STRATEGIC WEED MANAGEMENT FOR THE ABORIGINAL LANDS OF THE TOP END

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Summary Aboriginal lands constitute nearly 50% of the Northern Territory (NT) and are vital to contemporary Aboriginal life. However northern Australian ecosystems, especially wetland and riparian habitats, are under threat of invasion from a number of weed species which affect both the structure and function of an ecosystem and could have a major impact on the lives of Aboriginal people.

Weeds located on Aboriginal land in the wet-dry tropics pose unique management problems. Aboriginal lands are often vast, but the people are few and often without the physical, financial and technical resources available to control weeds. The aim is to develop a weed management strategy for Aboriginal land under the Northern Land Council's jurisdiction (Figure 1) using the collective wisdom available locally and internationally to ensure that the weed control dollar is spent in the most effective way. This paper describes the process proposed in developing such a strategy.

INTRODUCTION

The 1993 Native Title Act recognised Aboriginal prior ownership across Australia. However in the Northern Territory (NT) land rights legislation has been in existence for 20 years. The 1976 Land Rights (NT) Act enables Aboriginal people who can prove their traditional ownership in a court of law to claim areas of unalienated crown land or land held by them or on their behalf. Aboriginal people now own, or have under claim, nearly 50% of the NT, including 85% of its coastline.

The land involved is highly significant to its owners, and is of importance to other NT residents and to all Australians. Aboriginal people continue to be reliant on the natural environment for both their spiritual and physical well being (Pearce *et al.* 1996); practices such as hunting and foraging have an important place in contemporary Aboriginal life (Altman 1987). Aboriginal people are also initiating and running enterprises or negotiating land use agreements with non-Aboriginal entrepreneurs and companies. Economic activity on Aboriginal land contributes significantly to the NT and the Australian economy. Most of the major tourist destinations in the NT are on Aboriginal land as are most of the major mines and on-shore oil and gas wells.

Much of the land described by the Australian Heritage Commission as having wilderness value is on Aboriginal land. This is particularly so for northern Australia where sparse human population and low levels of industrial and agricultural development have tended to minimize the impact of European settlement (Wells *et al.* 1984). However, pastoralism and feral animals have caused widespread low-level degradation making natural ecosystems, particularly wetland and riparian habitats, more prone to weed invasion (Humphries *et al.* 1991).

Invasive weeds can disrupt land use practices of Aboriginal people and increase their dependence on outside assistance (Cook 1993). Aboriginal people of the NT

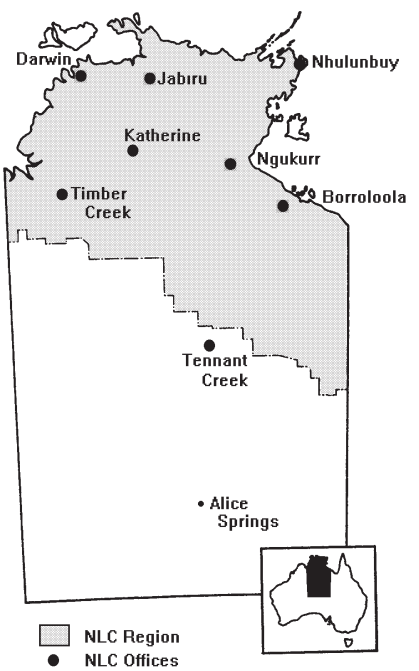

Figure 1. The Northern Land Council region.

recognise that weeds are an environmental problem (Young *et al.* 1991, D. Yibarbuk personal communication 1996). In the northern half of the NT (Figure 1) the Northern Land Council (NLC) has a statutory responsibility to assist Aboriginal landholders in land management. The NLC have emphasized there is a need for better planning and prioritization in weed management. One of us (MS) will be employed to draft an overview paper in late 1996 on weed management issues in the NLC region of the NT. The overview will act as the basis for the development of a regional weed management strategy to be undertaken in consultation with Aboriginal landowners. This paper describes some of the background to weed management issues on Aboriginal land and the steps involved in developing a comprehensive weed management strategy.

ABORIGINAL PERCEPTIONS AND USAGE OF LAND

The Native Title Act 1993 marked the end of the *terra nullius* concept and the recognition by the Australian legal system that Australian land and seas are subject to a complex system of inherited Aboriginal ownership. This ownership is linked to specific rights and responsibilities to ensure the spiritual and physical health of defined areas of land. It is integral to the way Aboriginal people care for country. Contrast this with the non-Aboriginal relationship with land where property may be passed down through many generations only to be disposed of as the result of some, usually economic, imperative. However this option is generally not open to Aboriginal people and is a primary cultural difference between Aboriginal and non-Aboriginal Australians.

Aboriginal people have adopted a wide range of uses for their land including residence, subsistence, horticulture/arboriculture, pastoralism, national parks, tourism, mining and exploration. Innovative commercial uses, such as wildlife utilization (e.g. goose and crocodile egg collection) and expanded tourism (e.g. hunting or photographic safaris and cultural and wildlife tours) are also being explored (Storrs and Finlayson 1996).

Hunting and foraging activities not only provide people with nutrition, it is closely tied to spiritual beliefs and traditional law and allows each generation to share their extensive environmental knowledge with succeeding generations (Pearce *et al.* 1996). Over the last 60 000 years Aboriginal land management practices, particularly the use of fire, have shaped the ecosystems of the Australian continent (Latz 1995). This relationship has been seriously disrupted since European colonization when a range of unfamiliar plants and animals and land management practices were introduced. Some species of feral animals (e.g. buffalo, pigs, rabbits, cats) and some invasive alien plants (e.g. guavas, rosellas, cashews) have become important resources for some Aboriginal people. However alien species are often associated with negative habitat changes.

Land degradation, present on many recently acquired marginal pastoral properties (Young *et al*. 1991), is of real concern among Aboriginal land managers, particularly when it affects current land uses (Rose 1995). At a recent 'Caring for Country' Workshop representative traditional landowners and managers from Aboriginal communities across the NLC region identified weeds as their major land use problem (P. Bayliss personal communication).

ALIEN PLANTS IN THE TOP END

On average, for a sample of Australian sites, about 18% of the total vascular flora are naturalized alien plants (W.M. Lonsdale unpublished results). The NT, at 5% (Humphries *et al*. 1991), has the lowest percentage of any state or territory in Australia. Reasons that have been suggested for this include limited agricultural development, low population densities (Humphries *et al.* 1991), seasonal aridity (Usher 1988), and the low fertility of many northern Australian soils (Cowie and Werner 1993). Throughout Australia, however, weeds are spreading faster than they can be controlled and plant introductions to Australia are likely to occur with increasing frequency (Humphries *et al.* 1991, Panetta 1993).

There is little documented information on the ecological condition of Aboriginal land in the NT although a common perception is that it is pristine. Some of the land, however, has been used for extensive pastoralism followed by increasingly diverse land uses, increased access and invasion by feral animals and weeds.

Large exotic ungulates, in particular cattle (*Bos taurus*), water buffalo (*Bubalus bubalis*) and pigs (*Sus scrofa*) have severely disturbed large parts of the Top End. In 1985 the feral buffalo population in the Top End was estimated to be 341 406, about the same size as the domestic cattle herd, with densities on flood plains exceeding 7 animals km^{-2} (Bayliss and Yeomans 1989). Numbers of buffalo have been recently reduced to low levels mainly as a result of the Commonwealth's Brucellosis and Tuberculosis Eradication Campaign (BTEC) scheme. Following buffalo removal the recovery of vegetation and amelioration of land degradation has been dramatic (Graetz 1989), however pig damage appears to be on the increase. After experimental removal of buffalo at CSIRO's experimental station in Kakadu, pig numbers were observed to double (Corbett 1995). The general lack of control of pig numbers is cause for concern.

Kakadu National Park (KNP), is an example of an area of Aboriginal land intensively managed for conservation purposes that has been disturbed by pastoral activities and feral animals (100 000 buffalo and cattle were removed from its 20 000 km^2 area between 1979 and 1990 – ANPWS 1991). It has 99 naturalized alien plant species which represent 5.4% of its total flora (Brennan 1996). The number of alien plants in KNP has increased at the rate of 1.6 species per year since 1948, and this trend is expected to continue as a result of increased tourism and development (Cowie and Werner 1993).

BTEC has not operated effectively on many areas of Aboriginal land such as the vast Arnhem Land region where large buffalo herds still exist. Little is known of the numbers of these buffalo or their effect on the environment. As well pigs and feral horses (*Equus caballus*) are abundant on wetland areas in the region especially in upper catchments.

In their survey of alien plants in KNP, Cowie and Werner (1987), found that most of the naturalized alien species were associated with human activity such as roadways, borrow pits, settlements, campgrounds and other disturbed areas but that habitats adjacent to flood plains and creeks were also found to be heavily invaded by weeds. The Top End's wetlands are currently under threat from mimosa (*Mimosa pigra*), a highly invasive shrub from central America, the South American aquatic fern salvinia (*Salvinia molesta*), and the African pasture species para grass (*Brachiaria mutica*). Para grass, which is currently being promoted for ponded pasture elsewhere in the NT, is threatening waterfowl habitat (Humphries *et al.* 1991) and has been identified by Aboriginal people as being of serious concern (Bayliss personal communication). Two highly invasive introduced pasture grass species, gamba grass (*Andropogon gayanus*) and mission grass (*Pennisetum polystachion*), are vigorous tall perennials of high biomass which could increase markedly the impact of fire in lowland woodland and forest communities.

Other weeds of concern present in the Top End are prickly acacia (*Acacia nilotica*), khaki weed (*Alternanthera pungens*), rubber bush (*Calotropis procera*), thornapples (*Datura* spp.), water hyacinth (*Eichhornia crassipes*), hyptis (*Hyptis sauveolens*), bellyache bush (*Jatropha gossypifolia*), lion's tail (*Leonotis nepetifolia*), devil's claw (*Martynia annua*), parkinsonia (*Parkinsonia aculeata*), castor oil plant (*Ricinus communis*), candle bush (*Senna alata*), coffee bush (*Senna occidentalis*), sicklepod (*Senna obtusifolia*), sida (*Sida acuta*, *S. cordifolia*, *S. rhombifolia*), caltrop (*Tribulus cistoides*) and Noogoora burr (*Xanthium strumarium*) (Storrs and Finlayson 1996).

CURRENT WEED CONTROL

An increasing awareness of Aboriginal land management requirements has coincided with major changes in the national policy agenda. These include the increased profile of environmental issues, the Year and Decade of Landcare commencing in 1990, the Commonwealth Government's Ecologically Sustainable Development (ESD) process and the process of Aboriginal reconciliation.

As is the case with other land, the legal responsibility for weed control rests with the owners or managers of Aboriginal land. However this does not recognise Aboriginal peoples' primarily non-economic relationship with the land. They do not have the resources to control weeds that were either introduced by managers of neighbouring lands or by the managers of their land before it was reacquired.

Aboriginal people in the NT are sometimes able to access land management funding programs from various sources for the purposes of weed control although programs currently available are targeted mainly at commercial operators on highly degraded agricultural and pastoral land in long-settled areas. Aboriginal activities in land management is mostly financed from sources outside mainstream land management programs (Young *et al.* 1991). Funds have been available from Commonwealth Government sources such as the Department of Employment, Education and Training (DEET), the Bureau of Rural Sciences (BRS) the Australian Nature Conservation Agency's (ANCA) Contract Employment Program for Aborigines in Natural and Cultural Resource Management (CEPANCRM), and the National Landcare Program (NLP). However most of these funding sources are short-term in nature creating problems for the planning and implementation of ongoing programs.

Access by Aboriginal people to mainstream funding programs has been low because: the types of degradation found on Aboriginal land and their remedies often differ from elsewhere; Aboriginal groups often lack the independent finance to contribute a share toward the cost of control which is often a requirement of grant applications; and the promotion of programs, and Aboriginal representation in decision-making systems, have been poor. NT Government officers and staff of Aboriginal organizations are working to redress problems of access.

The NT Government commits funds to weed control on Aboriginal land in key areas, as on some other land holdings, though the NT Government is reluctant to expand funding specifically for Aboriginal land as it is believed that other landholders would expect the same treatment (Miller and Schultz 1993). However, the effective management of weeds on Aboriginal land using public monies is in the long-term interest of Australia. The inescapable alternative is the wide-scale degradation of

some of the most biologically intact habitats in the country.

This principle has, in part, been accepted by the Commonwealth and NT Governments with attention focussed on the control of *Mimosa pigra*. Between 1991 and 1996 the Commonwealth have provided in the vicinity of $A8.5 million for the control of a mimosa infestation at Oenpelli in western Arnhem Land. This is the largest single program ever undertaken in Australia to prevent weed spread and restore a wetland following weed invasion (Cook 1993). This campaign brought the funding issue to a head and created a precedent for the control of weeds and potentially other forms of land degradation on Aboriginal land. As a result Commonwealth and NT attention was focussed on the inability of Aboriginal groups to finance land management activities in their own right. It is now widely felt that the expansive natural areas combined with small human populations on Aboriginal lands necessitates a strategic approach to tackling weeds.

STRATEGIC WEED MANAGEMENT

A weed *strategy* entails directing the large-scale, long-term operations of a weed control program (Moody and Mack 1988). Weed control *tactics* (i.e. the specifics of herbicides, and other control procedures) do not concern us here. Nevertheless, strategic weed management requires detailed planning and needs to be fully integrated in long-term management programs for the area. Area management rather than species management should be the focus. The underlying philosophy of any weeds management strategy should be to establish why weeds are present and address the causes, rather than killing weeds *per se*. This 'holistic' approach to weed management is the most appropriate for natural areas, but it is seldom undertaken. In developing a strategy (Storrs and Lonsdale 1995), one should consider the components that follow.

Prevention One of the most powerful weapons against weed incursions is to prevent them in the first place. Around half of Australia's noxious weeds were introduced intentionally (Panetta 1993). Current changes to Australian Quarantine Protocols will incorporate risk assessment of species not previously known as weeds. At a local level the introduction of new weeds to an area can be prevented by education and enforcement. Liaison with adjacent landholders and Landcare groups in shared catchments is necessary while control of plantings of aliens within a region is absolutely vital. Soil, construction material and vehicles are likely to be carriers of weed seeds and propagules into a region. Tourist vehicles seem to have a very low density of seed (Lonsdale and Lane 1994).

It is likely that Aboriginal communities will seek to develop multiple-use economies locally, and this will augment the exotic flora, particularly if pasture species are introduced. Agricultural development must take place in a sustainable manner, with the aim of maximizing long-term productivity (Lonsdale 1994).

Surveillance and early intervention Another powerful weapon against weed invasions is early intervention. The NT has a long coastline, but it would appear that weeds are unlikely to disperse by sea (Smith *et al.* 1990). Rather, seeds are probably brought in by wide-ranging feral animals and vehicles, probably at extremely low average densities. In the absence of much detailed knowledge on seed movement on the landscape scale, it is better to concentrate on identifying sites that are at risk. Routine monitoring of high risk areas for new weed species needs to be undertaken. Training of the community in alien and native flora identification is therefore a priority.

Identifying plant communities prone to invasion Certain types of plant communities, for example riparian systems, are more prone to invasion by weeds than others. In fact all the critical (highly invasive) weed species identified by Humphries *et al.* (1991) are either restricted to flood plain habitats or form their densest infestations along watercourses. Tropical wetlands, in particular, are in critical danger. Wetlands are very important for Aboriginal food gathering. They are also crucial to the survival of many native animals (Braithwaite 1990) including migratory species for which Australia has signed international conservation agreements.

Decreasing an area's susceptibility to invasion A key strategy for weed management is the minimization of disturbance (Hobbs and Huenneke 1992). Although all areas experience some level of disturbance, be it from seasonal flooding, fire or grazing by native animals, the native vegetation is generally well adapted to it and may require a low level of disturbance to maintain itself (Hobbs 1991). It is the more profound disturbance (defined as the removal of existing vegetation), usually from human activity or from domestic or feral animals that dramatically affects the composition of the flora. The control of feral ungulates, management of development, rehabilitation using native species, and the use of fire all need to be integrated into a weed management strategy.

Managing existing weeds Invasive weeds may already exist in a region. A prerequisite for a weed management program is a detailed survey of the area to highlight the critical invasive species and the key parts of the

landscape threatened, and prioritize resources accordingly. Physical, chemical and biological control, especially when integrated (Storrs and Julien 1996), the manipulation of fire regimes and the promotion of growth of indigenous plants, all play a part here. The long-term aim is to maintain alien plant populations at an acceptable level by managing the habitat.

DEVELOPMENT OF A WEED MANAGEMENT STRATEGY

The aim is to develop a strategy for the Aboriginal lands of the northern region of the NT that is integrated with the Kakadu Weed Management Strategy, the NT Weeds Management Strategy and the National Weeds Strategy. The process of developing a weed management strategy will entail:

Research—identification of objectives The first stage involves a literature review of environmental weed management around Australia and overseas to determine the state of current knowledge. This work will expand and develop the work that has already been done in Kakadu National Park (Storrs 1996).

Consultation Visits will be made to the seven NLC regions to consult with key stakeholders including Aboriginal landowners, representatives of Aboriginal associations, government agencies, adjoining landholders and Landcare groups, and weed control professionals. The consultations will determine the main issues, needs and priorities in regard to weed management and determine realistic objectives.

Preparation of overview paper Next an overview paper will be prepared. This will develop a conceptual framework for weed management and include:

1. main sites of weed infestation and prioritization of weed species,
2. responsibilities and relationships between different organizations involved in weed control,
3. current weed management programs,
4. land management objectives such as the minimization of disturbance and the rehabilitation and revegetation of disturbed sites,
5. possible strategies for the prevention of introductions of new weeds,
6. possible procedures for early intervention in cases of new weed incursions,
7. training, staffing, resource and research needs, and
8. possible performance indicators.

Further consultation and development of the strategy The overview paper will be circulated widely for comment. Extensive consultation with Aboriginal landowners will be made as part of the ongoing duties of the NLC. Only then will a strategy be drafted. It is intended that, by undertaking extensive consultation, the strategy would embody the state of current knowledge and opinion and would therefore provide directions that most people will support.

CONCLUSION

Weed control on Aboriginal land is vital. However, for reasons outlined above it is unlikely that Aboriginal people are ever likely to have the independent resources to keep weeds under control. We recommend a strategy that attempts to treat the underlying causes of weed problems, rather than a simply trying to eradicate individual species. Under this philosophy, the emphasis is on prevention and controlling the conditions that allow weeds to thrive. Weed control is then subsumed within the overall goals of land management. However this strategic approach needs both material and moral support from the Australian people and their representatives for its success.

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