APPROPRIATE FIRE MANAGEMENT STRATEGIES FOR THE NORTHERN TERRITORY

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SUMMARY

A broad framework for the development of guidelines for fire management in the Northern Territory is presented.

Strategies in place in the Northern Territory are briefly described. These include a collaborative study by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Conservation Commission of the Northern Territory (CCNT) in the southern half of the Northern Territory; "Anticipating the Inevitable", the patch burning strategy for Uluru National Park; a Fire Management Manual for parks and reserves in Central Australia; aerial burning in the "Top End"; and fire management of "Top End" parks and reserves.

INTRODUCTION

Appropriate fire management strategies, whether at the Northern Territory, regional, or park level are those which reflect the best compromise between what is perceived as the ideal situation and constraints including:

- lack of quantified objectives;
- lack of resources;
- lack of fire behaviour and effects information, and other relevant resource data;
- complexity of vegetation distribution and lack of mapping;
- social perceptions of the role of fire;
- conflicting ideologies between those responsible for land management;
- the complexity or boundary situations and land tenure;
- the requirement to protect life and assets;
- changing structural organisation of institutions responsible for fire management.

The institutionalised development of fire management strategies in the Northern Territory (NT) is a relatively recent activity and was originally largely based on an element of intuition. Strategies have since evolved through the combined process of direct management experience, input from research and adoption of new technology.

Fire management strategies at work in the NT vary widely in the quality and quantity of their information bases, the level of planning detail and the complexity of management practices. Preparation of fire management plans does not take place under a single planning model. However, all strategies in the fire-prone Territory landscape are guided by, or have as their starting point, a few basic principles. The comment must be made that lack of sophistication does not equate with lack of effectiveness. Aboriginal strategies, as described by numerous authors, lacked all the material trappings of current strategies in terms of data bases and predictive models but were most effective in maintaining a stable landscape over a period of 30 000 years.

This paper provides an overview of the background against which the broad recommendations for fire management have been developed in the Northern Territory. The second section of the paper briefly outlines the more salient strategic fire management activities of the Conservation Commission of the Northern Territory.

Extent of "Conservation Lands" in the Northern Territory and the Responsibility for Fire Management

The Northern Territory landscape has not had a complex land-use pattern. The major land-use categories are those related to Aboriginal activities, grazing and conservation, with tourism superimposed over all three. All these land-uses are either wholly dependent or closely linked in material and intangible ways to the native vegetation cover. The dependence of major land-uses on native vegetation adapted to fire creates a requirement for the managed application of fire over much of the Northern Territory.

The legislative framework for strategic planning of fire management activities in the NT is provided by the NT Bushfires Act 1980, the NT Conservation Commission Act, and the Territory Parks and Wildlife Conservation Act 1980. The Bushfires Act (1980) provides the authority to prevent and control bushfires in the NT to the NT Bushfires Council (BFC), a statutory organisation but administratively attached to the Conservation Commission. The BFC provides extension services to the major landholders in the NT (ie pastoralists and Aboriginal). The Northern Territory Conservation Commission Act has the promotion of conservation and protection of the natural environment throughout the Northern Territory as the initial item in its statement of functions.

The Territory Parks and Wildlife Conservation Act, 1980 provides for the preparation of plans of management to ensure proper management of parks and reserves. While there are no specific provisions under the Act relating to prescribed burning, any fire management activities must be carried out in accordance with the management plan.

Where no plans of management exist the Commission is authorised to perform its function to preserve and protect the park or reserve. This also provides a basis

for fire management. The Commission is currently responsible for the management of approximately eighty-four areas comprising 1.8 per cent of the Northern Territory (Mobbs 1986). The Commission is also actively involved in research into fire behaviour and effects.

Fire Management in the Northern Territory - A Historical Perspective

The application of fire by Aboriginals in the NT over a period of 30 000 years has been described by Jones (1969), Haynes (1985), and Latz and Griffin (1978).

Pastoralists in the higher rainfall areas of the NT have used fire in an intuitive manner for over one hundred years to promote native pasture production and assist with mustering (Norman 1963; Perry 1960). Anecedotal information exists on the fire practices of pastoralists early this century in central Australia (Portlock, personal communication).

Significant direct government involvement in fire management commenced about 1966 with the creation of the NT Bushfire Council and the work of professional ecologists in the precursors of the Conservation Commission. Aerial burning was trialled in the Top End in 1967-68 with the notion of maintaining past practices and ameliorating the effects of late dry season fires. Aerial burning was also conducted on a limited scale on the southern side of the Tanami Desert during this time for two reasons:

(a) the perception that there was a large area of spinifex carrying a heavy fuel load posing a threat to centralian pastoral areas and stations hundreds of kilometres to the north; and

(b) the notion that this build-up of older even-aged spinifex was an unsuitable habitat for colonies of rare wallabies thought to exist in the area.

The impetus for active fire management and research was maintained in the Top End from the early 1970s onwards. However, in central Australian rangelands, with the onset of record rains and extensive fires, management was aimed solely at protection, through the construction of fire breaks as a preventative measure, or by direct suppression efforts.

In the late 1970s, a substantial program of fire research was established in central Australia and attitudes to fire changed. A consensus of opinion for active use of fire by land managers in central Australia now exists.

Climate, Vegetation and Fire in the Northern Territory

The Top End

The monsoon climate of the Top End is characterised by a marked wet and dry season. Almost all rain falls over the summer period, October to April. The average rainfall in Darwin is 1 600 mm and by rough rule of thumb, drops by one milimetre for every kilometre travelled inland.

When viewed from a smaller scale, the Top End is dominated by eucalypt open forest and woodland with extensive floodplains in coastal areas. At a larger scale,

the predominant open forest and woodland comprise monsoon forest, paperbark and seasonal swamp forests. Descriptions of the floristics, structure and distribution of Top End vegetation can be found in Christian and Stewart (1953) and Storey (1969, 1976). A simple description of fuel dynamics is outlined by Cheney (1979) and Hoare (1985).

Within the area of monsoonal influence "fire is an integral part of the environment for its appearance in many plant communities is annual and it comes as surely as the rain of the wet season monsoon" (Stocker and Mott 1981). However, information on fire patterns for the "Top End" is available only for a few areas (Day 1985) and consequently no comprehensive annual statistics on total area burnt or individual fire size exist. Hoare (1985) describes broad fire patterns as dictated by climate and fuel state for Top End forests and woodlands.

Stocker (1966) recorded observations on Aboriginal and European use of fire and the effect on selected plant communities in the NT. He also made broad recommendations for fire management in the Top End and the lower rainfall areas of the NT. Stocker's basic observations and recommendations are found in all subsequent literature dealing with fire effects and recommendations for management in the Top End.

The major determinants of vegetation distribution in coastal regions are moisture availability in the dry season and the degree of flooding (soil oxygen supply) in the wet season. These two factors are strongly influenced by topographic position and soil type ie vegetation is closely aligned to landform and soil type (Bowman 1987).

However, within the open forest/woodlands of the Top End, Hoare *et al* (1980), had as one of its main aims, the provision of quantitative information on the fire/vegetation interaction to those responsible for land management in the Top End. The key recommendations based on their findings were:

(a) a system of planned fire management be adopted;

(b) early dry season biennial fires be adopted for large area hazard reduction; and

(c) fires of low intensity with flame height of less than 1.5 m be applied in the early part of the dry season and at intervals between three and five years to obtain optimal vegetation and habitat development.

The Centre

The climate of central Australia is characterised by extreme variability of rainfall, both seasonally and annually. Droughts occur seasonally and annually with durations from less than one year to fifteen years. Pluvial periods occur between droughts but are usually of short duration.

The vegetation of the NT's arid zone has been described by Perry (1960). A simple description of fuel type, dynamics and fire pattern in four broad fuel/vegetation areas is contained in Griffin *et al* (1983). Area burnt and number of fires was correlated with three years of cumulative antecedent rainfall. In the

absence of management intervention, the wildfire regime in central Australia is one of extensive wildfires following periods of above average rains.

Fire effects at the community level in central Australia are complex and vary depending on, among other things, the timing of fire in relation to maturity/seral development of the community.

Griffin (1984) suggests that for conservation lands, fires should only be lit in mature habitats, ie where all species in the community have had time to reproduce and develop sufficient fuel to carry another fire. Significant, in some cases apparently irreversible, changes in structure and floristics can take place in some central Australian plant communities (eg Mulga) if multiple fires occur in earlier stages of seral development.

From the park manager's point of view, the main effect of extensive wildfire is the possibility of burning the entire park in a single fire and reducing the area to a uniform successional stage. Depending on past fire events, the potential exists for significant change in park vegetation under such a regime.

The patch burning strategy put forward by Saxon (1984) and Preece (1987), has two main effects; it ensures a diversity of vegetation stages, and it prevents wildfire covering all the park in one event. Prescribed burning of patches also allows protection of rare and/or fire sensitive species and provides long burnt/unburnt edges which are ideal habitat for some animals (eg Mala *Largorchestes hirsutus* colonies of the southern Tanami).

Fire Management Strategies in the Centre

The following three examples indicate separate bases for fire management strategies operating in central Australia:

(a) Collaborative Commonwealth Scientific Industrial Research Organisation/Conservation Commission of the Northern Territory studies;

(b) "Anticipating the Inevitable", a patch burning strategy for Uluru; and

(c) Fire Management Manual for Central Australian Parks and Reserves.

The impetus for development of these strategies came directly from the initiation of research work in the late 1970s.

The aim of the collaborative CSIRO/CCNT study was to provide fire managers with information on fire history, fuel load, ecological maturity and fire behaviour for the southern half of the NT. Emphasis in the study was given to spinifex dominated communities.

Mapping the fire history of the southern half of the Territory has been completed using a combination of satellite imagery, aerial photos and Bush Fire Council records. The maps have been digitised and updating will be carried out via analysis of US National Ocean and Atmospheric (NOAA) satellite imagery. The data relating to each mapped fire are stored on computer.

The product of this research effort is a system that rapidly accesses and collates information for decisions on wildfire or prescription burning in spinifex areas and to varying degrees in other fuel types in the southern part of the NT below latitude 20^{o}S.

As an extension of the above collaborative study a fire management strategy was developed for Uluru and was published in a booklet titled "Anticipating the inevitable: a patch-burn strategy for Uluru (Ayers Rock - Mt Olga) National Park" (Saxon 1984). Proposed patch burns were located in concentric zones around selected fire sensitive segments of the park. Locations and prescriptions for patch burning were based on examination of fuel loading, maturity of vegetation and fire behaviour in twenty-one land units, and an additional number of facets within land units.

The actual implementation is left to park managers. While the strategy has been applied on the ground at Uluru the development of this strategy can be regarded as a research project.

The approach certainly provides a guide for the development of strategies in other areas. However, the resources and expertise used to assemble the data bases on which the strategy was developed are not available to those responsible for fire management on other lands in the centre.

The "Fire Management Manual for Parks and Reserves in Central Australia" (Preece 1987) presents a formal framework for planning and controlling fire management on a large number of diverse parks. The manual details planning activities in three phases: pre-burning preparation, implementation, and post-burning action. Planning in the pre-burning phase involves the identification of rare and endangered species, fire sensitive communities, communities at a desired stage of seral development and location of patch burns to protect the above communities and prevent the loss of the entire park area in one fire event, (usually done on the basis of fuel loads). The actual burning is carried out under the supervision of staff with long term local fire knowledge.

Planning of patch burning activities on parks is done on an annual basis. However, the desirability of adopting a longer planning horizon is recognised.

Fire Management Strategies in the Top End

Aerial Burning in the Top End

An annual program of aerial burning is conducted by the Bushfire Council on pastoral properties, Aboriginal lands, and CCNT parks and reserves in accordance with park fire management plans.

The annual program cannot be tightly prescribed because of logistical considerations and annual variation in fuel curing rates from region to region. The flexibility of the program is one of its main strengths. The program has been established over a period of twenty years and staff associated with it have developed a high level of expertise in its execution. In particular, this expertise coupled with the local landholders knowledge of fuel curing rates, identifies the

upper limits for burning and the majority of burns are of low intensity. The program is accepted by the Top End rural community and is highly effective.

The 1987 program, for example, involved 129 hours of flying (mostly with a fixed-wing aircraft) and the establishment of an extensive system of strategically located burnt breaks by dropping of incendiaries. Assessment of the results of the program are qualitative and are again made on the basis of local landholder knowledge and accumulated experience by the Regional Fire Control Officer. There are two areas where improvement could be made.

1 quantitative assessment of fuel curing rates throughout the area covered by the operation; and

2 mapping of annual fire patterns in the "Top End" including the burning carried out by the Bushfire Council.

Fire Management of Top End Parks and Reserves

With the recent restructuring of the Northern Territory Conservation Commission, overall responsibility for planning and conducting burns in Top End reserves has been regionalised with planning mostly carried out by senior district rangers. This decentralisation has led to non-uniformity of the documentation of individual fire management plans. However, this situation is currently not an impediment to adequate fire management at the individual park level.

On Top End reserves, fire management is gradually moving away from more extensive practices (eg aerial burning), to more intensive forms of management, especially around sensitive areas (eg monsoon forest pockets, crocodile breeding areas, wetland areas used by nesting waterfowl, and paperbark communities). These areas are well-known at the local level and field staff generally have sufficient experience to conduct onground multi-stage burns around the perimeters of these areas to protect them. Where local park staff do not have adequate fire experience to carry out such burning, the district ranger can call on an extensive pool of expertise residing in other sections of the Commission.

CONCLUSION

Widespread NT community acceptance of active fire management has resulted from clarification of the principles underlying management practices and the consolidation of the biological rationale for burning by relatively recent research.

Strategic planners in the NT must continue to focus on the requirements of local operational field staff. The incorporation of research findings into locally available information bases and their translation into improved practices are the key elements in the development of appropriate strategies.

The adoption of a systematic process for the development of appropriate strategies at all levels of management will lead to increase in on-ground effectiveness and efficiency in fire management.

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