Biodiversity, fire and bitou bush management on the mid-north coast headlands of New South Wales: a study in progress

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Introduction

In New South Wales (NSW), increased urban settlement and land tenure changes have led to a reduction in fire frequency in coastal areas and seen many coastal headlands given protected status (e.g. added to national park estate). As a result, coastal headlands have become important recreational and conservation sites. Managing weeds, fire and biodiversity in conservation areas requires an integrated approach. The decision making processes for integrating these management issues on protected headlands is difficult, especially in the absence of baseline information. Bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata* (DC.) T.Norl.) is the main weed of coastal headlands in NSW and poses a significant threat to biodiversity (i.e. it is listed as key threatening process under the NSW *Threatened Species Conservation Act 1995*). Fire is a known management tool to control this weed. In an attempt to provide baseline data to assist in the management of bitou bush for biodiversity conservation, we have undertaken a pilot study to review vegetation history and other historical information from ten coastal headlands in northern NSW using aerial photographs taken between 1940 and 2006. The focus of the review is to determine the historical integration of weed, fire and biodiversity management on these headlands and understand how past management decisions, in addition to geomorphology and coastal evolution have shaped the current vegetation. This may allow us to learn from past decisions to assist future management.

Ten study sites

The ten headlands are reserved for conservation and public use and are located between the Macleay River and the Wallis Lakes region in northern NSW. Eight headlands occur in national park estate, while two are managed by local government (Kempsey and Port Macquarie-Hastings Councils). We used air photo interpretation to infer past coastlines from the surface expression of soil landscapes. These headlands were once offshore islands and are now joined to the mainland due to deposition of sediments during Pleistocene and Holocene interglacials. This earlier separation from the mainland may have contributed to a high degree of endemism on these headlands. The headlands contain endangered Themeda (*Themeda australis* (R.Br.) Stapf.) Grassland and Littoral Rainforest communities, in addition to many significant plant species, all of which are threatened by bitou bush invasion.

Interpreting aerial photos

Stereoscopic air photo interpretation was used to determine vegetation data, which was then arranged in GIS layers to enable spatial, temporal and qualitative comparisons. Vegetation attributes, including plant species and community types, cover classes of *Themeda* and bitou bush, as well as tree, shrub and rock cover, were determined from aerial photos. The study also identifies the geological history of each headland and assesses the soil landscapes, thus enabling the documentation of physiography (physical features), soils and natural hazards (e.g. erosion/landslip risks). This information on natural hazards can be used when making decisions regarding site restoration, weed and fire management and infrastructure development (e.g. walking tracks, viewing platforms). The air photo interpretation and GIS mapping has been verified by selective field sampling. Land managers were also surveyed and asked to provide the history of bitou bush control at each headland.

What have we found so far?

This study began in 2003 and is ongoing. To date, we have identified and mapped high priority ecological communities, such as Littoral Rainforests and Themeda Grasslands, and documented 67 plant species of regional or state-wide conservation significance. We have determined geomorphologic history, recreational usage, vegetation condition, the status of bitou bush and other weeds and management history (including weed control and fire history) across the ten headlands. We are now in the process of analysing this information to see what past management techniques were most successful (in light of current biodiversity) and to determine the most effective integration of herbicides, bush regeneration and fire to suppress bitou bush and other weeds and promote native vegetation. It is anticipated that selective burning on headlands will be undertaken to protect, and potentially enhance, biodiversity. The aim is to promote re-establishment of Themeda Grasslands while protecting Littoral Rainforest and suppressing weed invasion. The interpretation of historical information from aerial photos may be applicable in other landscapes that require this type of rigor for appropriate management of biodiversity values.