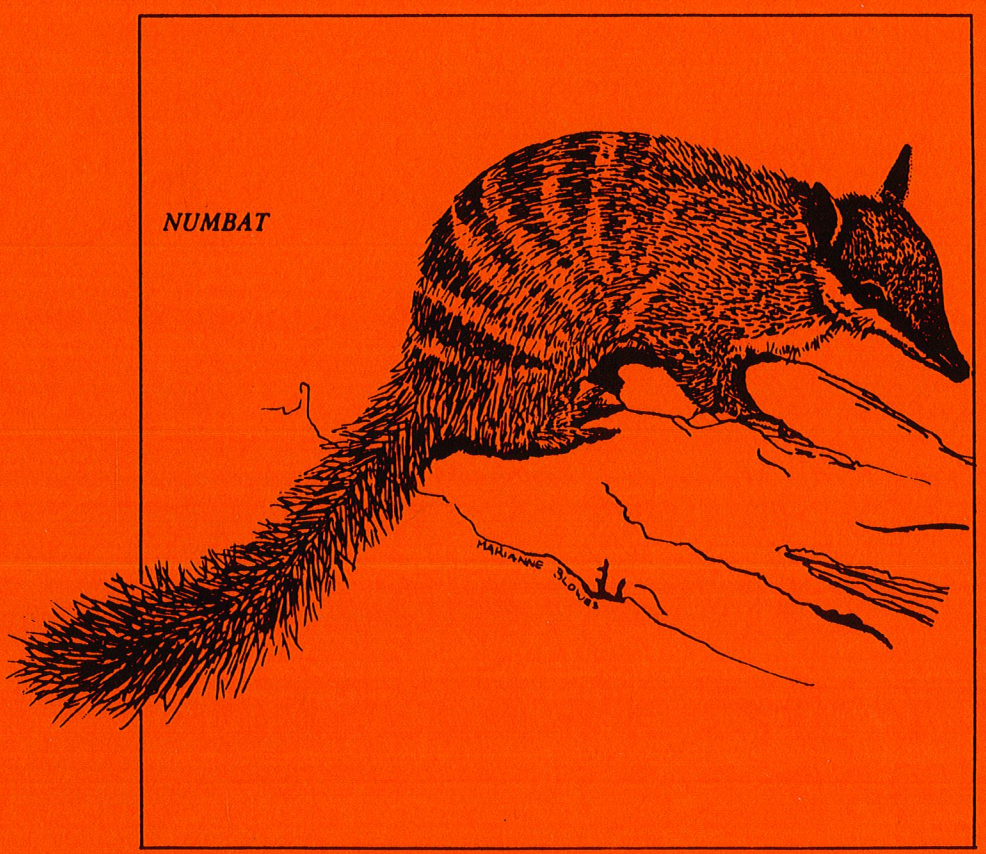
AN INTRODUCTORY GUIDE FOR A CASE STUDY ON FIRE MANAGEMENT IN THE DRYANDRA STATE FOREST



National Fire Management Workshop

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AN INTRODUCTORY GUIDE TO THE DRYANDRA STATE FOREST

1.0 LOCATION, SIZE AND TENURE

Dryandra State Forest (Dryandra) lies about 160km south-east of Perth in south-western Australia in the Wheatbelt Region of the Department of Conservation and Land Management (Figure 1). It is a complex of discontinuous blocks (Figure 2) totalling some 23 500 ha including areas of Vacant Crown Land proposed for inclusion in the State Forest. The largest area of continuous bushland is 12 192 ha. The other eight outlying blocks range in size from 87 ha to 3913 ha. The boundaries of these blocks tend to be irregular and deeply incised.

Most land adjoining Dryandra is privately-owned and has been cleared for agriculture. However small patches of vegetated Crown Land and Nature Reserves occur in the surrounding district. Farming activities include cropping with wheat, oats, and barley; grazing of sheep and some cattle; and pig production.

The wheatbelt region is the most highly disturbed area of Western Australia and the resulting impact on the original flora and fauna has been high. For example, at least 17 mammal species have disappeared from agricultural areas since the arrival of Europeans (Kitchener *et al.* 1980).

Dryandra was originally reserved to protect natural stands of Brown Mallet (*Eucalyptus astringens*) and to provide areas for establishing plantations of this species. Until 1960 bark was stripped from Brown Mallet to provide a source of tannin for the leather industry. While the demand for tannin persists, the local industry became uneconomic by 1960 with the introduction of synthetic tannins.

A smaller timber industry still uses Brown Mallet to produce tool handles, fence posts and firewood; however, the major values of Dryandra now is for nature conservation.

The Department of Conservation and Land Management (CALM) is responsible for managing the State Forest and the adjacent Crown Land and Nature Reserves.

All the State Forest in Western Australia is vested in the Lands and Forest Commission. The title "State Forest" suggests that all such areas are used for timber production. This is not always so in practice. Timber operations are currently excluded from the central Dryandra Block and the whole area was classified, in the General Working Plan 87 for State Forests (1982) as a Management Priority Area for Flora, Fauna and Landscape and managed as if it were a national park.

Contiguous with Dryandra State Forest is a large reserve vested in the W.A. Water Authority which in the past provided water supplies for steam locomotives and the Congelin townsite, now defunct. The area is virgin wandoo forest and is managed by CALM for conservation.

2.0 CLIMATE, TOPOGRAPHY AND SOILS

Meteorological records have been kept at Narrogin, some 25 km to the southeast of Dryandra, since 1933.

Narrogin experiences a Mediterranean climate with warm to hot, dry summers and cool, wet winters. The mean annual rainfall (50 years) is 500 mm, of which almost 80% fall between May and September. In summer, rain can be expected to fall on only 2 or 3 days of each month. This leaves a considerable period for fuels to become very dry, especially given the hot, dry easterly winds experienced over summer.

Dryandra lies between 240 and 440 metres above sea level. The landscape is gently undulating except where interrupted by sharp breakaways in the middle and upper slopes. In broad terms the geomorphology of the area consists of laterite plateau modified by erosion and deposition. The major landform units (figure 3) are:

(i)Plateau Type

This occupies the upper landscape and comprises small, gently sloping laterite residuals capped in parts by duricrust. In some areas small escarpments (breakaways) mark the boundary of the plateaus and occasional spurs reach the valley floor. The associated soils are gravelly sands, sand, duplex soils, laterite boulders and duricrust. The pediment slopes below the breakaways are often covered with loose gravel or the exposed pallid zone clay.

(ii)Slope Type

From the lip of the breakaways the land usually falls steeply for a short distance, then gradually becomes more gently and eventually merges imperceptibly with the Valley Type. The gently sloping terrain which may extend over local divides from one valley to the next and include the local interfluves, are comprised of laterite gravels and clay. Yellow earths exist on slopes below scarps, and there are occasional granite and dolerite outcrops.

(iii)Valley Type

This consists of valley floors encompassing major tributary streams and has an irregular outline because it extends into some minor tributaries. The valley floor has gradients of about 1:300. Soils consist of alluvial material which generally forms a simple soil pattern whereby the upper terraces have a yellow duplex soil and the lower terrace adjacent to the stream consists of undifferentiated alluvium. Exposures of granite have associated sandy soils which become waterlogged in winter. Of these landform units the Valley type contains the most fertile soils and has been mostly alienated for agriculture.

3.0 FLORA AND FAUNA

3.1 Flora

The indigenous vegetation is typical of that found on the western margins of the central wheatbelt in south-western Australia. It generally consists of open woodlands interspersed with areas of open forest, dense thickets, and shrublands. The vegetation is closely associated with soils and topography and distinct vegetation communities can be found on the three landforms identified.

(i) Plateau Communities

High lateritic plateaux usually contain an open woodland of Powderbark Wandoo (*Eucalyptus accedens*), Jarrah (*E. marginata*) and Marri (*E. calophylla*). The latter two species are relativley common where sandy soils predominate. The shrub understorey is dominated by thickets of *Dryandra* spp. or varying mixtures of species from the families Proteacea, Myrtaceae and Papilionaceae.

Kwongan (sclerophyllous shrubland), sometimes with dense clumps of mallee (*E. drummondii*), occurs within this landform. The kwongan are floristically rich and exhibit a wide variety of lifeforms and regenerative strategies.

(ii)Slope Communities

Brown Mallett with very little understorey is common in small pockets immediately below the breakaways but gives way to Powderbark Wandoo and Wandoo (*E. wandoo*) downslope.

The open woodlands of Wandoo and Powderbark Wandoo on the slopes are usually associated with thickets of either Sandplain Poison (*Gastrolobium microcapum*) or Box Poison (*Oxylobium parviflorum*). In other areas Rock Sheoak (*Allocasuarina huegeliana*) forms low forests and woodlands in association with granite outcrops and sandy soils.

(iii)Valley Communities

The main vegetation component on this landform unit is an open Wandoo woodland with a ground cover of sedges, annual herbs and grasses (mostly introduced). The form and vigour of Wandoo is best developed in these areas. On heavier soils Wandoo is replaced by low woodlands of Jam (*Acacia acuminata*) and York Gum (*E. loxophleba*). Where granite is exposed or overlain by shallow sands, these sands are replaced by Rock Sheoak. Excision of better soils for agriculture has resulted in the fragmented nature of the forest and the high perimeter to area ratio of the blocks.

The floristics of Dryandra is presently being studied in detail and some species are of particular interest as new species or regional endemics. Given the size of the forest, the highly cleared surround, and the large

number of rare flora on similar but much smaller areas within 30 km, then it is likely that Dryandra will prove to be of high botanical importance.

Some 8 000 ha of Brown Mallet plantations occur within Dryandra.

3.2 Fauna

Before European settlement, that part of south-western Australia between the 400 and 650 mm annual rainfall isohyets was very rich in mammals. With extensive clearing of the bush for agriculture and the introduction of exotic animals, plants and disease, both the number of species and the area inhabited by them has been reduced. Only a few isolated pockets of bushland which are large and varied enough to provide a habitat for the present species now remain. One such area is Dryandra which contains a diverse array of habitats and is the largest area of remnant bushland in the Western wheatbelt.

Dryandra continues to provide habitat for 14 ground dwelling mammals including rare species such as the Woylie (*Bettongia penicillata*) and Numbat (*Myrmecobius fasciatus*). Other rare mammals known from the reserve include the Tammar (*Macropus eugenii*) and the Red-tailed Wambenger (*Phascogale calura*).

The theory is that poison thickets (generally *Gastrolobium* and *Oxylobium* spp) provide protection for all potential prey against fox predation.

Further evidence of the importance of Dryandra for fauna is the relatively large number of birds species (about 100) which have been recorded as using the area, including the rare Crested Shrike-tit (*Falcunculus frontatus*) and an important population of the Mallee Fowl (*Leipoa ocellata*). The frog, *Heleioporus barycragus*, is an example of one of the species present in the area which occur at the edge of their geographical range.

3.3 Summary of Nature Conservation Values

The nature conservation values of Dryandra are derived from the:

(a)persistence there of rare fauna, and fauna of scientific interest (e.g. at the edge of their geographical range);

(b)probable presence of flora of scientific interest (e.g. undescribed and geographically restricted species); and

(c)the large size and diversity of habitats represented at Dryandra and the lack of any similar large and varied conservation areas elsewhere in the region.

4.0 LEGISLATION AFFECTING MANAGEMENT LEGAL RESPONSIBILITIES

Management of conservation reserves in W.A. is to be undertaken according to an approved management plan. These plans are developed through a planning process which involves widespread public consultation. In the case of National Parks, management plans shall be designed to allow members of the public to recreate, consistent with the proper maintenance and restoration of the natural environment (i.e. the protections of indigenous flora and fauna and the preservation of any feature of historic, archaeological or scientific interest). In both the preparation and implementation of management plans, departmental staff must comply with the various Acts and legislation which impinge on operations. These are:

4.1 Acts administered by this Department

Conservation and Land Management Act, 1984

Timber Industries Regulations Act, 1926

Wildlife Conservation Act, 1950

4.2 Acts under which the Department has specific

responsibilities are:

Bush Fires Act, 1954

Land Tax Assessment, 1976

Mining Act, 1978

4.3 Other State Acts which affect the Department's land

management responsibilities include:

Aboriginal Heritage Act, 1972

Aerial Spraying Control Act, 1966

Agriculture and Related Resources Protection Act, 1976

Agriculture Protection Board Act, 1950

Beekeepers Act, 1963

Control of Vehicles (Offroad Areas) Act, 1978

Country Areas Water Supply Act, 1947

Environmental Protection Act, 1986

Fisheries Act, 1905

Land Act, 1933

Local Government Act, 1960

Main Roads Act, 1930

Mining Act, 1978

Public Works Act, 1902

Rights in Water and Irrigation Act, 1979

Soil and Land Conservation Act, 1979

State Energy Commission Act, 1979

State Planning Commission Act, 1985

Water Authority Act, 1984

To date, few management plans have been completed. Where no formal management plan exists, interim management guidelines are applied. These ensure minimum disturbance and maximum protection of biota and landforms pending completion of the formal plan.

5.0 MANAGEMENT OBJECTIVES

5.1 Overall management ~~objectives~~ GOALS.

The objectives for the management of national parks are laid out in Section 56(1) (c) of the Conservation and land Management Act (1984):

"... to fulfil so much of the demand for recreation by members of the public as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna and the preservation of archaeological, historic or scientific interest ..."

Basically, the purpose of a national parks is to provide opportunities for recreation in natural surroundings and to conserve elements of the biophysical and cultural environment represented in the park. Recreational activities must be managed to minimise conflicts between the different types to ensure that they do not jeopardise the long-term conservation objectives.

This overall management objective is appropriate to Dryandra even though the current tenure of the area is State Forest.

5.2 Detailed Management Objectives

The current management objectives for Dryandra are listed below.

(a) manage specific areas of Dryandra to maintain populations of fauna gazetted as rare or otherwise in need of special protection. processes.

(b) conserve Gazetted Rare Flora;

(c) conserve any assemblage of flora or fauna occurring in Dryandra which is of restricted distribution, at the limit of its known geographic range, or otherwise of scientific interest;

(d) conserve the sample of interzone (Darling/Wheatbelt) biota found in Dryandra;

(e) conserve the landscape features of Dryandra;

(f) conserve the archeological and historical values of Dryandra;

(g) maintain the current level of commercial operation in Dryandra provided this is consistent with achieving other objectives;

(h) provide for the proper use and management of the scientific and educational resources of Dryandra;

(i) manage areas designated as recreation forest to provide a broad range of recreational and education opportunities without significant impact on other natural values;

(j) to manage the area to minimise any undue detrimental effects on neighbouring lands; and

(k) to manage the area to preserve those values that contribute to the regional, conservation reserve system as a whole.

5.3 Departmental Fire Management objectives

The fire management objectives of the Department of Conservation and Land Management are:

1. To protect community and environmental values on lands managed by the Department from damage or destruction by wildfire.

2. To use fire as a management tool to achieve land management objectives, in accordance with designated land use priorities.

Policies for fire management are detailed separately in an attached document.

6.0 ARCHAEOLOGICAL AND HISTORIC VALUES

Archaeological and prehistoric values of Dryandra have not been described. However, a number of Aboriginal sites are known to occur including an ochre pit and a tool manufacturing site.

The major historic site at Dryandra is the centrally located Dryandra settlement (Figure 2) which was constructed in the 1930's to house workers from the Forests Department. This is now leased to the Lions Club (International) and used for visitor accommodation. Other historic sites include an old well and plaque commemorating Lord Forrest, the first Premier of Western Australia, and the unusual Lol Grey fire lookout tree.

7.0 LAND USE WITHIN THE FOREST WHICH SIGNIFICANTLY AFFECTS FIRE MANAGEMENT

7.1 Nature Conservation

Vegetation regeneration is much slower at Dryandra than in areas with higher rainfall to the west. While many problems with fire management for nature conservation at Dryandra are similar to those elsewhere, complicating features are:

(a) the difficulty of predicting fire effects when regeneration is slow and effective rainfall variable;

(b) the presence of many fire sensitive plants;

and

(c) the highly fragmented nature of the reserve area.

Animals for which habitat management is clearly required are the Woylie, Numbat and Tammar. Vegetation thickets provide protection for these species. Some thickets are being maintained by a low level of seedling establishment in the absence of fire, while other thickets have collapsed through senescence or have not regenerated satisfactorily following fire. Soil stored seed is rapidly predated following seed set and release during late spring. Infrequent (30 years) fires in summer may be necessary to create hollows in standing trees and maintain an adequate number of hollow logs on the ground suitable for numbats. However summer fires may also consume logs on the ground (J.A. Friend, pers.comm). In the short term, termites numbers seem unaffected by fire.

The need for careful fire management is emphasised by the presence of fire sensitive species such as Rock Sheoak, Brown Mallet and many of the *Dryandra* spp. (especially *D. nobilis*).

7.2 Fire Protection and Timber Production

Brown Mallet within Dryandra is utilized for the manufacture of tool handles and for firewood and fenceposts. These activities support several local industries with a combined timber resource demand of about 1 500 tonnes per year. While most of the Brown Mallet at Dryandra has been planted (about 8 000 ha), the species also occurs naturally; natural stands are not harvested.

Brown Mallet is a fire sensitive species and is killed by fires of only moderate intensity. Prolific seed regeneration usually follows fire. The estimated time for regeneration to reach maturity is up to 50 years (A.J.M pers comm).

Given that Brown Mallet is an important commercial tree and that numbats regularly use plantation areas, specific fire protection of mallet stands is clearly necessary.

7.3 Fire Protection and Recreation

Dryandra is a major recreation area used by both day visitors and campers. Common activities include bushwalking, picnicking and visiting notable features such as the arboretum and the fire lookout.

The old forestry settlement is regularly used by clubs and groups, and hosted 3000 overnight visitors in 1985/86. The settlement is enclosed by mallet plantation on several sides and require special consideration in fire management planning.

Open fires are permitted in designated fireplaces throughout the year unless a Very High or Extreme fire danger is forecast.

7.4 Apiarists

There are currently some 44 apiary sites within Dryandra. Depending on intensity fire can delay honey flow for between two and seven years.

7.5 Utilities

A high voltage electricity line runs to the Dryandra Settlement. All telephone communications are by underground cable.

A system of firebreaks and access tracks is in place to help protect the forest and facilitate fire control and other management objectives.

7.6 Adjoining Land Use and Fire Protection

With few exception, land adjoining Dryandra is used for agriculture. This influences fire management of Dryandra in two ways. Firstly, fires started by farming operations are the most likely source of fire entering Dryandra. Secondly, as in most agricultural areas, bushland is viewed by private land owners as a fire hazard. This places social and political constraints on fire management.

7.7 Bush fires Act (1954)

The provisions of the Bush Fires Act are implemented by the local authority. Whilst much of the Act relates to private property there are specific sections relating to CALM.

Endorsement of the fire management section of any management plan on conservation lands by local authorities.

Endorsing alteration to or suspension of prohibited burning time to allow CALM to do fuel reduction burns.

Prohibition of lighting fires if fire hazard forecast by Bureau of Meteorology is Very High or Extreme.

A summary of the Bush Fires Act is attached.

8.0 FIRE HISTORY AND FUEL LOADINGS

8.1 Fire History

Since records have been kept, there have been very few wildfires in Dryandra State Forest. Of the 13 wildfires in the area since 1938, the largest fire burnt 150 ha of State Forest. The average area burnt by wildfire is 40 ha (CALM, 1985).

The primary reasons for the absence of large and devastating wildfires by comparison with western forests is the lower levels of fuels associated with lower annual rainfall, the efficient fire detection and suppression system and in the district.

There have been about 80 wildfires in surrounding farmland within a 20 km radius of Dryandra fire tower. Almost all of these were caused by harvesting operations. Of the 13 fires to burn into Dryandra, about 60% started in private property during harvesting. The remainder were either lightning strikes (3) or billy fires. Based on these records, it is apparent that Dryandra is under greater threat from wildfires coming into the forest than *vice versa* and that the fire risk is lower than for forests in higher rainfall areas of the south west. Nevertheless, a severe wildfire could develop within Dryandra on many summer days.

Since about 1938, most of Dryandra has experienced only prescribed edge burning off major roads and tracks in autumn and spring. Historically, very little broadacre burning was done, but it is likely that some of the edging (especially in autumn) ran deep into the blocks. Since 1979 there has been some broadacre prescribed burning. The results have been variable, and often only 20-50% of blocks have burnt.

9.0 MANAGEMENT RESOURCES

9.1 CALM Resources

Dryandra State Forest lies within the Narrogin District of the Wheatbelt Region. Both District and Regional boundaries are defined by CALM and generally coincide with those of Local Authorities.

Within the Wheatbelt Region there are some one million hectares of land managed by CALM. Much of this land lies within more arid areas to the east of Dryandra: nearly all is within or adjoining agricultural land.

Including research and enforcement officers, there are 30 CALM personnel based in the Region. Of these, 20 have a designated role in fire control and others are involved in support work.

While all those directly involved in fire control have had some training and experience in fire suppression, the level of expertise varies widely.

Narrogin District has 22 personnel of whom 14 are directly involved in operational activities related to fire control. One employee mans a fire lookout tower during the fire season.

CALM fire suppression equipment and its disposition are given in Appendix 1. It should be noted that the District and Region are very large and that personnel and equipment may be up to five hours from District Headquarters.

Radio communication between the Narrogin District Headquarters and Dryandra is by VHF. Regional communications are by HF which often gives poor communications during summer or periods of high sunspot activity.

9.2 Other Resources

Local farmers are organized into volunteer bush fire brigades equipped with private vehicles. Most farmers have fire units mounted on vehicles of one tonne carrying capacity, but others have trucks fitted as "tankers". The light units may be either four or two wheel drive, while all trucks are two-wheel drive.

Graders , water tankers and bulldozers are available locally through government authorities or private contractors. However, at any instant there may be no bulldozers which are readily available.

CONCLUSION

Dryandra State Forest is a small remnant of a once widespread ecosystem. It provides a refuge for a number of plants and animals and is a popular venue for a wide range of recreational activities. Dryandra has escaped serious damage from wildfires over the past 40 years, but the potential exists for wildfires to threaten both conservation values and human life.

The fragmented nature of the reserve, and the small size of many of the component blocks pose particular problems for fire management planning.

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APPENDIX 1

INVENTORY OF MAN POWER AND EQUIPMENT FOR NARROGIN AND KATANNING DISTRICTS

1.Narrogin District

Staff

12 officers (includes 2 clerical, 3 research and 1 wildlife

1 overseer

9 wages employees (plus 1 person during weekends over the fire season)

Equipment

1 light utility

2 sedans

1 station wagon

1 Toyota landcruiser crew transporter

3 4 x 4 tray tops SWB (light 450 litre tank and pump)

1 gang truck duel cap 4 x 2 (1900 litre tanka and pump)

2 4 x 4 Isuzu HD (Ngn 2800 litre, Pingelly 3600 litre)

1 tipper 4 x 2

1 motor cycle

2 tractors

1 set of tandem disc harrows

1 scarifier

2 tractor grader blades

7 chainsaws

1 single axle trailer

1 LFO trailer

2 stationary pumps

1 washdown unit

1 lighting plant

2.Katanning District

Staff

4 officers (including 1 clerical)

3 wages employees

Equipment

1 Isuzu gang truck 4 x 4 (1900 litre tank)

1 Nissan tray top 4 x 4 (580 litre tank)

1 Nissan tray top 4 x 4 (675 litre tank)

1 sedan

1 LFO trailer

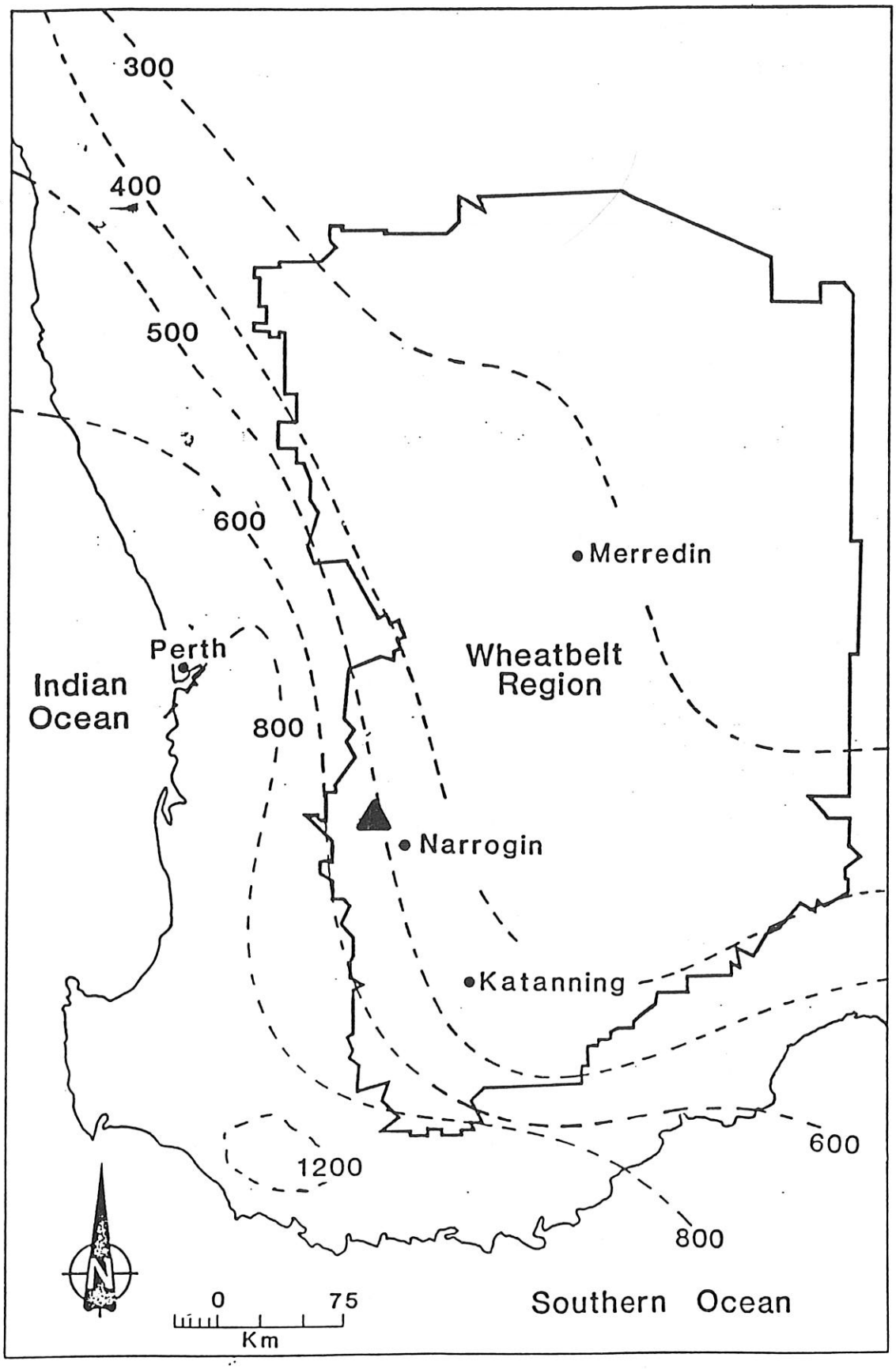
1 heavy duty (1 tonne) trailer

2 chainsaws

1 stationary pump

FIGURES

FIGURE 1: LOCATION OF DRYANDRA STATE FOREST & WHEATBELT REGIONAL BOUNDARY



—— Boundary, Wheatbelt Region

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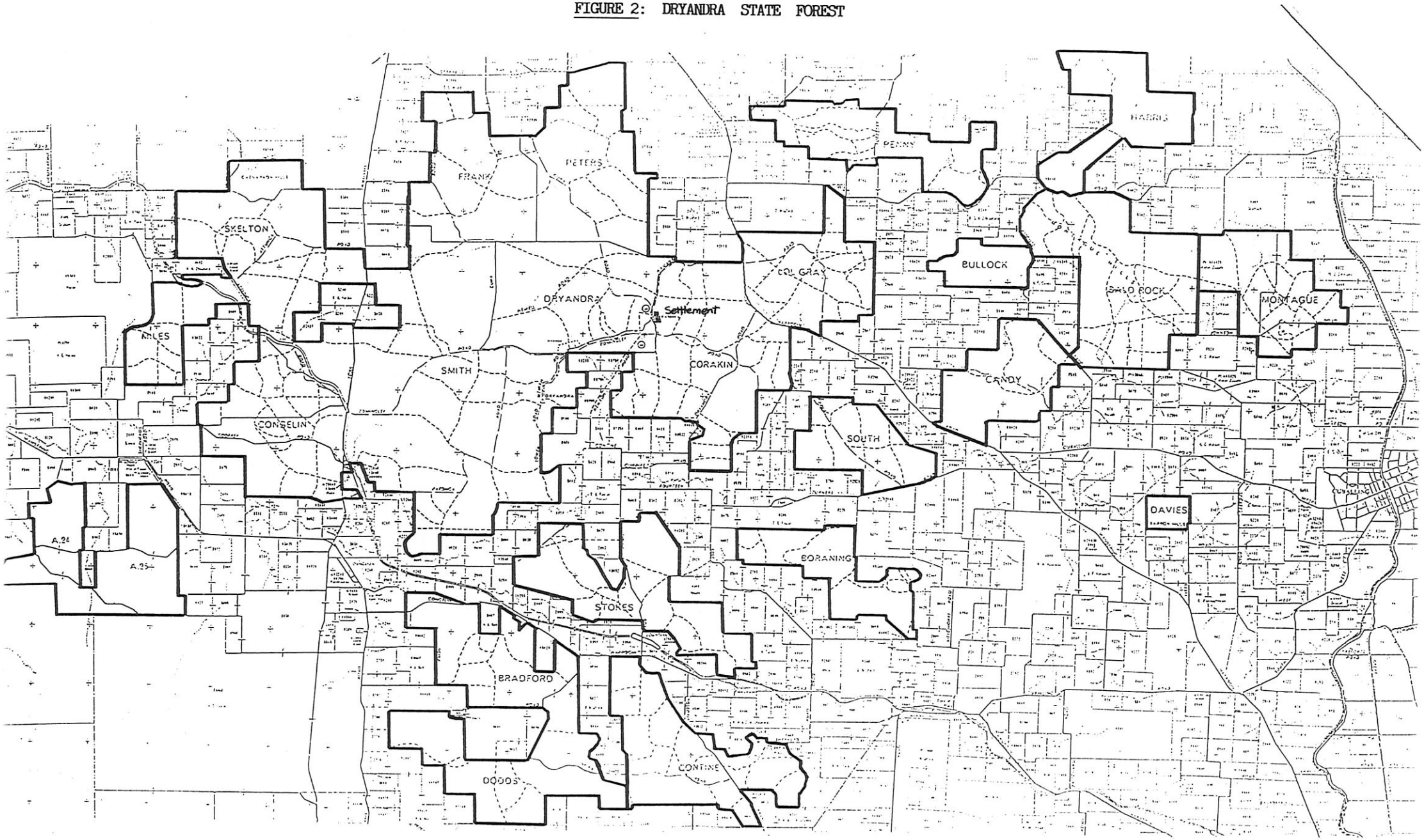
▲ Dryandra State Forest

FIGURE 2: DRYANDRA STATE FOREST



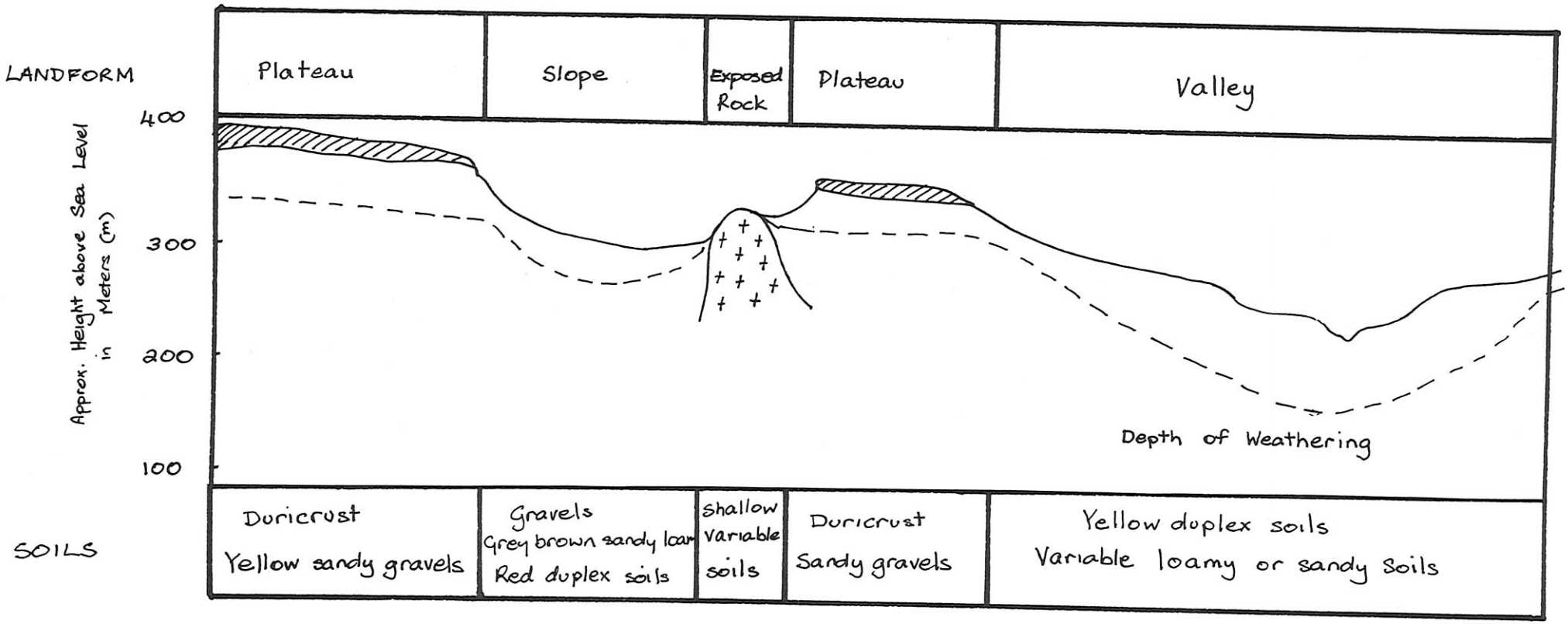


FIGURE 3: SECTION OF LANDSCAPES IN THE DRYANDRA AREA. (Adapted from McArthur et al, 1977).