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THE INTEGRATION OF PASTORALISM AND CONSERVATION ON THE  
COASTAL WETLANDS OF THE NORTHERN TERRITORY

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1. ABSTRACT

The coastal wetlands of the Northern Territory are a valuable resource for conservation, pastoralism, tourism and the commercial utilisation of wildlife. These values are under threat from alien plants, saltwater intrusion and introduced animals. Integration of such a range of land uses necessarily involves compromise by all interested parties. In specific cases formal agreements under relevant legislation provide a mechanism to satisfy pastoral and conservation objectives on the same site. The Lower Mary River Landcare Group provides an example of a particularly active attempt to integrate pastoralism and conservation on the coastal plains. Collective responsibility for the catchment and the provision of a forum for members to discuss their management and its compatibility with the goals of others in the catchment underpins the integration of land uses. There is ongoing intensification of land use on the coastal wetlands, and the potential for extensive modification, for example through ponded pastures. To maintain a balance between pastoralism and conservation there needs to be improved accessibility of information to land managers on the economic and environmental implications, on property and beyond, of management choices they make.

2. INTRODUCTION

Seasonally inundated plains are widespread along the lower reaches of the river systems of the Top End of the Northern Territory, extending up to 80km inland from the coast (Fig. 1). These plains are among the most productive of Territory landforms (Finlayson 1991) with a seasonal cycle of flooding and drying which both adds nutrients to the system and creates pulses of growth and decay, making nutrients available for plant growth.

The wet-dry tropical climate exhibits uniformly high temperatures and solar radiation throughout the year, with a highly seasonal rainfall pattern (Nix 1983, Taylor & Tulloch 1985). In response to this rainfall pattern, the plant species composition at one point may vary markedly between wet and dry seasons (Finlayson *et al.* 1990). In addition to this temporal variation, there is a spatially complex pattern of plant communities, spanning gradients in the duration of inundation and salinity (Wilson *et al.* 1991).

3. THREATS

3.1 Alien Plants

Alien plants pose a major threat to the wetlands. The tropical shrub *Mimosa pigra* has spread rapidly across several wetlands (Lonsdale *et al.* 1989). This thorny plant forms dense monospecific thickets, dramatically modifying the habitat and displacing native species. Control is difficult and to date has primarily involved mechanical and chemical treatments. CSIRO and Northern Territory Department of Primary Industry and Fisheries are continuing experimental studies of suitable biological controls.

While all land users perceive *Mimosa* as a major threat to wetland values, some alien plants threaten a narrower but significant range of values. Para Grass, *Brachiaria mutica* has been actively introduced as a pasture species. It is a sprawling stoloniferous perennial that will displace native species to form a dense monoculture, occupying the same floodplain niche as the native Wild Rice, *Oryza rufipogon*. The value of Para Grass as a pasture species is widely accepted by the pastoral community despite its competition with valuable Wild Rice and the native perennial grass *Hymenachne acutigluma*, which although apparently less palatable to stock than some exotics, provides a highly nutritious fodder (Calder 1981).

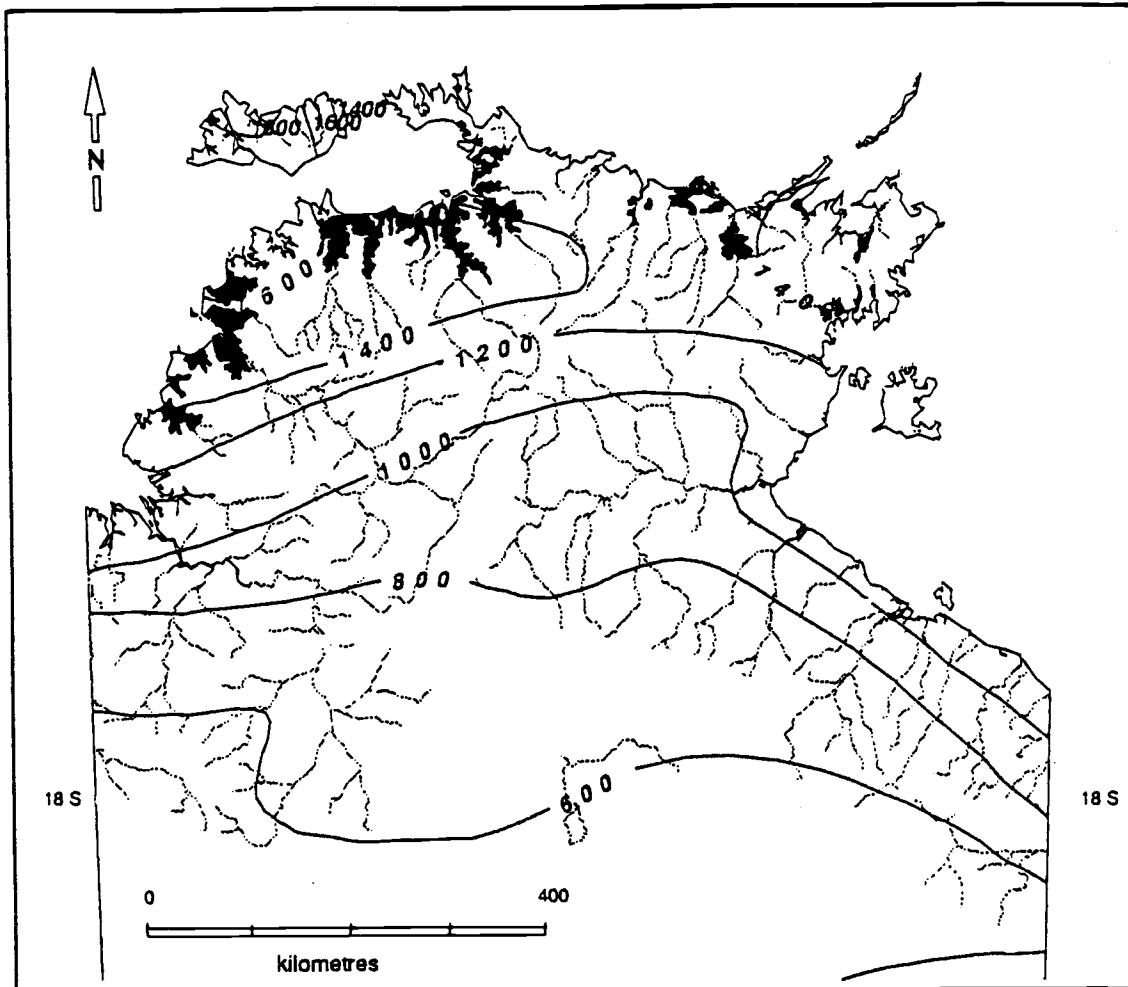


Figure 1. The coastal wetlands of the Northern Territory (Wilson *et al.* 1990). Rainfall isohyets (mm) are based on records to 1984 (Bureau of Meteorology, Darwin).

Two of the many species that rely upon the wetland vegetation for food are the Magpie Goose, *Anseranas semipalmata*, and the Dusky Rat, *Rattus colletti* (Frith and Davies 1961, Friend *et al.* 1988). Replacement of abundantly seeding Wild Rice and *Eleocharis* which produce edible bulbs, with Para Grass (which produces little seed and no bulbs), will impact on these native animals. In turn the Magpie Geese and Dusky Rat are a food resource for Water Pythons, *Liasis fuscus*, Dingos, *Canis familiaris dingo*, (Corbett 1989) and birds of prey. Thus reduced abundance of native annual grasses and sedges is likely to have marked impacts on wetland fauna.

### 3.2 Saltwater Intrusion

Saltwater intrusion has been widespread over the last 40 years, occurring on the Reynolds, Finniss, Mary, South Alligator and East Alligator River Systems (Fogarty 1982, Wilson *et al.* 1990). On the Mary River approximately 17,000 ha of freshwater wetland has been affected by saltwater intrusion (Woodroffe *et al.* 1991) leading to the destruction of large areas of freshwater vegetation. Intense buffalo activity leading to the breakdown of natural levee banks has been implicated as a causal agent, allowing inflow of sea water at high tide (Stocker 1970, Fogarty 1982). Woodroffe *et al.* (1991) suggest that a combination of factors are responsible, including changing tidal levels and geomorphic processes. Regardless of the cause, the fact that extensive areas of the wetlands are

at an elevation below high tide level means there is a significant potential for further saltwater intrusion.

### 3.3 Introduced Animals

Introduced ungulates, both feral and domesticated, have the capacity to modify the flora and fauna of wetlands. For example, domestic herbivores have caused structural and compositional change in sub-humid flooded grasslands in Argentina (Sala *et al.* 1986). An inquiry into feral animals in the Northern Territory concluded that feral buffalo contributed substantially to environmental changes in the coastal wetlands and "these changes have had a markedly adverse effect on vegetation, soil, natural waters and drainage, faunal habitat, and potential pastoral productivity" (Letts *et al.* 1979;16). Feral pigs utilise the wetlands (Hone 1990) resulting in extensive disturbance by rooting (Bowman & Panton 1991, Bowman & McDonough 1991), although their impact on pastoral production and conservation values has not been quantified.

Cattle and buffalo are the major domestic animals of the floodplains. The degree of environmental modification they cause is dependent upon management strategies, particularly in regard to season, duration and intensity of stocking.

## 4. LAND USE

### 4.1 Pastoralism

The wetland vegetation remains green well into the dry season, in some situations persisting through to the next wet. Thus at the time of the year when the quality and quantity of feed on the adjacent upland country is at its lowest, the wetlands provide a productive alternative. While the carrying capacity of upland country with native pasture is less than one beast per 40ha (T. Easton pers comm), native *Hymenachne acutigluma* floodplain pasture supports a dry season stocking rate of one beast per 1.5 to 2ha (Cameron 1988).

During the wet (growing) season, the plains are highly susceptible to damage by grazing and trampling (Calder 1981) leading to a reduction in dry season forage, pugging of soils and premature drainage through the development of swim channels. In response to these restraints on wet season grazing the majority, but not all, of the managers in the Mary River Catchment remove their stock from the plains during the wet. Stock movements have been restricted by the Brucellosis and Tuberculosis Eradication Campaign in recent years, resulting in increased grazing pressure on some areas.

Pastoralists undertake *Mimosa* control programs in conjunction with the Northern Territory Department of Primary Industry and Fisheries. Exotic grasses have been introduced to both upland and floodplain country, in some instances accompanied by clearing the tree overstorey on upland areas. Barrage construction and fencing is undertaken by some pastoralists in an attempt to control saltwater intrusion, and feral animal control is a common practice.

### 4.2 Conservation Lands

The *Melaleuca* forest and grassland/sedgeland vegetation communities of the coastal plains are distinctive and restricted in distribution, occupying less than 1% of the Northern Territory. The distribution of coastal wetlands in reserves is strongly influenced by the large Kakadu National Park so there is under-representation of some communities and species occurring in other catchments (Wilson *et al.* 1990).

While the plant species diversity is low, the temporal and spatial patterning of the vegetation result in a patchwork of habitats. These diverse patches support abundant fauna, particularly avifauna (Finlayson *et al.* 1988, Morton and Brennan 1991). The importance to avifauna is illustrated by records of dry season aggregations of more than one million Magpie Geese representing 60-70% of the population of the Top End, within a

small area of floodplains in Kakadu National Park (Whitehead et al. 1990). While such aggregations reflect a habitat patch that is particularly important for part of the year, the numbers of Geese occurring on particular river systems may fluctuate greatly, both seasonally and in the longer term, apparently in response to shifting, widely spaced patches of favourable habitat. Thus the capacity of the wetlands arises from the landscape scale interactions between water and vegetation to provide a shifting mix of faunal habitats (Whitehead et al. 1990).

*Mimosa* and feral animal control programs are undertaken by the Australian National Parks and Wildlife Service, the Conservation Commission of the Northern Territory and the Northern Territory Department of Primary Industry and Fisheries. On the Mary River Conservation Reserve a major effort has been put into halting saltwater intrusion over the last three years with the construction of 21 earthen barrages. In addition a substantial concrete and rock barrage has been constructed across a freshwater billabong on the Mary River which had recently been connected to an advancing tidal channel.

#### 4.3 Tourism

Water bodies and abundant wildlife provide a valuable recreational resource with Barramundi, *Lates calcarifer*, fishing and the spectacular congregations of wetland birds being two major attractions. Hunting is also a popular activity with declared open seasons for waterfowl, and safari tours to hunt feral animals. Recreation and tourism contributing 6.1% to the 1989/90 Gross Domestic Product in the Northern Territory, while agriculture contributed 1.3% (Anon 1992).

Fishing remains the major recreational activity and the Mary River supports the most popular recreational Barramundi fishery. A 1986/87 survey of fishing in the five river systems from Darwin to Kakadu revealed an annual effort of over 220,000 angler hours and a catch of over 27,000 Barramundi (Griffin 1988). In response to decreasing abundance and size of Barramundi, bag limits, size limits, and even site specific closed seasons have been implemented.

In the past, management of waterfowl has been primarily concerned with control of the hunting season. But maintenance of Magpie Geese populations at or near the existing levels will require management strategies that preserve the full range of floodplain habitats (Whitehead et al. in Press).

#### 4.4 Commercial Utilisation of Wildlife

Crocodile, *Crocodylus porosus*, eggs are harvested from the floodplains under an approved program administered by the Conservation Commission of the Northern Territory (Anon 1989), which has been recognised by the International Union for the Conservation of Nature as contributing positively to conservation of the species. Consideration is also being given to the commercial harvesting of Magpie Goose eggs to supply birds for the restaurant market.

#### 4.5 Horticulture

Horticulture occurs on the adjacent uplands rather than the wetlands but has the potential to affect the plains through changed runoff characteristics of the catchment, and the use of fertilisers and pesticides. If the capacity of the wetland ecosystems to support the current grazing and wildlife values is to be maintained, land use on the uplands must be sympathetic to the requirements of the plains (Whitehead 1991). In the Mary River Catchment the formation of a Landcare Group provides a vehicle for such integrated management.

#### 4.6 Landcare

The Lower Mary River Landcare Group was established in 1989, when the land managers of the area recognised the need for a united approach to combat their land degradation issues. Saltwater intrusion, woody weed infestation and feral animal control are perceived as the main threats to the multiple

land use of the area. The group membership includes a wide variety of enterprises, with pastoralism (cattle and buffalo), tourism (safari tours, boat hire, camping and monsoon vine forest educational walks), conservation (including 5 reserves managed by CCNT), mining (gold and mineral exploration), horticulture and defence force training being represented.

Many of the managers recognise the potential for multiple exploitation of their land and while their major land use may be pastoral, they have also embarked on complimentary activities such as tourism. The Landcare Group has accepted that to integrate any or all of these land uses, property management planning can provide the basis for sustainable utilisation. Two land managers in the group are currently involved in the property management planning process, with several other managers looking to begin in the near future.

The Landcare Group is in the initial stages of compiling its preferred long term management strategy for the area. Projects include a *Mimosa* eradication trial funded by the National Soil Conservation Program and the general co-ordination of activities in the area. The group has called for a united Government approach to reduce conflicting advice by Departments. Results of this co-ordination are already apparent with extension officers working together on key management issues. As a group they are concerned with the conservation of native flora and fauna, and are starting to address issues relating to their influence as the current land managers on the ecosystem. One such issue is the effect of earthen barrages on plant species diversity and composition due to the changed hydrology.

## 5. DISCUSSION

The coastal wetlands of the Northern Territory are an economically and environmentally valuable resource. They are an integral component of the pastoral and tourism industries and have considerable potential for expansion of non-consumptive (tourism) and consumptive industries (wildlife harvesting). To maintain this diversity, and the benefits which flow to a variety of sectors of the community, compromise is required by all interest groups.

The establishment of Landcare Groups and the enactment of new pastoral lands legislation signals a new approach to pastoralism by the Northern Territory Government. A significant change in the Pastoral Lands Act 1992 (NT) is the provision for monitoring of pastoral lands, including the setting aside of ungrazed reference areas and establishment of monitoring sites.

In practice there are significant logistic problems and high costs associated with monitoring of the quality required to reliably answer key management questions. For example, a vegetation monitoring program was established in 1991 to assess the impact of cattle grazing in three communities on the Mary River Conservation Reserve. Access to the wetlands is difficult with the majority of the year too wet for conventional four wheel drive access and too dry for airboat access away from the major waterways. The cost of establishing a series of enclosures was in excess of \$20,000 excluding wages, and maintenance of the project in the seasonally flooded environment will be expensive. While monitoring will provide valuable feedback into pastoral management in the long term, many decisions on the integration of pastoralism and conservation must be taken before robust results will accrue.

A formal agreement under the *Territory Parks and Wildlife Act 1980* has been reached with one landholder on the Mary River to sympathetically manage a Magpie Geese breeding area, in exchange for grazing rights on the Mary River Conservation Reserve. The agreement specifies that no exotic grasses will be introduced to the breeding area. Such agreements provide a useful mechanism for addressing special cases but effective conservation of native flora and fauna will require sensitive management over large areas rather than a few patches.

The Lower Mary River Landcare Group is attempting to integrate management across the catchment whereby "no single landholder is simply responsible

for his lease or property but is responsible for the area as a whole" (Sterling in Press). This collective responsibility and the provision of a forum for members to discuss their management and its compatibility with the goals of others in the catchment underpins the integration of land uses.

A catchment approach provides a useful framework in which to address many issues. For example, issues such as wildlife corridors or the provision of a patchwork of faunal habitats across land tenure boundaries can be meaningfully addressed at this scale. A regional analysis is also necessary to compare the potential benefits in pastoral production gained from invasive exotic pasture species, with the associated costs of controlling such plants on conservation or tourism sites, coping with increased fire risks, or loss of wildlife values that attract tourists to the region. When dealing with highly mobile species such as Magpie Geese, a broader regional perspective (across catchments) is also required (Whitehead *et al.* in Press).

There is an ongoing intensification of land use on the coastal wetlands. For example, the Brucellosis and Tuberculosis Eradication Campaign has resulted in the removal of tens of thousands of feral buffalo and required extensive fencing programs that allow the control of domestic stock. In turn, the capital investment required for fencing adds pressure for an increased financial return from the wetlands.

In many instances company ownership increases the availability of finance to intensify management. In addition the technology is at hand to dramatically alter the character of the wetlands through ponded pastures. In Queensland there has been vigorous debate over ponded pastures, including their affect on the Barramundi fishery (Garrett 1991). In July 1991 the Queensland Minister for Environment and Heritage declared a moratorium on coastal ponded pastures in that State. On coastal wetlands of the Northern Territory earthen banks have been primarily used to control saltwater intrusion, with only limited bank construction to manipulate pastures. Interest in using earthen banks to manage the pasture for enhanced production of perennial grasses is increasing, yet the authors are not aware of any economic analysis or investigation of environmental effects in the Northern Territory.

There is a long established structure of pastoral advisers who have traditionally provided guidance aimed at increasing animal production. In recent years there has been an increased emphasis on extension to improve the maintenance of land resources. To assist the integration of pastoralism and conservation in a system that relies heavily on voluntary co-operation, greater input from other interest groups (tourism and conservation organisations) is also required. To keep pace with the rapid changes occurring in the pastoral industry, extension officers with a conservation brief that recognises the economic and social value of native flora and fauna, are needed to maintain a balance which promotes the long term interests of the entire community. The notion of interaction and compromise is particularly important in wetlands, where it is not possible to effectively quarantine activities to prevent the flow of impacts throughout the system.

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