A PROPOSAL TO ESTABLISH QUARANTINE AREAS FOR THE CONTROL OF DIEBACK DISEASE (PHYTOPHTHORA CINNAMOMI) IN NATIONAL PARKS

B.G. MUIR

BACKGROUND

The National Parks Authority of W.A. has its functions defined in the Act (Section 9) as being amongst other things, to maintain and manage land under its control and to preserve the natural beauty. To these ends extensive works to control erosion, destroy weeds and vermin which threaten the parks, and to protect floral assemblages and fauna are undertaken.

It is generally recognised today that Phytophthora cinnamomi - dieback disease, is presenting a major threat to W.A.'s timber industry, the wildflower trade, tourism and conservation. This danger lies in the high degree of susceptibility of the flora to the disease. Gymnosperms (cycads e.g. Macrozamia, conifers e.g. Callitris and Podocarps e.g. Podocarpus) are all susceptible as are 444 known species (in 131 genera and 48 families) of flowering plants (Newhook and Rodger 1972). Proteaceae, Leguminaceae, Epacridaceae and Myrtaceae are the most susceptible families and these four genera make up a large proportion of the endemic flora of the south-west of W.A. The importance of control of the disease is therefore obvious.

SPREAD OF THE DISEASE

Dieback disease effectively has two basic phases in its life cycle. A mobile phase where the fungus moves by water flow or other transport, and an immobile phase where the fungus remains saprophytically in its host. The second phase is not easily spread unless the host is transported e.g. movement of firewood, sawdust, or root material in topsoil etc. This phase is however, dangerous in the sense that the fungus may survive for many years in its dead host plant, then break out as a new mobile infection when conditions are right. As a general rule however, the mobile phase is the most dangerous, as it is present in soil and may also be transported in water bodies.

The disease spreads uphill fairly slowly, usually less than 30 cm per year, but may move downhill freely. Rates of spread of 2m/year uphill have however been recorded. The presence of roots from adjacent host species touching each other may lead to rapid spread using the tissues as a passageway.

DIEBACK MANAGEMENT

To date no cure for dieback is available on a large scale. Use of fungicides e.g. Ridomil, is effective in small areas or on the nursery scale but is prohibitively expensive on large infections, averaging 50¢ to $1.00 per square metre for a once-only treatment. If follow up is needed this cost is doubled*

Alternative measures to slow spread of the disease have been proposed. These methods are primarily management of the ecosystem to create conditions unfavourable to Phytophthora, or application of stringent hygiene procedures to limit the rate of spread.

* Footnote: These charges are for the chemical only and do not include labour, equipment, etc.

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Manipulation of the environment has been pursued along two lines: firstly to increase the nutrient levels of the soil thus producing healthier vegetation able to resist the disease. This has mostly been done by causing intensely hot fires which prompte legume growth in the understorey. Secondly, a prime host species, Banksia grandis is being thinned in some forests to remove some of the most susceptible source plants which harbour the disease. There is as yet, no real evidence to support the view that either method will work although results in some studies have been encouraging.

Hygiene as a method of controlling spread, is seen as of primary importance by the Forests Department. Appropriate hygiene will reduce the rate of spread of the disease, which is relatively slow if not transported artificially by some means and this in turn may "buy time" until a cure or more appropriate control is available.

QUARANTINE AREAS AND HYGIENE

It has been determined from studies so far that although dieback disease can be transmitted in the gut or on the feet of animals, by sheet flow of water downslope, by transport of infected plants or sawdust etc. it is generally recognised that the greatest spread over the largest areas is on the wheels and underbodies of vehicles.

Studies by the Forests Department e.g. Batini and Cameron (1974) have shown that transport of soil clods and mud contribute heavily to potential spread. In decreasing order of importance for spread of the disease were tracked vehicles, dual-wheeled vehicles and single wheeled vehicles. This relationship was mainly due to the amount of soil carried on the machinery from one place to another. Obviously many other factors come into play, for example soil type, wetness, vehicle design, additional machinery e.g. ploughs, and even factors such as road speed and degree of jolting which may cause self-cleaning of the machines while travelling from one location to another.

Nonetheless it is clear that tracked and dual-wheeled vehicles play a major role in spread of the disease.

Hygiene therefore, consists primarily of removing as much soil as possible before moving from an infected area to an uninfected location. The most effective means is by high-pressure water washdown and using a crowbar or similar instrument to remove large dried-on clods of earth. The washdown can be enhanced by using detergents, Chem-trate, copper sulphate or formalin in the washing water but generally the benefits are few from this more expensive procedure, although copper sulphate is a relatively cheap addition.

Quarantine areas are simply those areas where additional care must be taken to ensure adequate washdown before taking heavy machinery into them. They may be just recognised as quarantine or may be supported by Legislative powers, as is the case with Forests Department quarantine areas.

DIEBACK HYGIENE AND THE NATIONAL PARKS AUTHORITY

The National Parks Authority has long recognised the importance of dieback hygiene to prevent introduction of the disease, or to limit its spread in National Parks. Accordingly most ranger staff are conscious of the problem. However, full awareness of the extent and seriousness of the disease are not recognised by staff and the National Parks Authority has never specifically produced guidelines on limiting actions which may reduce its spread.

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It is felt that the National Parks Authority's guidelines in this matter can lie in two directions. Firstly, to educate ranger staff in the practical and theoretical aspects of Phytophthora biology and management. It is intended that this aspect is to be dealt with in future training programmes.

Secondly, it is seen as advantageous if the Authority:

1. declared some parks or portions of parks quarantine zones as an administrative, internal incentive to limit rate of spread; and

2. by the presence of such areas emphasise in the minds of management staff the seriousness of the problem and the need for careful management in this regard.

It is not anticipated that areas declared quarantien would be closed to the public or in any way restricted in terms of public access as are Forests Department quarantine areas; although a provision for allowing closure exists under the National Parks Authority Act 1976 (Section 24.1).

Similarly, entry for management, patrol, firefighting, weed control or any other purpose would continue unchanged. The emphasis would lie in limiting access to tracked and dual-wheeled vehicles, except in special circumstances, and ensuring appropriate hygiene measures be taken whenever possible if entry into these areas is necessary. In an emergency situation e.g rescue or wildfire, quarantine restrictions on tracked and dual-wheeled vehicles would be lifted immediately.

SELECTION OF AREAS SUITABLE TO BE DECLARED QUARANTINE

Quarantine areas may be selected on two criteria:

(a) areas known to contain the disease at high levels of infection may be closed to prevent them becoming sources of infection for "clean" areas.

(b) areas thought to be free or relatively free of disease may be closed to reduce the possibility of infection from outside sources into them.

Option (a), close areas already infected, is not feasible for application to National Parks. Parks by their nature are open for public access for the purposes of recreation and enjoyment and it is not practical to washdown visitors vehicles. Therefore the transport of disease into recreation areas is highly likely, has probably already occurred, and is unpreventable in the future.

Option (b), close areas believed to be relatively free of the disease, is feasible because:

(1) most entry into them is by our own personnel
(2) the public has low visitation rates and even when visited access is usually by single wheeled vehicle or on foot
(3) low visitation reflects less interest in the area by visitors and hence future prospects for tourist development are reduced.

Accordingly option (b) is suggested as a logical approach and plans for parks are prepared with low visitation and freedom from disease as basic guidelines.

In addition, if it was considered that areas need to be limited in size for any reason and alternative quarantine zones were available, the one with highest biological diversity was chosen.

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Initially nine parks have been chosen for consideration, but with the intention to increase this number if advantages to the environment are believed to be real and as new information comes to light.

THE NATIONAL PARKS SELECTED FOR INITIAL RECOGNITION OF DIEBACK QUARANTINE ZONES.

The following National Parks have been selected for a trial introduction of quarantine zones. They are presented in alphabetical order below together with brief reasons for their selection. Maps and details of reasoning and site selection are presented in the same order in Appendix 1.

A. Avon Valley National Park. The Park is important biologically because it is the largest representative area of the Avon-Darling botanical systems interzone and is the only "wilderness" National Park close to Perth. It also contains a representative sample of highly susceptible Jarrah (Eucalyptus marginata) forest.

B. Cape Le Grand National Park. This Park is in a wetter climatic zone than Cape Arid National Park and has much higher visitation, it is therefore more susceptible to introduction and establishment of the disease. Cape Le Grand and Cape Arid National Parks contain representative samples of the Esperance-Israelite Bay unique flora and therefore have considerable biological importance.

C. D'Entrecasteaux National Park. Unique faunal and floral habitats, abound in D'Entrecasteaux National Park, therefore its biological significance is high. It contains representative areas of coastal Jarrah vegetation assemblages, as do William Bay and Walpole-Nornalup National Parks, but is believed to be freer of the disease, has less visitors and is under less pressure for frequent control burning, than the latter parks.

D. Fitzgerald River National Park. Being a World Biosphere Reserve, it is the responsibility of the National Parks Authority to do all in its power to retain the character of the land as a baseline for comparison in the future. Accordingly, every effort should be made to prevent or limit the spread of Phytophthora into or through the Reserve. Additionally, the very high level of endemism amongst the flora (greater than 60%) makes protection of the park highly desirable.

E. Leeuwin-Naturaliste National Park. This Park contains the northern and western most stands of Karri (Eucalyptus diversicolor) forest with its unique understorey. Although Karri itself is not susceptible to dieback disease many of the understorey species are. Other parts contain Banksia woodlands, Agonis woodlands and south west coastal heaths which are highly prone to infection.

F. Moore River National Park. This Park is the only large reserve representative of the Coonambidgee Vegetation Complex. The Park is heavily used illegally for the cut wildflower trade and infections of dieback are recognised and obviously associated with routes of access by pickers. It is hoped that declaration of the whole Park as a dieback quarantine zone, and installation of strategic signs to this effect may discourage casual visitation and may bring to the attention of illegal pickers that their actions in the long term could be detrimental to the very resource which they are exploiting.

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G. Scott River National Park. The Scott River gravels and sands of the southern portion of the park support several unique and endemic plant species of considerable scientific importance. Many are Gazetted Rare. The low lying nature of the country, with seasonal sheet flooding create ideal conditions for the establishment and spread of Phytophthora. The northern portion of the park is a narrow belt between farmland and the Blackwood River and is therefore difficult to isolate, the southern portion however, is large enough to form a buffered core zone relatively isolated from adjacent farms. There would be an advantage in installing signs on the major access routes to discourage illegal wildflower pickers.

H. STirling Range National Park. Again, as for Fitzgerald River National Park, this park has a unique and highly endemic flora both floristically and structurally. Landscape values are high, and already Phytophthora damage is apparent on Bluff Knoll, Mt. Mogog, Mt. Trio and Toolbrunup, always on the faces most used by tourists. Spread of the disease in these areas is related entirely to public use of pathways by large numbers of visitors.

It is considered that although walker numbers are high in the park spread of the disease by them is:

(a) comparatively lower than is likely to occur with tracked and dual wheeled vehicles, and
(b) can be slowed by the deliberate act of not creating new visitor facilities in areas comparatively free of Phytophthora; thus keeping visitation numbers minimal.

Accordingly, it is proposed that areas of the park which experience lower numbers of visitors be quarantined to reduce the probability of new infections.

I. Yanchep National Park. Although visitation to this park is at one of the highest levels of any park in Western Australia, most activity is restricted to only a few hectares in the main recreation area.

Consequently, access into the northern parts of Yanchep are mainly by National Parks Authority management vehicles, although there is some illegal use of tracks by wildflower pickers, firewood collectors, off-road enthusiasts etc.

Apart from protection of a representative sample of Bassendean Dune System, the Spearwood Dune System and the interface between these two, public awareness of quarantine and the presence of signs could well reduce this illegal activity.

In Yanchep National Park particularly, quarantine signs may be replaced by "Walkers Welcome, no unauthorised vehices" signs or if quarantine signs were installed they would be placed a short distance into the park adjacent to tracks. It is believed these would serve equal value for dissuasion of access without promoting the idea of the presence of dieback disease in National Parks. Alternatively however, public recognition of the problem may be seen by the National Parks Authority as both advantageous and desirable.

Further detail on the parks and quarantine area selection are presented in Appendix 1.

APPENDIX 1

THE NATIONAL PARKS SELECTED FOR INITIAL RECOGNITION OF DIEBACK QUARANTINE ZONES

A. AVON VALLEY NATIONAL PARK

1. Proposed boundary of dieback quarantine area.

That area contained within the northern boundary of the National Park, Sapper Road, the Avon River and 37 Mile Break, (Map 1)

2. Reason for selection of the area concerned.

2.1 Little or no public access (of south side river)
2.2 Definable on the ground.
2.3 As a consequence of few vehicles using the area, dieback spread is likely to be slow although the disease is present.
2.4 Contains examples of the laterlic plateau and river valley sides and representative areas of most of the vegetation types.
2.5 Contains the entire catchments of two minor creeks.

3. Action required to enhance protection.

3.1 Education of ranger staff to recognise the disease and to use hygiene measures wherever applicable.

B. CAPE LE GRAND NATIONAL PARK

1. Proposed boundary of dieback quarantine area.

   All the National Park east of Le Grand Road and Lucky Bay Road. (Map 2)

2. Reason for selection of area concerned.

   2.1 Limited public access except on approved roads or along beach.
   2.2 Protects wetland systems and headwaters of several minor creeks.
   2.3 Believed to be relatively free of dieback.
   2.4 Definable on the ground.

3. Action required to enhance protection.

   3.1 Awareness of ranger staff to be enhanced by training.
   3.2 Signs (in long term) to be installed at strategic points of entry into the park.

C. D'ENTRECASTEAUX NATIONAL PARK

1. Proposed boundaries of dieback quarantine area.

1.1 South eastern side of Black Point Road, then following the North-east boundary across to Jangardup Road then south west, around private land CG 7226, west along the southern boundary to the coastal track then due north west past Bolgamup back to Black Point track. (Maps 3 and 4).

1.2 From the coast eastwards along the southern boundary of Malimup Block just north of Malimup Spring then following the south and east boundaries in a general northerly direction to the Meerup Road then due south west to the bottom of the tongue of park which is the southern end of the Callcup Block as shown on Map. Crosses the south end of that tongue then west to the coast along the north boundary of the Malimup Block.

2. Reasons for selection.

2.1 Relatively free of dieback as determined by survey of Muir 1981.
2.2 Area selected is relatively inaccessible and is therefore naturally protected to some extent.

3. Actions to be taken.

3.1 As finances and management on-site permit signs be installed which read "Walkers Welcome". Dieback quarantine area. No unauthorised vehicles".
3.2 Rangers involved in park management be trained in dieback control measures.

D. FITZGERALD RIVER NATIONAL PARK

1. Proposed boundary of dieback quarantine area.

From the junction of the Fitzgerald River and northern boundary of the National Park, due east following the boundary to the north east corner of the park then south to a point approximately 1km north of Hamersley Drive on the west bank of Culham Inlet; thence due west and north west parallel to and following Hamersley Drive, but 1km away from that road, until it meets the Kybelup Pool-Hamersley Drive track. The boundary then turns south west along that track (on its northern side), to Hamersley Drive, follows the north side of Hamersley Drive until the junction of Telegraph Road then turns west along the north side of Telegraph Road, following it until Colletts Road is reached. Then along the north east side of Colletts Track to the point where this track crosses the Fitzgerald River. From here all the land on the north east side of the Fitzgerald River in a north westerly direction to its junction with the northern boundary of the park. In the event of relocation of the gazetted northern boundary to a new line coinciding with existing firelines, the quarantine area will extend to this new alignment. (Map 5)

2. Reasons for selection of area concerned.

2.1 Easily definable on the ground by existing boundaries, proposed boundaries, well known tracks or major watercourses. The only portion difficult to locate on the ground is that between Culham Inlet and the Kybelup Pool-Hamersley Drive track. This is not however, considered a problem as the boundary is flexible and allows development adjacent to Hamersley Drive in the portion within 1 km of the road.

2.2 The area is believed to be relatively free of dieback with the exception of a single confirmed infection on Bell Track about 1 km south of the northern boundary of the park.

2.3 The area defined includes the following:

2.3.1 The headwaters of all minor creeks east of Fitzgerald River and most of Coppermine Creek.

2.3.2 The majority of the larger drainage landscapes.

2.3.3 Most of the landscape features poorly preserved in the region or represented only in the Fitzgerald River National Park.

2.3.4 Almost all the habitats known to contain Red-eared Firetail Finch, Western Whipbird, Western Bristlebird and Ground Parrot.

2.3.5 The most floristically rich parts of the Park with the greatest structural diversity.

2.3.6 Most of the smaller ephemeral wetlands.

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3. Action required to enhance protection.

3.1 Close Bell Track completely and provide signs showing alternative access down Drummond Track.

3.2 Be aware of the priority being given to the area and be careful not to undertake earthworks, development or any other activity in the defined area without a full understanding of the consequences.

3.3 Ensure washdown of gear when moving into the area.

3.4 As the idea becomes accepted and as finances permit, to install signs saying "Dieback Quarantine Area". Please keep to tracks, at strategic points around the periphery of the quarantine area.

E. LEEUWIN-NATURALISTE NATIONAL PARK

1. Proposed boundary of dieback quarantine area.

1.1 As shown on Map 1. Including reserves A20455, A8768 and A8427.
1.2 Map 2 - Pt. A22673.
1.3 Map 3 - Pt. Reserve A20548 and reserve A35036.
1.4 Map 4 - Pt. Reserve A32376 north of Skippy Rock Road and Reserve 13984 (Maps 6, to 10).

2. Reasons for selection of areas concerned.

2.1 Area 1.1
(a) Definable by boundaries readily recognised on the ground.
(b) Believed to be relatively clear of dieback disease.
(c) Area is relatively large and represents the vegetation of the northern end of the ridge.
(d) Contains a fairly diverse selection of vegetation types including open heaths, and some Melaleuca woodland and Agonis woodland.
(e) Has limited public access except along established tracks.

2.2 Area 1.2
(a) As for Area 1.1 described in 2.1 above.
(b) Is a relatively large area of bushland representing the north-central part of the ridge. It contains Agonis woodland.

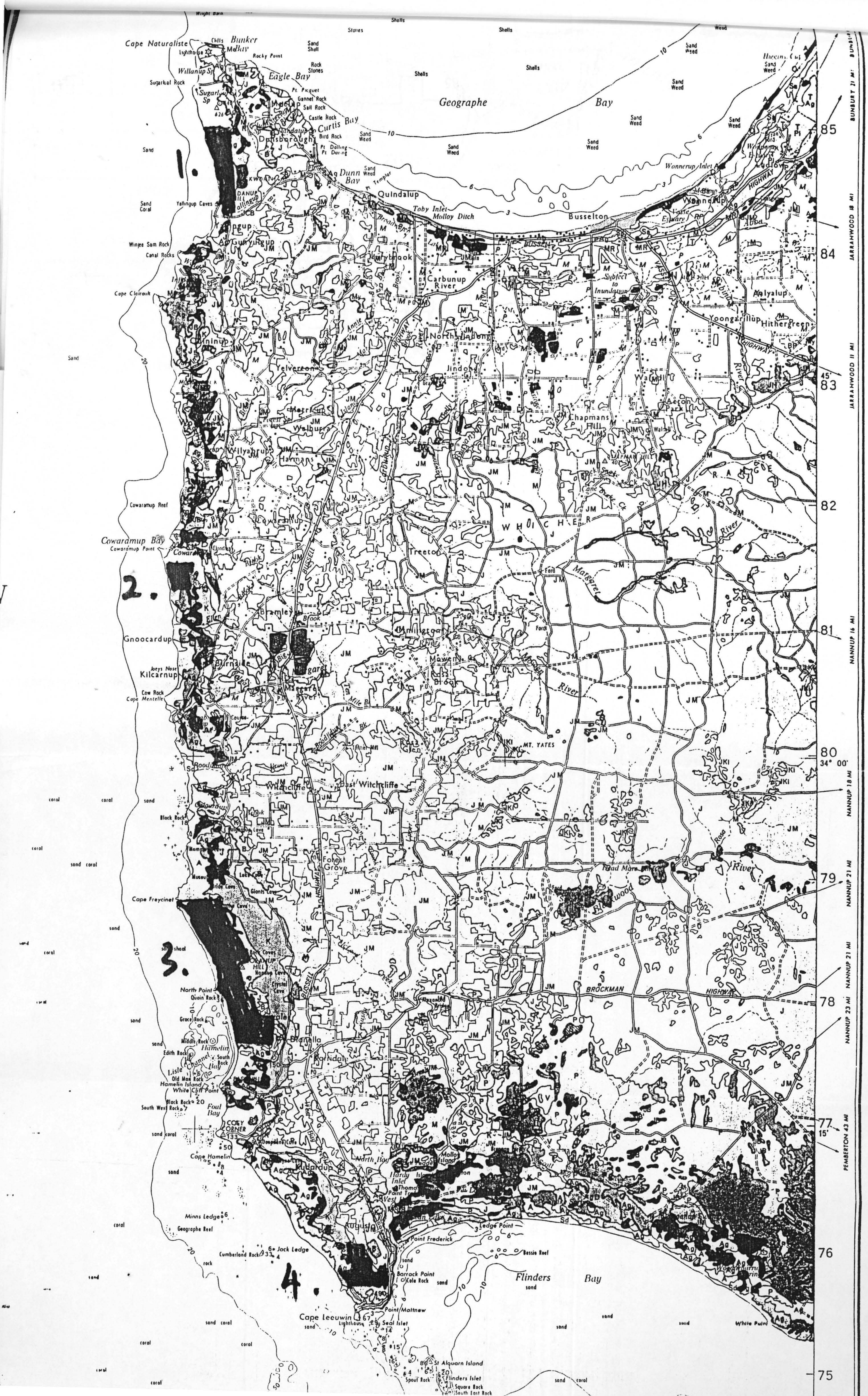
2.3 Area 1.3
(a) As for areas 1.1 and 1.2 described above. Because boundaries are difficult to describe and locate on the ground, Brozie Track, Georgette Road and Trig Road are taken as the discernible limits of the quarantine area.
(b) The area is large and represents the south-central portion of the ridge. It contains extensive areas of Agonis heath and low woodland, most of the population of E calicola, some Jarrah and much of the Boranup Sand Path with its unique heath formation.

2.4 Area 1.4
(a) As for areas 1.1-1.3 above.
(b) Represents the southern end of the ridge. The area contains Agonis shrubland and low woodland, Jarrah and Karri.

3. Action required to enhance protection.

3.1 The extensive use of all tracks in the area by fishermen, surfing enthusiasts and off roaders precludes the closure of any access-ways. Policing of the ridge by ranger staff is almost impossible. Consequently the main value of the notion of dieback quarantine depends on awareness of National Parks Authority management staff. The rangers and other NPA staff should be aware that the spread of dieback disease in these areas must be minimised and no restorative or developmental action taken which uses tracked or heavy equipment without full washdown being undertaken.

As National Parks Authority is virtually the only management agency likely to use tracked vehicles in the area this requirement is directed predominantly at ourselves.



LIFE FORM AND
OF TALLEST ST

TREES (Above

TREES (10 to

TREES (Below

SHRUBS (A

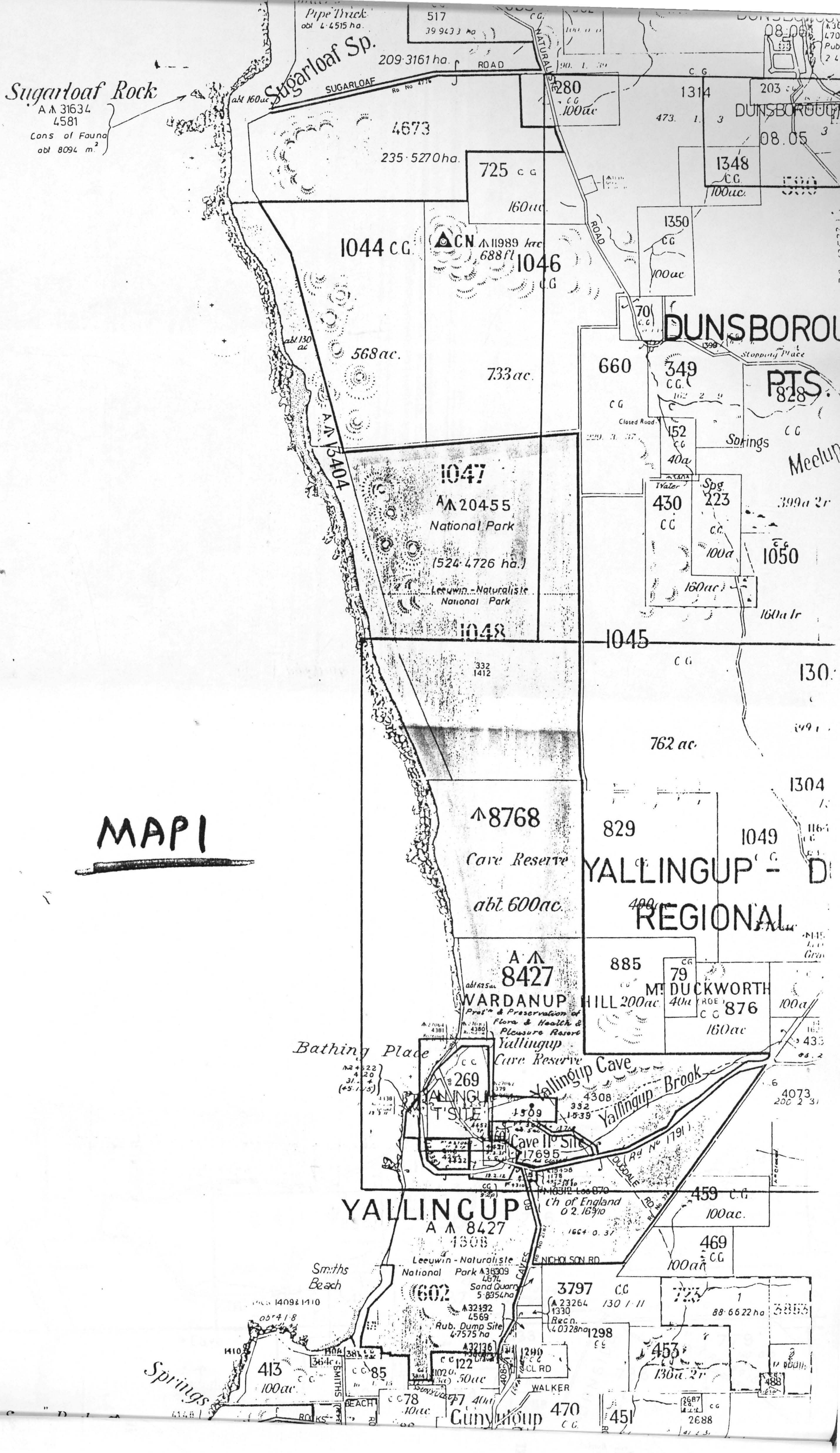
SHRUBS (B

HERBS

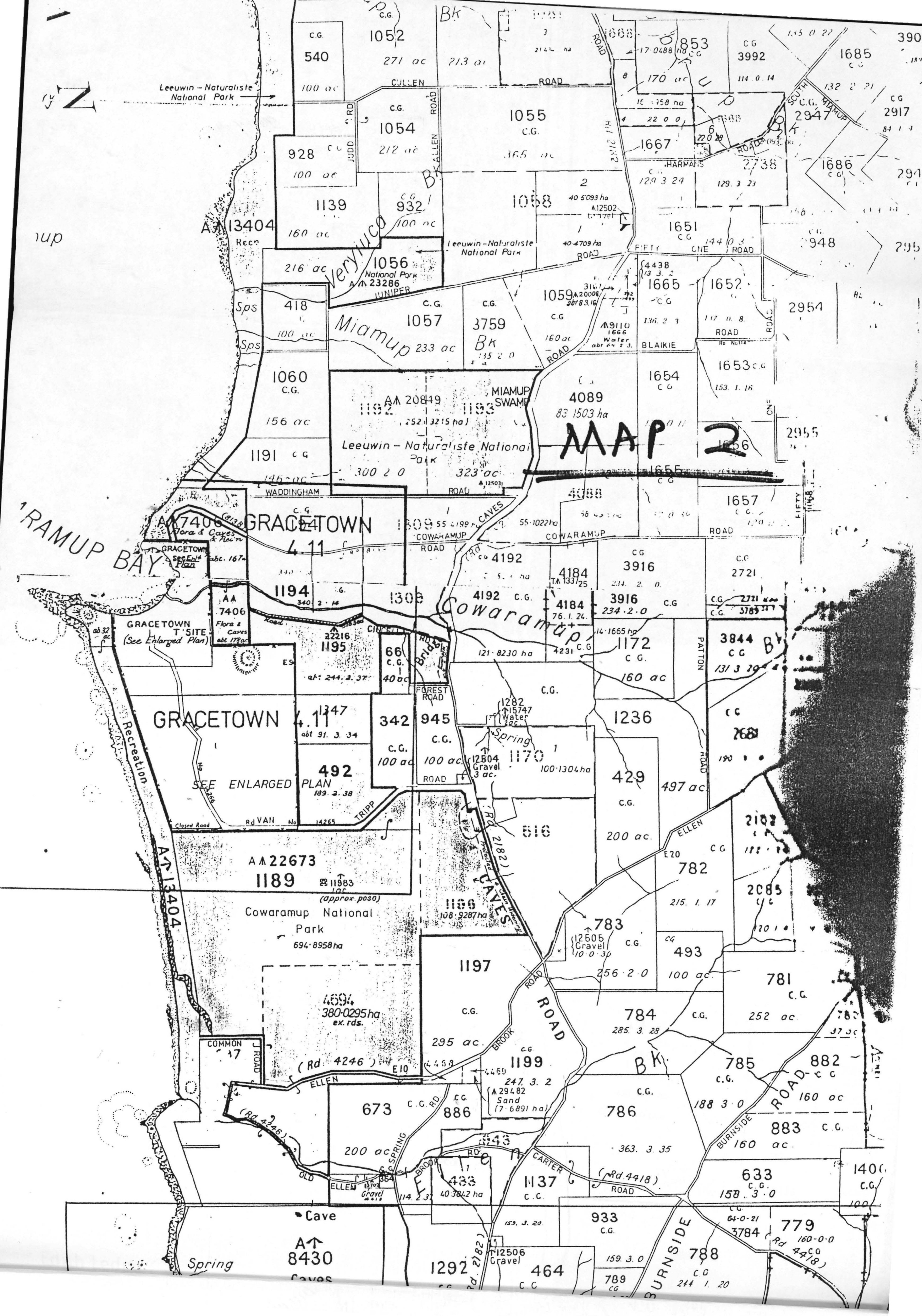
HUMMOCK

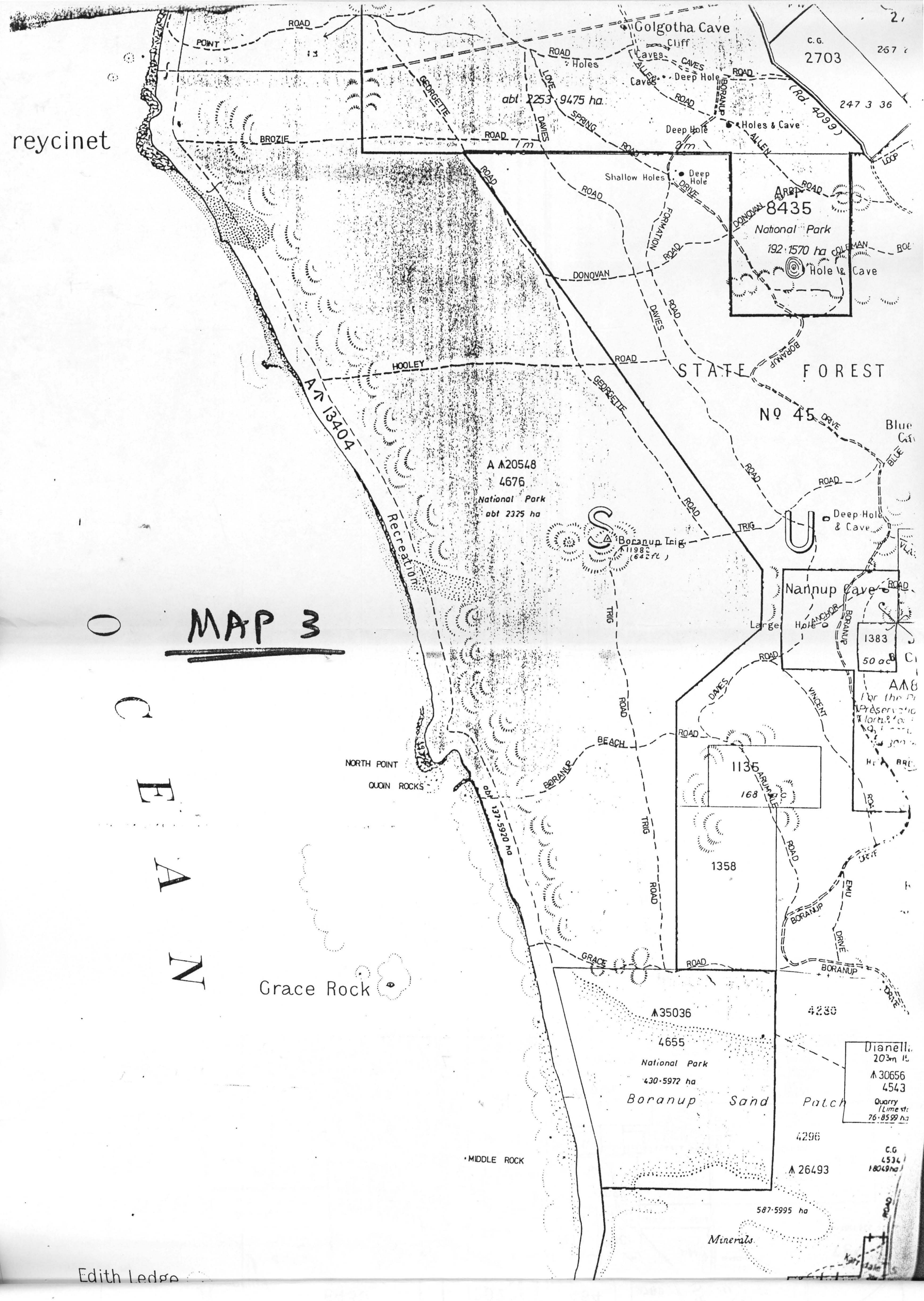
BARREN

CLEARED


Sugarloaf Rock
A ⩚ 31634
4581
Cons of Fauna
abt 8094 m²
Pipe Track
abt 4.4515 ha.
517
39.9433 ha
Sugarloaf Sp.
abt 160ac
209·3161 ha.
ROAD
SUGARLOAF
Rd No 4776
NATURALISTE
280
CG
100ac
1314
473. 1. 3
203
DUNSBOROUGH
08.05
1348
CG
100ac.
4673
235·5270 ha.
725 CG
160ac.
1350
CG
100ac
1044 CG
CN ⩚ 11989
688 ft
1046
CG
ROAD
70
CG
DUNSBOROUGH
PTS.
1398
Stopping Place
abt 130 ac
568 ac.
733 ac.
660
CG
349
CG
828
Closed Road
152
CG
40a
Springs
CG
Meelup
A ⩚ 13404
1047
A ⩚ 20455
National Park
(524·4726 ha.)
Leeuwin-Naturaliste
National Park
1048
Water
430
CC
Spg
223
CG
100a
399a 2r
1050
160ac
160a 1r
1045
CG
332
1412
130
762 ac.
1304
⩚ 8768
Care Reserve
abt 600ac.
829
1049
YALLINGUP - D
400ac
REGIONAL
A ⩚
8427
abt 625ac
WARDANUP HILL
Prot'n & Preservation of
Flora & Health &
Pleasure Resort
Yallingup
Care Reserve
885
200ac
79
CG
40a
Mt DUCKWORTH
ROE
876
CG
160ac
100a
433
Bathing Place
269
CC
YALLINGUP T'SITE
1509
Yallingup Cave
4308
332
1539
Yallingup Brook
4073
Cave Il° Site
17695
Rd No 1791
DUGDALE RD
Rd No 37
Ch of England
459 CG
100ac.
YALLINGUP
A ⩚ 8427
4308
Leeuwin-Naturaliste
National Park ⩚ 36309
4674
Sand Quarry
5·8354 ha
CAVES RD
Rd No 2182
NICHOLSON RD
1664 0. 37
469
CG
100ac
Smiths
Beach
602
⩚ 32192
4569
Rub. Dump Site
4·7575 ha
⩚ 32136
3797
CG
130 1·11
⩚ 23264
1330
Recn.
40328 ha
1298
723
1
88·6622 ha
1410
413
100ac.
CC
SMITHS
BEACH
ROCKS
85
122
50ac
CL RD
WALKER
453
130a. 2r
488
78
10ac
77
40a
Gunyulgup
470
CG
451
2687
2688
Springs

MAP I


MAP 2
Leeuwin - Naturaliste National Park
C.G. 540 100 ac
1052 271 ac
213 ac
CULLEN ROAD
JUDD RD
ALLEN ROAD
C.G. 1054 212 ac
1055 C.G. 365 ac
928 100 ac
1139 160 ac
C.G 932 100 ac
1058
2 40.5093 ha
1 40.4709 ha
A 13404 Recn
216 ac
Veryiuca
1056 National Park A 23286
JUNIPER
Leeuwin-Naturaliste National Park
ROAD
Rd 2182
1668
853 C.G
17.0488 ha
170 ac
C G 3992 114.0.14
1685
132 2 21
SOUTH
C.G. 2947
MIAMUP
2917
1667
HARMANS ROAD
2738 129. 3 23
129.3 24
1686
1651 C.G 144 0 3
FIFTY ONE ROAD
2948
418 100 ac
Sps
Miamup
C.G. 1057 233 ac
C.G. 3759 Bk 135 2 0
1059 C.G 160 ac
A 20008
A 9110 1666 Water
4438 13 3. 2
1665 C.G 136. 2 3
1652 117 0. 8.
BLAIKIE ROAD
2954
1653 c.c 153. 1. 16
1060 C.G. 156 ac
A 20849
1192
1193
MIAMUP SWAMP
252 3215 ha
Leeuwin - Naturaliste National Park
300 2 0
323 ac
4089 83 1503 ha
1654 C G
2955
1656
1655 C G
1191 C G 146 ac
WADDINGHAM ROAD
4088
1657
FIFTY ONE
A 7406 Flora & Caves & Recn
GRACETOWN 4.11
1809 55.4199 ha
55.1022ha
CAVES
COWARAMUP ROAD
RAMUP BAY
GRACETOWN See Enl'd Plan
4192
4184 TA 13325
3916 234. 2. 0.
C.G 2721
1194 340 2 14
1308
4192 C.G.
4184 76. 1. 24.
3916 234.2.0
2721
3789
Cowaramup
A 7406 Flora & Caves abt 178ac
GRACETOWN T'SITE (See Enlarged Plan)
ab 32 ac
22216 1195 abt 244. 2. 37
CINCELLI RD
66 C.G. 40 ac
Bridge
121.8230 ha
4231
14.1665 ha
1172 C.G. 160 ac
3844 C G 131 3 29
PATTON ROAD
FOREST ROAD
C.G.
1282 15747 Water 2ac
1236
GRACETOWN 4.11
1347 abt 91. 3. 34
342 C.G. 100 ac
945 C.G. 100 ac.
Spring
12504 Gravel 3 ac.
1170 100.1304ha
429 C.G. 200 ac.
497 ac
Recreation
SEE ENLARGED PLAN
492 189. 2. 38
TRIPP
Closed Road
Rd VAN No 14265
516
ELLEN
E20
782 215. 1. 17
2085
A 22673 1189
11983 1ac (approx. posn)
A 13404
1166 108.9287 ha
CAVES
Rd 2182
Cowaramup National Park 694.8958 ha
783
12505 Gravel 10 0 30
256 2 0
493 100 ac
781 C.G 252 ac
1197 C.G. 295 ac.
4694 380.0295 ha ex. rds.
ROAD
784 285. 3. 28
BK
785 C.G. 188 3 0
882 160 ac
COMMON
ROAD
(Rd 4246)
E10
ELLEN
BROOK
1199 247. 3. 2
A 29482 Sand (7.6891 ha)
786 C.G. 363. 3. 35
BURNSIDE ROAD
883 C.G. 160 ac
673 200 ac
C.G. RD
886
SPRING
(Rd 4246)
OLD ELLEN
Gravel
114. 2. 37
BROOK RD
483 40.3842 ha
1137 C.C.
CARTER ROAD
(Rd 4418)
633 C.G. 158. 3. 0
1400 C.G. 100
Cave
A 8430 Caves
Spring
1292
Rd 2182
12506 Gravel
464 C.C
159. 3. 20.
933 C.G.
159. 3. 0
789
BURNSIDE
788 C.G 244 1. 20
64-0-21 3784
779 160-0-0
Rd 4418



MAP 3
reycinet
OCEAN
Golgotha Cave
Cliff
Caves
Holes
Deep Hole
Holes & Cave
Deep Hole
Shallow Holes
Deep Hole
C.G.
2703
247 3 36
(Rd. 4099)
abt 2253·9475 ha
POINT ROAD
BROZIE ROAD
GEORGETTE ROAD
LOVE
DAVIES
SPRING ROAD
CAVES ROAD
ALLEN ROAD
BORANUP
FORMATION ROAD
DONOVAN
DRIVE
LOOP
COLEMAN
8435
National Park
192·1570 ha
Hole & Cave
STATE FOREST
Nº 45
BORANUP DRIVE
Blue
BLUE
HOOLEY ROAD
A ∧ 13404
Recreation
A ∧20548
4676
National Park
abt 2325 ha
Boranup Trig
∧11982
(642ft)
TRIG ROAD
Deep Hole
& Cave
Nannup Cave
Large Hole
ANCHOR
BORANUP
1383
50 ac
For the
Preservation
DAVIES ROAD
VINCENT
BEACH ROAD
BORANUP
NORTH POINT
QUOIN ROCKS
abt 137·5920 ha
1135
ARUMVALE
168
1358
EMU
DRIVE
BORANUP
GRACE ROAD
BORANUP DRIVE
Grace Rock
∧35036
4655
National Park
430·5972 ha
Boranup Sand Patch
4230
Dianella
203m
∧30656
4543
Quarry
(Limestone)
76·8599 ha
4296
C.G
4534
∧26493
•MIDDLE ROCK
587·5995 ha
Minerals
ROAD
Edith Ledge

MAP 4

HARDY INLET

AUGUSTA

AUGUSTA REGIONAL

Pt Trafalgar & Recreation

Thomas Isd Park Lands

WEST BAY

Irwin

Lion Islds

Timber

Pt Ellis

Augusta Siding

SEINE BAY

COVERAGE 1:2000

Pt Fred

Dukes Hd

Flinders Siding

Redman

Barrack Pt

Pt Matthew

Lighthouse

Cape Leeuwin

GREEN HILL

Leeuwin National Park

SKIPPY ROCK

QUARRY BAY

JANE RD

HARRIS RD

MATHEWS RD.

LUKES RD

DIANA ROAD

HILLVIEW ROAD

GREEN HILL ROAD

LEEUWIN ROAD

SKIPPY ROCK ROAD

RINGBOLT BAY

JELLY GROPER BAY

SARGE BAY

DEEP REEF

"Seal Island Nature Reserve"

Seal I

AM 25645

Cons. of Fauna

F. MOORE RIVER NATIONAL PARK

1. Proposed boundary

1.1 Entire Park (Map 11).

2. Reasons for selection

2.1 Moore River National Park is the best preserved area of Bassendean Complex vegetation on the Swan Coastal Plain. It also contains an area of Coonambidgee complex on its western side. This scarce vegetation type is not represented elsewhere in reserves.

2.2 Although Phytophthora has never actually been isolated from the Park the death of Banksia species along tracks strongly suggest its presence.

2.3 Illegal picking of wildflowers, particularly Verticordia nitens (Morrison) is considered to be a major cause of the spread of dieback disease. It is believed that quarantine procedures are sufficiently well understood by the public that quarantining this area may reduce illegal activities and consequently the spread of the disease.

3. Action to be taken.

3.1 Installation of signs as finances permit. Signs to read "Walkers Welcome. Dieback disease quarantine area. No unauthorised vehicles".

G. SCOTT RIVER NATIONAL PARK

1. Proposed dieback quarantine area.

   1.1 All park south of Scott River (Map 12).

2. Reasons for selection of area concerned.

   2.1 The largest consolidated portion of the Park.
   2.2 Definable by boundaries recognised on the ground.
   2.3 Believed to be relatively clear of dieback disease.

   2.4 Contains extensive swamp systems and several other vegetation types. The area is the main locality for several rare or scientifically important plant species.
   2.5 Has limited public access due to swampy nature although passable in summer. Wet conditions make the possibility of dieback disease a real threat to the rare plants.

3. Action required to enhance protection.

   3.1 Awareness by National Parks Authority staff, the local Shire and other interested parties to ensure that tracked vehicles are not used in the park without washdown precautions.
   3.2 Progressive installation of signs on major accessways to indicate "Walkers Welcome, Dieback protection area, no unauthorised vehicles".

H. STIRLING RANGE NATIONAL PARK

1. Proposed boundary for dieback quarantine.

1.1 West block. Along the internal fireline, along the northern boundary, south down Mabinup Track to STirling Range Drive then west to Twins Track, along Twins Track to its junction with Yetemerup Track then westwards to the junction with Talyuberlup Track. Thence south to North Henton Track then west to Stirling Range Drive. West along the north side of Stirling Range Drive to Marri Track then north to Red Gum Pass road, the south west on the north west side of Red Gum Pass Road to Hume Track, thence north to Madyerip Track, west to Donelly Track then south to Red Gum Pass Road. It then picks up again at the junction of Red Gum Pass Road and Pillenorup Track where it continues east on the south side of Pilenorup Track to the southern extension of South Talyuberlup Track thence south to the southern buffer fireline. The western and southern edges are the innermost fireline of the boundary buffer zone (Map 13).

1.2 East Block. From the south internal bufferstrip fireline on the south boundary northwards along Yungermere Track, then east along East Pillenorup Track to South Bluff Track, then east along Ellen Track, down No. 1 Access Track to the boundary. Then follows the eastern and southern boundaries right on the park boundary (Map 13).

2. Reasons for selection of area concerned.

2.1 Definable on the ground by park boundaries and recognised management tracks.

2.2 The area is believed to be relatively free of dieback in that it is:

(a) away from sources of infection such as existing roads and facilities.
(b) the firelines are rarely used except for park patrols and fire management.
(c) the known infections are all located outside the proposed quarantine areas.

2.3 The only sources of spread arise from foot traffic in the hills. As a general rule there are no watercourses feeding from known infections or areas of potential infections into the proposed quarantine area.

2.4 As the Gazetted Rare plants and other interesting plants, of the Range occur mostly on the hill tops, dieback will only spread into them by foot traffic which cannot be regulated or controlled.

2.5 The rare plants which occur on lowland (susceptible) areas are protected by the eastern block. The only source of infection is from vehicle access or runoff from the hills.

3. Action required to enhance protection.

3.1 Maintain existing "No Road" signs on access tracks to discourage vehicle use by the public. Install additional signs at Quarry Track, Madyerip Track, Toolyelup Track and Kojaneerup spring Track.

3.2 Be aware of the priority being given to these areas and be careful not to undertake earthworks, development or any other activity in the defined region without a full understanding of the consequences.

I. YANCHEP NATIONAL PARK

1. Proposed boundary

1.1 All that portion of the park east of Wanneroo/Lancelin Road and southwards from the north boundary to Old Yanchep Road.

1.2 As shown on map west, north and east of the track which circumnavigates the Loch including Water Reserve 7953 (Map 14).

2. Reasons for selection of area concerned.

2.1 The sandy, well drained nature of much of the soils in the quarantine area are not condusive to spread of the disease and infection are likely to be localised and initiated from machinery.

2.2 Lower contour levels moister and therefore likely to contain the disease. Thus movement from this area uphill into quarantine area should be avoided.

2.3 Area 7953 contains interesting floral associations which require special consideration.

2.4 Limited public access - most of that which does occur is around the edge of the lake.

3. Action to be taken.

3.1 Signs be installed at strategic locations. These to read "Walkers Welcome. Dieback disease quarantine area. No unauthorised vehicles."

3.2 Training in the biology of the disease and quarantine measures to be provided for all staff.