A MONITORING SYSTEM FOR USE IN THE MANAGEMENT OF NATURAL AREAS IN WESTERN AUSTRALIA

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INTRODUCTION

In Western Australia the Department of Conservation and Land Management exercises direct control over some 16.4 million ha of land including National Parks, Nature Reserves and State Forest. In addition it is called on to give advice on management of other areas of natural land. Proper management of natural areas imposes a requirement to predict likely effects of any management decision. To make effective management decisions, it is desirable to know:

1. the distribution and abundance of the various species of plants and animals over the landscape, and

2. the dynamics of the communities and ecosystems. This state of knowledge is seldom achieved for any particular area of land.

One approach to improving the information base involves the establishment of a system of monitoring sites throughout the State. Such a system is currently being developed with the following objectives:

1) to provide data on long-term changes in natural communities; such data should be based on standardised observations so that some interpretation is possible;

2) to complement and supplement the biological survey function;

3) to provide a simple and effective method for assessing effects of present management decisions in order to improve subsequent decisions; and

4) to increase the interest of departmental staff and the public in particular areas by involving them in the monitoring program.

It is anticipated that the monitoring program may provide some early indications of management problems such as over-grazing, epidemics, local extinctions, etc.

Observations spanning many years (at least 5) are considered essential to enable one to distinguish long-term trends in the biota from year-to-year variability and changes resulting from short-term cycles. These long-term studies will also provide a sound basis for interpreting

results of short-term inferential studies of community dynamics (i.e. those based on one off observations of sites with different disturbance histories).

THE MONITORING METHOD

The method selected and subsequently tested through a pilot study incorporates the following features:

1) repeatability - plots are permanently marked, and methods for recording are standardized;

2) flexibility/adaptability - the design of the monitoring quadrat enables it to be used for a range of organisms that differ in size and abundance;

3) user-friendliness - data recording sheets are being designed for simplicity and ease of use. A system of reporting back to observers is also planned; and

4) regularity of recording - it is proposed to structure the system so sites are visited at least annually.

A permanently marked, square quadrat is used (Fig. 1). A photopoint is located 10 m north of the south-west corner of the quadrat; the photograph is to be taken with that corner peg in the centre of the field of view. The quadrat can be expanded away from the south-west corner as indicated in Figure 1, to suit the the organism of interest. In the

case of vascular plant species in the South-West Botanical Province of Western Australia, a 20 m x 20 m quadrat is used. To facilitate recording of presence/absence data, this quadrat can be marked off in a series of nested quadrats. Canopy cover is measured as intercepts along two sides and two diagonals of the quadrat; this provides a repeatable indicator of abundance and biomass. Observations on life history attributes of species can be recorded simultaneously with either of the two preceding steps. Measures of other attributes such as tree DBH and faunal observations over larger areas can be referenced back to the initial quadrat. For example, systematic observations can be made of birds using a 1 ha square that incorporates the 400 m^2 square used for vascular plants and shares the common south-west corner. Note that the quadrat must be located within a community; the techniques outlined are not appropriate for measuring changes at a boundary or ecotone. Any number of quadrats can be used but, at the moment, the program is based on a single quadrat, representative of the particular community of interest, at each site.

Each monitoring site is assigned an identifying code. At the time of establishment, basic information to be recorded includes identity of the observer and date, purpose/status of site, locality data, and geomorphological and vegetation descriptions. Monitoring procedures to be undertaken on a regular basis are graded from a photograph (plus observer and date), through notes to supplement the photograph, a plant species list, vegetation structure and

habitat data, cover values along the transect lines to fire fuels, faunal observations, etc. Observations can be recorded directly onto computer data entry sheets that are suitable for immediate key punching. Data processing will be fully automated with provision for feedback to each observer indicating how his/her observations have contributed to the knowledge at that site.

It is proposed to involve Departmental field staff and members of the general public in the monitoring program to the greatest extent possible. This has the potential to increase the amount of information being collected; it is also efficient and educational. However, a large program would still require careful supervision and management to maintain interest and continuity of observations.

STUDIES USING THE MONITORING METHOD

During the evaluation phase, some 24 monitoring sites have been established in the south-west of Western Australia using the methods described above (Fig 2). Objectives for these studies are:

1) to assess rates of change in natural communities in relation to major environmental gradients (climate microcolimate, soils, fertility) e.g. York gum *Eucalyptus loxophleba*, jam *Acacia acuminata* woodlands on loamy sands across a rainfall gradient); and

2) to assess rates and patterns of change in different woodlands and shrublands at Clackline Nature Reserve; and

3) to assess the effects of management actions e.g. the effects of prescribed fires on wandoo *E. wandoo* and York gum woodland communities at Dryandra State Forest and Mockerdungulling Nature Reserve.

In addition, about 1000 permanently marked sites already used for ecological survey are now being re-evaluated for incorporation into the monitoring program.

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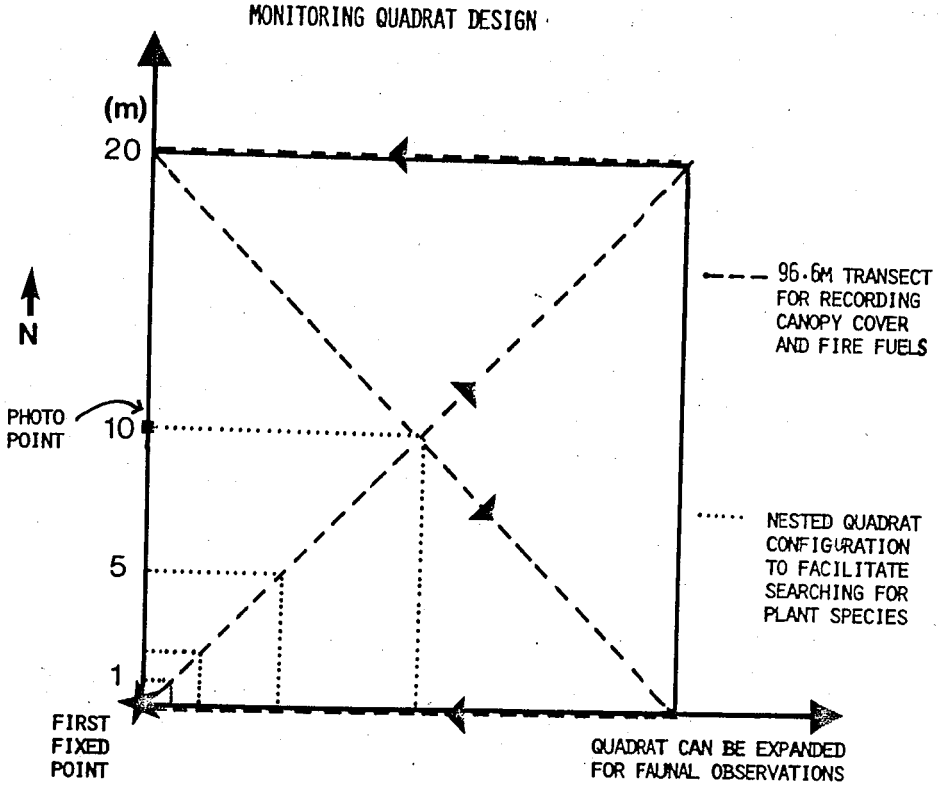
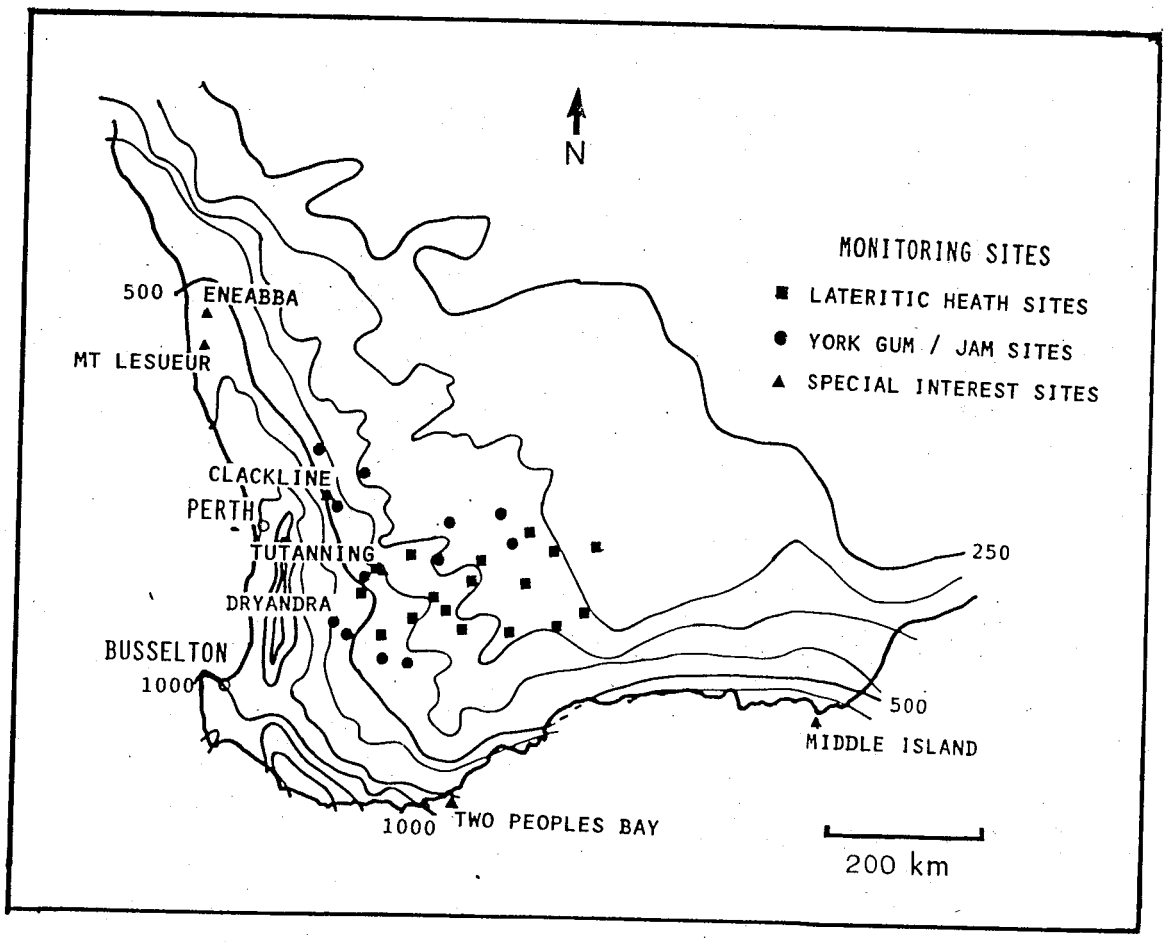
Figure 1. Design of the permanent quadrat to be used in the monitoring program.

Figure 2. Locations of the monitoring sites established in south-western Australia using the standard methods together with other permanent study sites yet to be incorporated in the monitoring program.


MONITORING QUADRAT DESIGN
(m)
20
N
PHOTO POINT
10
5
1
FIRST FIXED POINT
96.6M TRANSECT FOR RECORDING CANOPY COVER AND FIRE FUELS
NESTED QUADRAT CONFIGURATION TO FACILITATE SEARCHING FOR PLANT SPECIES
QUADRAT CAN BE EXPANDED FOR FAUNAL OBSERVATIONS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MONITORING SITES
LATERITIC HEATH SITES
YORK GUM / JAM SITES
SPECIAL INTEREST SITES
500
ENEABBA
MT LESUEUR
CLACKLINE
PERTH
TUTANNING
DRYANDRA
BUSSELTON
1000
250
500
MIDDLE ISLAND
1000
TWO PEOPLES BAY
200 km