988).

The fire scar history is derived by on screen digitising using the near infrared band of the daytime NOAA data. These are mapped every 9-10 days for the (Kimberley) tropical savanna grasslands and the hummock grasslands to the south of the Kimberley region and extending into the Pilbara.

DISCUSSION

The FIRE WATCH program has added significantly to the effective management of susceptible environments in the north-west of WA. This has been achieved by providing information for fire management, in particular information which has:

- assisted the development of prescribed burning techniques to reduce bush fire hazard;
- led to the development of an understanding of the relationship between fires and biological diversity;
- helped quantify the fire risk within an area based on the factors of fire history, fuel load accumulation and curing rates.

Use of the NOAA-AVHRR data has, for the first time, illustrated the extent of bush fires in north-western rangelands of WA for the period 1993-1995. Particularly graphic is the high correlation between (wet) seasonal conditions and the area burnt in the following dry season. Whilst the 'locals' would instinctively know this, it has not previously been possible to demonstrate 'common knowledge' at a regional scale. What it further serves to demonstrate is the risk of bush fires occurring based on time from last burn. With the Kimberley wildfire interval estimate of three years and the Pilbara up to five years (Hodgkinson *et al.* 1984), the bushfire controlling agencies are now using these data to reduce the fire hazard in these areas through controlled burning and better planning to contain fire risks.

In the short time it has been operational, FIRE WATCH has demonstrated its ability to provide timely, accurate and cost-effective information at a regional level. But perhaps its greatest advantage is that its application is not limited to any unique physical environment within WA; rather, it has the potential to be effective in many other locales, both national and international.

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