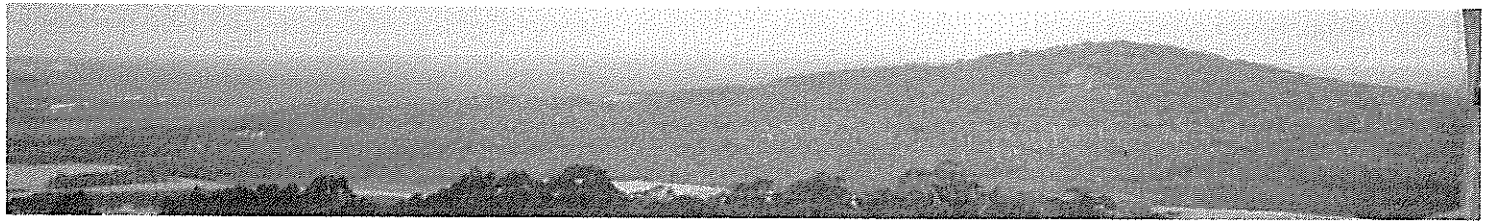
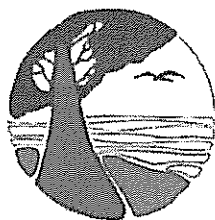


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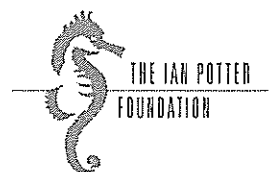


A Project of the



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The Mount Hallowell Survey and Research Project

*This Project of the Denmark Environment Centre Inc was made possible by a grant from
The Ian Potter Foundation.*

1. Summary

The Mt Hallowell Reserve is one of the last remaining long-unburnt areas in the South West. The biodiversity contained within its borders is not only of irreplaceable scientific knowledge, but is also a valued part of the Denmark community. The Denmark Environment Centre's (DEC's) Mt Hallowell Reserve Survey and Research Project has identified several significant threats to the integrity of the Reserve and has proposed the steps necessary to maintain the Reserve sustainably into the future.

Threats to the Reserve

The DEC survey indicated several key threats to the biodiversity of the Reserve. These include:

- Significant levels of introduced predatory feral animals, weeds and die back.
- A limited ability for new native species to establish themselves in the Reserve.
- A diminishing area (the core) within the Reserve which is not affected by feral animals, weeds and dieback. The diminishing area limits the number of species which can be sustained within the Reserve.

If these threats are to be limited the DEC recommends:

1. That domestic animals be restricted from accessing the Reserve via uncontrolled fire breaks, the Sheila Hill Memorial Track, the Monkey Rock Lookout, and the Bibbulmun Track and that appropriate signage and enforcement be put in place.
2. That the fire access track on the north side of the reserve be designated a mandatory leash area for dogs and appropriate signage and enforcement be put in place.
3. That a regular 1080 baiting program be implemented to control predatory feral animals in both the core and non-core areas of the Reserve.
4. That public information displays, highlighting the conservation value and importance of the Reserve, be erected at the Sheila Hill Memorial Walk and Monkey Rock car parks.
5. That the weeds noted in the survey be controlled.
6. That non-designated tracks and walk trails be closed and rehabilitated.

Creating a Sustainable Future for the Reserve

As population and development surrounding the Reserve continues to increase, the pressure on the biodiversity within the Reserve will rise correspondingly.

If these pressures are to be managed and the biodiversity within the Reserve protected, the DEC recommends:

7. That weed mapping take place and a weed control program be developed.
8. That no further development or property subdivision take place on land bordering the reserve.

2. Introduction

This project of the Denmark Environment Centre Inc (DEC) was made possible through the generous support of The Ian Potter Foundation.

The Mt Hallowell Reserve is located approximately 5 km south-west of the Denmark townsite in Shire of Denmark, Western Australia. The 536ha Reserve consists of virgin (unlogged) old growth forest and has long been regarded as an area of high biodiversity in a region regarded as one of the 25 biodiversity hotspots on the planet (Myers et al 2000). The Shire of Denmark has vesting of the reserve and adopted a management plan in 1995 highlighting as its priority, the management of the reserve for its conservation values (Shire of Denmark 1995). Apart from its high biodiversity and conservation values, the Reserve serves as a key benchmark for fire management research due to it being one of the few remaining long unburnt areas in the South West that remains a 'no planned burn area' (Christensen and Abbott 1989).

Due to the encroaching development around (and sometimes in) the reserve, the DEC identified the need to provide detailed information on what is happening to the Reserve and highlight why the Reserve is an invaluable part of the South West region. The Ian Potter Foundation funded Mt Hallowell Survey has provided the first step in supplying this information. This survey will provide important information for the Shire of Denmark on which to base the 2005 Shire of Denmark Mt Hallowell Management Plan.

3. Background

The Mount Hallowell Reserve was originally gazetted as a timber reserve in 1913 and then as a Timber and National Park Reserve in 1927. Fire swept through the area in 1937 (the last reported burn on the majority of the Reserve), making it today one of the longest unburnt areas in the south west. The middle of the century saw the encroachment of residential dwelling and land clearing in and around the reserve (Map 5 Appendix 4). Large portions of land were excised from the area to the south and to the north east. This populating of the area also brought with it the opening of many previously inaccessible areas and the increased impact of introduced flora and fauna species to the Reserve. The 1980s & 1990s saw the Reserve take on a further significant role in the Denmark community with the Sheila Hill Memorial Track, upgraded access to Monkey Rock lookout and the extension of the Perth to Albany Bibbulmun Track, providing recreational resources and attractions to draw tourists to the region. This period also saw further population growth on the boundaries of the reserve, leading to a controlled burn on the north side of the Reserve in 1986.

A Management Plan was produced in 1995 by the Shire of Denmark and has listed as its management priority the conservation value of the park, and highlighted the many species of flora and fauna present. The Shire of Denmark nominated the reserve for inclusion on the Register of the National Estate and in 2002 the Reserve was placed on the National Estate database as an important 'Indicative Natural Place' (Appendix 3).

5. Mt Hallowell Reserve Vegetation Report

5.1 Background

A Mt Hallowell Reserve Management Plan was produced by the Shire of Denmark in November 1995. That management plan indicated a broad deliniation of the predominant vegetation types: Jarrah/Marri on the lower slopes below 60 metre contour and Karri/Yate above the 60 metre contour. A flora list was compiled by Brenda Hammersley and the Denmark Naturalists' Group.

The strategies developed in the 1995 Management plan included the rehabilitation of the old sand pits and tracks, preparation of flora and fauna data base, protecting and maintaining viable populations of existing flora and fauna species and prevention of further introductions of plant pathogens (*Phytophthora* sp).

The present work aims to gather more detailed flora information. The need for more detailed flora work was identified in the 1995 plan. It is hoped that the information in this report will assist in the revision and updating of the management plan.

5.2 Methodology

Prior to field visits detailed maps were produced using aerial photography and cadastral information. These prepared base maps delineated apparently different vegetation types. Eight field trips were undertaken to establish the veracity of the desktop work. During these field trips, vegetation types, and boundaries between vegetation types, were identified on the ground. Subtle ecotones (boundaries between vegetation types that in some cases were fifty meters or more wide) were not considered as separate vegetation types. Classification of vegetation types has potential to become unnecessarily complex. For clarity and simplicity in this survey, the possibility that a vegetation classification would result in different management options was a deciding factor in sub-division of a vegetation type.

The flora list attached was developed from the original list of flora presented in the 1995 Management Plan Report. Brenda Hamersley undertook this work, and added many species to the original list. The key(indicative) flora of the different vegetation types have been listed below in the body of the report.

Each flora type was photographed during the survey and many of these photographs are presented on the CD attached as an appendix to this report.

- Increased walkers/dogs on the northern track/access
- Increased disturbance and access in Dieback (*Phytophthora* sp) susceptible areas
- Increased perceived need for fire security by adjoining landowners
- A reduction in undisturbed corridors joining the Reserve and the coastal vegetation

All the above factors are the result of management decisions, local planning decisions, and the pressure that people inevitably exert on their surrounding environment. Historically decisions have been made incrementally and the combined effect may not have been fully assessed. Holding the ecological integrity of the Hallowell Reserve at present levels will require careful consideration when planning surrounding land use, fire breaks, access tracks, and tourist facilities. The previously, sometimes long term, undeveloped surrounding sub-divisions are now increasingly places of residence.

5.5 Vegetation Types

The vegetation types identified during the survey are listed below with a short description and list of indicative species. The division of vegetation into structural types and sub-types was achieved under the following categories. The number in brackets indicates the number of areas in that category.

Tall Forest (Forest > 20 mtrs tall)(8)

- Pure Karri (2)
- Karri/Marri (3)
- Jarrah/Marri/Karri (2)
- Jarrah/Marri

Medium Forest(Forest between 10 mtrs & 20 mtrs tall) (5)

- Jarrah/Marri (3)
- Karri/Marri (2)

Medium/Low forest(Forest between 5 & 10 mtrs tall) (5)

- Jarrah/Marri (2)
- Allocasuarina/Jarrah (3)

Low Forest(< 5 mtrs) (4)

- Allocasuarina/Jarrah (2)
- Allocasuarina/Banksia (2)

Woodland (As for Low Forest but < 30 % tree cover)(4)

- Allocasuarina (2)
- Jarrah (1)
- Jarrah/Marri/Banksia (1)

Shrubland (< 5% tree cover) (9)

- Agonis/Beaufortia (3)
- Agonis/Astartea (2)
- Agonis/Callistemon (1)
- Agonis/Jarrah/Marri (1)
- Agonis/Kunzea (1)
- Agonis/Xanthorrhoea (1)

Sedgeland (1)

Medium Forest

Jarrah/Marri - these medium forests occupy the gravelly soils above the sands and winter wet flats. The understory is interesting and varied. *Allocasuarina fraseriana* and *Banksia grandis* are a typical lower canopy in this plant community type. Also:-

Acacia myrtifolia
Acacia pentadenia
Agonis parviceps
Agonis theiformis
Anarthria prolifera

Hakea amplexicaulis
Macrozamia riedlei
Mesomelaena tetragona
Thomasia integrifolia
Xanthorrhoea preissii

Woodland

Jarrah – the Jarrah woodlands existed as moderately thick stands and as sparse woodland with sedge and *Agonis* understory. Where Jarrah is less than 5% of the total canopy, this report considered the vegetation type as a shrubland with scattered tree occurrence.

Acacia myrtifolia
Agonis parviceps
Banksia ilicifolia

Corymbia calophylla
Eucalyptus marginata
Lepidosperma sp.

Jarrah/Marri – often existing adjacent to the Jarrah/Marri forest types these woodlands indicated the change from gravel soils to poorer sandy soils.

Acacia pentadenia
Adenanthos cuneatus
Agonis parviceps
Agonis theiformis

Allocasuarina fraseriana
Astartea sp.(aff. fascicularis)
Banksia grandis
Johnsonia lupulina

Sheoak/Banksia – these woodlands existed on the nutrient poor sandy soils. The tree species are all dieback susceptible and are found within these moist sandy flats where dieback incursions are the most common.

Allocasuarina fraseriana
Banksia grandis

Banksia ilicifolia
Banksia quercifolia

Hypocalymma strictum

Sheoak/Jarrah - sedge and rush sp. are dominant understory in these areas of woodland. Other species include:-

Acacia myrtifolia
Agonis parviceps
Dasypogon bromeliifolius

Persoonia longifolia
Xanthorrhoea preissii

These soil conditions and micro-climates differ from one outcrop to another and result in unique floral associations. *Agonis marginata* is present on many outcrops but absent on others. *Stypandra glauca* is similarly common but not omnipresent on the granite outcrops. Surrounding Yate (*Eucalyptus cornuta*) trees are a feature of the granite summit and some other outcrops, but absent from others where *Agonis flexuosa* or *Allocasuarina decussata* is a dominant fringing component of the vegetation.

The smaller outcrops have a less significant effect on the surrounding vegetation composition which reflects soil type and landscape position. These outcrops are predominantly in the areas designated in this report as Karri and Karri/Marri Tall Forest areas. Species commonly associated with the granite Monadnocks are:-

<i>Agonis flexuosa</i>	<i>Bossiaea linophylla</i>	<i>Hibbertia furfuraceae</i>
<i>Agonis linophylla</i>	<i>Eucalyptus calophylla</i>	<i>Lepidosperma</i> sp.
<i>Agonis marginata</i>	<i>Eucalyptus cornuta</i>	<i>Leucopogon revolutus</i>
<i>Agonis parviceps</i>	<i>Eucalyptus diversicolor</i>	<i>Stypandra glauca</i>
<i>Allocasuarina decussata</i>	<i>Eucalyptus megacarpa</i>	
<i>Andersonia sprengelioides</i>	<i>Eutaxia obovata</i>	

Monkey Rock and surrounds:-

<i>Agonis flexuosa</i>	<i>Eucalyptus diversicolor</i>
<i>Bossiaea linophylla</i>	<i>Lepidosperma</i> sp.
<i>Eucalyptus cornuta</i>	<i>Leucopogon revolutus</i>

Mount Hallowell (Kooryunderup) and surrounds :-

<i>Agonis flexuosa</i>	<i>Eucalyptus cornuta</i>
<i>Agonis linearifolia</i>	<i>Eucalyptus marginata</i>
<i>Agonis marginata</i>	<i>Eutaxia obovata</i>
<i>Agonis parviceps</i>	<i>Lepidosperma</i> sp.
<i>Allocasuarina decussata</i>	<i>Leucopogon revolutus</i>
<i>Bossiaea linophylla</i>	<i>Stypandra glauca</i>
<i>Eucalyptus calophylla</i>	

The area of vegetation around Kooryunderup that is influenced by the outcrop is the largest compared to any other granite outcrop visited during the survey.

5.6 Mt Hallowell Reserve Flora List

FERNS *(Polypodiaceae, Cheilanthes, Dennstaedtiaceae, Lindsaeaceae, Aspleniaceae)*

ADIANTACEAE

Cheilanthes austrotenuifolia

DENNSTAEDTIACEAE

Pteridium esculentum

LINDSAEACEAE

Lindsaea linearis

ASPLENIACEAE

Asplenium aethiopicum – **Priority 4**

GYMNOSPERMS *(Podocarpaceae)*

ZAMIACEAE

Macrozamia riedlei

PODOCARPACEAE

Podocarpus drouynianus

MONOCOTYLEDONS *(Cyperaceae, Restionaceae, Dasypogonaceae, Xanthorrhoeaceae, Phormiaceae)*

CYPERACEAE

Evandra aristata

Lepidosperma angustatum

Lepidosperma effusum

Lepidosperma gladiatum

Mesomelaena tetragona

RESTIONACEAE

Anarthria prolifera

Anarthria scabra

Desmocladius fasciculatus

Desmocladius flexuosus

Leptocarpus elegans

Leptocarpus tenax

Lepyrodia extensa

Stenotalis ramosissima

DASYPOGONACEAE

Dasypogon bromeliifolius

Lomandra nigricans

Lomandra pauciflora

Lomandra sericea

XANTHORRHOEACEAE

Xanthorrhoea gracilis

Xanthorrhoea preissii

PHORMIACEAE

Stypandra glauca

DICOTYLEDONS

APIACEAE

Actinotus glomeratus
Actinotus omnifertilis
Hydrocotyle alata
Pentapeltis silvatica
Platysace filiformis

ASTERACEAE

Euchiton collinus
Olearia muricata
Ozomanthus ramosus

CASUARINACEAE

Allocasuarina decussata
Allocasuarina fraseriana

CRASSULACEAE

Crassula decumbens

DILLENiaceae

Hibbertia amplexicaulis
Hibbertia cuneiformis
Hibbertia cunninghamii
Hibbertia furfuraceae
Hibbertia pilosa

DROSERACEAE

Drosera erythrorhyza
Drosera glanduligera
Drosera macrantha
Drosera microphylla

EUPHORBIACEAE

Amperea simulans
Poranthera huegelii
Ricinocarpus glaucus

GERANIACEAE

Pelargonium australe
Pelargonium littorale subsp.littorale

GOODENIACEAE

Dampiera alata
Dampiera diversifolia
Dampiera hederaceae
Dampiera linearis
Goodenia eatoniana
Goodenia sp.Sth.Coast (A.R. Annells 1846) Priority 3
Scaevola microphylla
Scaevola striata
Velleia macrophylla

HALAGORACEAE

Gonocarpus benthamii

MONOCOTYLEDONS

Platysace pendula
Trachymene grandis
Xanthosia huegelii
Xanthosia rotundifolia

Drosera pulchella

EPACRIDACEAE

Andersonia caerulea
Andersonia caerulea
subsp.diminuta
Andersonia sprengelioides
Astroloma baxteri
Leucopogon alterifolius
Leucopogon capitellatus
Leucopogon distans
Leucopogon glabellus
Leucopogon oxycedrus
Leucopogon parviflorus
Leucopogon propinquus
Leucopogon revolutus
[L.obovatus]
Leucopogon unilateralis
Leucopogon verticillatus
Monotoca tamariscina
Sphenotoma gracile

Hovea chorizemifolia
Hovea elliptica
Hovea trisperma
Jacksonia horrida
Kennedia coccinea
Mirbelia dilatata var. *meissneri*

Pultenaea reticulata
Sphaerolobium alatum
Sphaerolobium grandiflorum
Sphaerolobium medium
Sphaerolobium vimineum

PITTOSPORACEAE

Billardiera floribunda
Billardiera variifolia
Sollya heterophylla

POLYGALACEAE

Comesperma virgatum
Comesperma volubile

PROTEACEAE

Adenanthos cuneatus
Adenanthos obovatus
Banksia grandis
Banksia ilicifolia
Banksia littoralis
Banksia quercifolia
Dryandra nivea
Dryandra serra – **Priority 4**
Grevillea quercifolia
Grevillea trifida
Hakea amplexicaulis

Hakea linearis
Hakea ruscifolia
Hakea varia
Isopogon longifolius
Isopogon sphaerocephalus
Persoonia elliptica
Persoonia longifolia
Petrophile diversifolia
Petrophile longifolia
var. *longifolia*

RANUNCULACEAE

Clematis pubescens

RHAMNACEAE

Trymalium floribundum
Trymalium ledifolium var. *rosmarinifolium*
Trymalium venustum

RUBIACEAE

Opercularia hispidula
Opercularia volubilis

RUTACEAE

Boronia alata
Boronia crenulata
Boronia gracilipes
Boronia molloyae
Boronia spathulata
Boronia stricta
Chorilaena quercifolia
Crowea angustifolia var. *platyphylla*

SANTALACEAE

Choretrum lateriflorum
Leptomeria scrobiculata
Leptomeria squarrulosa

SOLANACEAE

Anthocercis sylvicola – **Priority 2**

THYMELAEACEAE

- Pimelea clavata*
- Pimelea hispida*
- Pimelea spectabilis*

TREMANDRACEAE

- Platytheca juniperina*
- Tetratheca affinis*
- Tetratheca setigera*
- Tremandra stelligera*

VIOLACEAE

- Hybanthus debilissimus*

BRYOPHYTES - MOSSES

BRYACEAE

- Bryum caespiticium*
- Bryum dichotomum*
- Leptobryum pyriforme*
- Orthodontium lineare*
- Rosulabryum albolimbatum*
- Rosulabryum billardieri*
- Rosulabryum campylothecium*
- Rosulabryum torquescens*

DICRANACEAE

- Campylopus australis*
- Campylopus bicolor*
- Campylopus introflexus*
- Dicranoloma diaphanoneurum*

FISSIDENTACEAE

- Fissidens curvatus*
- Fissidens taylorii*
- Fissidens tenellus*

HEDWIGIACEAE

- Rhacocarpus purpurascens*

HYPNACEAE

- Hypnum cupressiforme*

LEUCOBRYACEAE

- Leucobryum subchlorophyllosum*

PLEUROPHASCACEAE

- Pleurophascum occidentale* – **Declared Rare Flora**

Likely to be downgraded to Priority 4 at the next review of CALM's Rare Flora List.

POTTIACEAE

- Barbula calycina*
- Didymodon subtorquatus*
- Gymnostomum calcareum*
- Tortula antarctica*
- Triquetrella papillata*
- Weissia controversa*

6. Mt Hallowell Reserve Small Mammal Survey

6.1 Background

Native fauna are an integral part of any Australian landscape. Gathering and analysing information on fauna in a given area provides a valuable snapshot of the health and vitality contained within. From December 2003 to January 2004, the Denmark Environment Centre Inc. (DEC) conducted an extensive, small mammal survey of the Mount Hallowell Reserve in Denmark WA to add to the knowledge of small mammals in the Reserve and to recommend strategies to maintain and enhance those populations.

The past study of small mammals in the Mt Hallowell Reserve has been limited to two published reports. The Mt Hallowell Reserve Management Plan (Shire of Denmark 1995) relied on unconfirmed sightings and/or scat observations of native and exotic mammals and can only give an indication of what might be present, but does not constitute scientific data (Appendix 1). The report also includes unconfirmed lists of birds and reptiles (Appendix 1) within the Reserve. The Results of Critical Weight Range Mammal Survey (Beck 1996) used cage trapping, ground searches and spotlighting, but was limited in duration and scope to areas adjacent to the Bibbulmun track.

The Shire of Denmark's Mt Hallowell Management Plan 1995, stipulates as a management goal "The Reserve is to be managed as a conservation priority area for the maintenance of all ecological processes and recognising that the reserve is a scientific reference site". The strategies developed to attain this goal include the preparation of a flora and fauna database and the protection and maintenance of viable populations of existing flora and fauna species, particularly those with special status. This project aims to provide information to support those goals and make recommendations that will maintain them in the future.

6.2 Methodology

6.2.1 Site selection

Hair tubing sites were determined by using aerial photographs with regions of different vegetations delineated. Hair tube site selection was then determined by having an equal representation of hair tube in each of the specified vegetation regions. Hair tubing sites were also selected on the basis of having an equal hair tube presence distributed throughout the Reserve. The individual tubes were placed, where possible, on animal runways and adjacent to animal furrows to increase animal contact. Hair tubing took place between December and February 2004.

6.2.2 Hair Tubing

Small mammal surveying of the Mt Hallowell Reserve was undertaken by using hair tubes. Hair tubing was the preferred method of sample collection as it:

- Has little or no impact on the mammals
- Has a high success rate per tube
- Is cost effective
- Enables personnel to carry large numbers of tubes into areas that have limited access

Table 6.1 Site Duties

Hair tubing trip	Site Duties
Trip 1	Place directional flagging tape, fill out hair tubing site form, record GPS coordinates, place flagging tape, set tube, place bait.
Trips 2 & 3	Set further tubes, change the tape in the tubes and collect samples. Each collected sample to be placed on A4 paper and covered in GLAD Baking Paper to preserve the sample. For each sample collected, the date of collection and the site ID number was recorded with the sample.
Trip 4	Collect samples, record information, removing the tubes and flagging tape.

6.2.3 Analysis of Hair Samples

The samples gathered from the hair tubes were analysed using the DEC's Hair Analysis Resource Centre (HARC). HARC allows for the magnification of the sample and the identification by the appearance and structure of each hair, the species of mammal it came from.

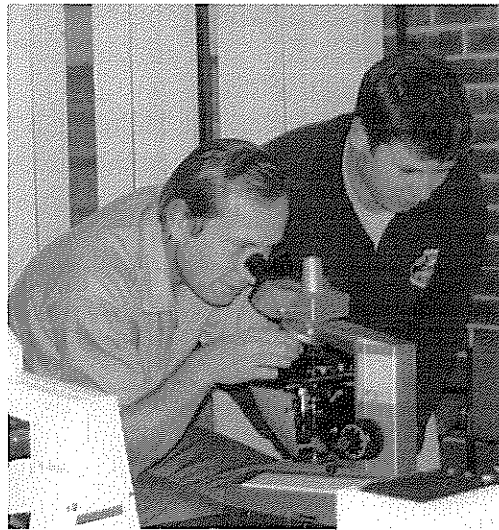


Fig 6.2 Volunteers receive hair analysis training at CALM Woodvale

The following is the typical procedure used when identifying a hair sample collected from a hair tube.

Whole Mount

A sample of hair is removed from the tape, using a solvent; the DEC used a readily available cleaning product called *Citro Clean*. The sample is then cleaned in methylated spirits to remove excess glue (if necessary) and placed in a paraffin solution on a glass slide. The samples are examined under an optical microscope in the whole mount, using 100x and 400x magnification, in order to observe the hair profile, the structure of the medulla and the pigment distribution.

6.3 Results

A total of 527 hair tubes were set with 537 samples collected during the survey. The results indicate 9 species of mammal positively being present in the survey area. Of these, 5 were native mammals and 4 were exotic animals (see Appendix 2 for full results).

Table 6.2 Hair Tubing Results

Species	Week 2	Week 3	Week 4	Total
Native Species				
Rattus Sp	2	1	6	9
Brush Tail Possum (<i>Trichosurus vulpecular</i>)	11	30	32	73
Bush Rat (<i>Rattus fuscipes</i>)	91	128	134	353
Mardo (<i>Antichinus flavipes</i>)	4	1	3	8
Southern Brown Bandicoot (<i>Isodon obesulus</i>)	11	12	12	35
Western Grey Kangaroo (<i>Macropus fuliginosus</i>)	1	0	2	3
Exotic Species				
Black Rat (<i>Rattus rattus</i>)	3	3	4	10
Dog (<i>Canine familiarus</i>)	11	10	9	30
Feral Cat (<i>Feline catus</i>)	5	5	3	13
House Mouse (<i>Mus musculus</i>)	1	2	0	3
Total Tubes Set	144	193	190	527
Samples Collected	140	192	205	537

6.3.1 Native Mammals

6.3.1.1 Brush Tail Possum (*Trichosurus vulpecular*)

A total of 73 brush tail possum samples were recorded in the survey area. The majority of recordings were in the central 'intact' portion of the reserve. The former range of this possum has been considerably reduced over the years and they have also disappeared from large areas of more arid country (Johnson & Thompson 1996). Introduced predators are one of the most significant impacts on this species (Beck 1996).

6.3.1.2 Bush Rat (*Rattus fuscipes*)

A total of 353 bush rat samples were positively identified. Samples were attained throughout the survey area and the results indicate a large population of this species. Bush rats, as do all native fauna, form an integral part of the forest ecosystem. Native fauna encourage the breakdown of fallen vegetation and add to the nutrient level of the soil, giving the soil greater capacity to hold micro-organisms and water.

6.3.1.3 Mardo (*Antichinus flavipes*)

A total of 8 mardo samples were recorded in the survey area. Like the brush tail possum locations recorded, the majority of mardos were in the central 'intact' area of the reserve. Mardos also prefer areas that are long unburnt (10 years or more) (Christensen and Kimber 1975). As the mardo is a carnivorous mammal and feeds largely on invertebrates on the forest floor (Sawle 1979) the presence of mardos is a good indication of a healthy understorey.

6.3.3 Mammals not likely to leave a hair sample

The following mammals indicated in the Mt Hallowell Management Plan (Shire of Denmark 1995) may be present, but would be unlikely to leave a hair sample.

Table 6.3 Mammals not likely to leave a hair sample

Species	Why hair sample would be unlikely
Echidna (<i>Tachyglossus aculeatus</i>)	Robust nature of hair and root
Dunnart (<i>Sminthopsis species</i>)	Fine nature of hair
Western Pygmy Possum (<i>Cercartetus concinnus</i>)	Fine nature of hair
Honey Possum (<i>Tarsipes rostratus</i>)	Fine nature of hair
Rabbit (<i>Oryctolagus cuniculus</i>)	Further research required
Western Brush Wallaby (<i>Macropus irma</i>)	Large size of macropod

Table 6.4 Mammals likely to be identified with hair tubes within 25km of the Mt Hallowell Reserve

Species	Study or Publication
Brush-tailed Phascogale (<i>Phascogale tapoatafa</i>)	Chuditch Monitoring Program (DEC 2002)
Chuditch (<i>Dasyurus geoffroyi</i>)	Chuditch Monitoring Program (DEC 2002)
Western Ring Tail Possum (<i>Pseudocheirus occidentalis</i>)	Chuditch Monitoring Program (DEC 2002)
Woylie (<i>Bettongia penicillata</i>)	Gilbert's Potoroo Survey (DEC 2003)
Quokka (<i>Setonix brachyurus</i>)	Gilbert's Potoroo Survey (DEC 2003)
Water Rat (<i>Hydromys chrysogaster</i>)	Mammals of the South West (Johnson & Thompson 1996)

Native fauna form an integral part of the forest ecosystem. Native fauna encourage the breakdown of fallen vegetation and add to the nutrient level of the soil, giving the soil greater capacity to hold micro-organisms and water. Unless the Mt Hallowell Reserve is effectively managed without delay, this crucial link in the forest cycle will continue to diminish as the core size of the Reserve is further reduced. This will impact not only on the Reserve but may have significant impact on the safety of our community as well.

7. Mt Hallowell Reserve Macrofungi Information

Katrina Syme RMB 1020 South Coast Hwy Denmark WA 6333 March 2004

7.1 Background

Fungi are globally the second most diverse group of organisms, behind arthropods. (Buchanan & May, 2003) They underpin all life yet they are among the least studied. The scant attention fungi have received in biodiversity studies is due in most cases to a lack of awareness amongst biologists of their significance in evolution, ecosystem function and human progress. The origin of land plants may not have been possible without fungi. In some cases, fungi may be 'keystone species' which if lost would lead to a major change in the ecosystem. Fungi have a major role as indicators of ecosystem health as monitors of the disturbance of the soil. (Hawksworth, 1990)

Fungi are ubiquitous, inhabiting terrestrial and aquatic ecosystems, including even marine environments, where they interact with plants, animals and insects. The greater number by far is microscopic; those which can be seen with the naked eye are referred to as the *macrofungi* or more commonly as *mushrooms*. Macrofungi produce fruiting bodies in a myriad colours, textures and shapes - such as corals, puffballs, earthstars, cup fungi, brackets and truffles. They are further divided into two broad groups - basidiomycetes (including gilled fungi such as mushrooms) and ascomycetes (including cup fungi such as morels), based on the way they produce spores.

Fungi in the environment

In their many roles, fungi contribute to ecosystem health and vitality. Fungi are crucial to the viability and stability of Australia's nutrient-poor soils.

Mycorrhizal fungi assist in nutrient uptake in plants. They are involved in a mutualistic relationship with more than 90% of plants, in which the hyphae of the fungus surrounds or invades the plant's fine roots, thus extending the root system and assisting uptake of nutrients. It is believed that in various ways, mycorrhizal fungi protect their plant partners from disease caused by pathogens.

As saprotrophs, fungi are nature's great recyclers, and are able to break down lignin and cellulose. Without them, the planet would be buried in organic matter.

Parasitic fungi play an important role in the environment too, but when the balance is altered they can cause major diseases in crops, being a natural consequence of growing plants in extensive pure stands or monocultures. (see Kendrick, 1992, p. 193). For example, the Australian endemic *Armillaria luteobubalina*, a gilled fungus, has caused widespread tree deaths in replanted logged karri forests in south-west Australia. Most pathogenic fungi are microscopic and have a limited host range, but their number does include macrofungi including certain species of bracket or shelf fungi which grow on trees.

In the macrofungi, the spore-bearing fruiting bodies may only appear sporadically; the bulk of the organism is concealed in the substrate as a vast network of fungal mycelium which, in ground-dwelling species, ramifies through and binds the soil. Research has shown that particular species may have been growing undisturbed for centuries and can cover many hectares.

- 2) From the small amount of fungi work conducted in the Reserve, two species have been identified which have not been collected elsewhere in the Shire:
 - a) *Leucopaxillus lilacinus* - a rare species of fungi found across southern Australia
 - b) *Amanita* sp. 'pink gills' - has only been found once, at the foot of the northern slope of Mount Hallowell. When described, this vouchered collection could prove to be the type for the species.
- 3) Mount Hallowell is close to the site of the type collection of the rare species
 - a) *Cortinarius phalarus*, the type collection of which is on private property on Minsterly Rd. Its status would be more secure within the Reserve, where it is likely to occur.
 - b) *Phaeocollybia graveolens*, which is only known from the Mt Shadforth Reserve.
- 4) Certain native animals, including the Southern Brown Bandicoot (*Isodon obesulus*) and the Bush Rat (*Rattus fuscipes*), depend on truffle-like and above-ground macrofungi as part of their diet. Most truffle-like fungi form mycorrhizal partnerships with plants, so a three-way symbiosis is formed in which the good health of all partners depends. Invertebrates also perform a vital role in spore dispersal.

7.4 Recommendations On The Management Of Mount Hallowell To Retain Its Fungal Diversity

With such a large area of the south coast region cleared for agriculture, it is important to preserve remnant vegetation to prevent more loss of biodiversity. Highly important repositories of biodiversity are found in remnant vegetation.

Management issue which need to be addressed are:

- 1) *Inappropriate fire regimes such as frequent prescribed pre-emptive burning on remnant patches*
 - a) *In a time of accelerating climate change, drying, and the risk of increased fire frequency and intensity, it is a matter of extreme urgency to document and monitor biological diversity in ecosystems such as the fire-prone relictual tall forests of south-western Australia and fragmented ecosystems in the agricultural and pastoral areas. Climate change will have enormous ramifications on co-dependent and co-evolved species (e.g. such as mycorrhizal associates in the plant kingdom and mammals which depend on them for food) throughout the region.*
 - b) *Mycorrhizal fungi primarily inhabit the litter and organic soil layer and are significantly affected by fire. Long-unburnt sites may have higher numbers of mycorrhizal roots than recently burnt or frequently burnt sites. Species diversity is comparable between long-unburnt and frequently burnt sites but species composition differs. Fire thus favours some fungal species but has a negative effect on others. Spatial and temporal separation of fires of differing intensity can theoretically increase habitat diversity and managers should thus aim for a mosaic of fire ages and intensities within forest stands and across larger regions in order to maximise or maintain fungal diversity. (Robinson & Bougher, 2003)*
- 2) *Fungi play a major role as indicators of ecosystem health; therefore a systematic fungi survey should be conducted in the Reserve.*
- 3) *Control of feral animals which kill mycophagous native marsupials*
- 4) *Weed control*
- 5) *Monitoring of, and controlling, recreational activities on fragile areas such as granite outcrops which harbour specific vegetation habitats such as moss beds.*

7.5 Mt Hallowell Fungi Species List

<i>Cortinarius</i>	<i>rotundisporus</i>
<i>Cortinarius</i>	<i>sinapicolor</i>
<i>Cortinarius</i>	<i>symeae</i>
<i>Cortinarius</i>	<i>vinaceolamellatus</i>
<i>Cortinarius</i>	<i>violaceus</i>
<i>Crepidotus</i>	<i>eucalyptorum</i>
<i>Crepidotus</i>	<i>mollis</i>
<i>Crepidotus</i>	<i>uber</i>
<i>Crepidotus</i>	<i>variabilis</i>
<i>Crepidotus</i>	<i>applanatus</i>
<i>Crucibulum</i>	<i>laeve</i>
<i>Cystangium</i>	<i>balpineum</i>
<i>Cystangium</i>	<i>pisiglarea</i>
<i>Daldinia</i>	<i>concentrica</i>
<i>Dermocybe</i>	<i>austroveneta</i>
<i>Dermocybe</i>	<i>clelandii</i>
<i>Dermocybe</i>	<i>erythrocephala</i>
<i>Dermocybe</i>	<i>globuliformis</i>
<i>Dermocybe</i>	<i>kula</i>
<i>Dermocybe</i>	<i>splendida</i>
<i>Descolea</i>	<i>maculata</i>
<i>Descomyces</i>	<i>albus</i>
<i>Entoloma</i>	<i>sericellum</i>
<i>Exidia</i>	<i>glandulosa</i>
<i>Fistulina</i>	<i>hepatica</i>
<i>Fistulinella</i>	<i>mollis</i>
<i>Fomitopsis</i>	<i>lilacinogilva</i>
<i>Galerina</i>	<i>autumnalis</i>
<i>Galerina</i>	<i>hypnorum</i>
<i>Galerina</i>	<i>unicolor</i>
<i>Ganoderma</i>	<i>australe</i>
<i>Gastrum</i>	<i>javanicum</i>
<i>Geoglossum</i>	<i>glutinosum</i>
<i>Gummiglobus</i>	<i>potorooii</i>
<i>Gummivena</i>	<i>potorooi</i>
<i>Gymnomyces</i>	<i>wirraborensis</i>
<i>Gymnopilus</i>	<i>allantopus</i>
<i>Gymnopilus</i>	<i>eucalyptorum</i>
<i>Gymnopilus</i>	<i>ferruginosus</i>
<i>Gymnopilus</i>	<i>junonius</i>
<i>Gymnopilus</i>	<i>purpuratus</i>
<i>Gymnopus</i>	<i>dryophilus</i>
<i>Gyroporus</i>	<i>cyanescens</i>
<i>Hebeloma</i>	<i>aminophilum</i>
<i>Hebeloma</i>	<i>westraliense</i>
<i>Heterotextus</i>	<i>peziziformis</i>
<i>Hydnangium</i>	<i>carneum</i>
<i>Hygrocybe</i>	<i>austropratensis</i>
<i>Hygrocybe</i>	<i>coccinea</i>
<i>Hygrocybe</i>	<i>conica</i>
<i>Hygrocybe</i>	<i>miniata</i>
<i>Hygrocybe</i>	<i>polychroma</i>
<i>Hygrocybe</i>	<i>viscidibrunnea</i>
<i>Hygrophorus</i>	<i>involutus</i>
<i>Hypholoma</i>	<i>australe</i>
<i>Hypomyces</i>	<i>chrysospermum</i>

<i>Pycnoporus</i>	<i>coccineus</i>
<i>Ramaria</i>	<i>flava</i>
<i>Ramaria</i>	<i>ochraceosalmonicolor</i>
<i>Ramaria</i>	<i>versatilis</i>
<i>Ramaria</i>	<i>fennica</i>
<i>Ramariopsis</i>	<i>depokensis</i>
<i>Ramariopsis</i>	<i>helvola</i>
<i>Resupinatus</i>	<i>applicatus</i>
<i>Rhodocollybia</i>	<i>butyracea</i>
<i>Rickenella</i>	<i>fibula</i>
<i>Russula</i>	<i>adusta</i>
<i>Russula</i>	<i>albonigra</i>
<i>Russula</i>	<i>clelandii</i>
<i>Russula</i>	<i>erumpens</i>
<i>Russula</i>	<i>flocktoniae</i>
<i>Russula</i>	<i>neerimea</i>
<i>Russula</i>	<i>persanguinea</i>
<i>Scleroderma</i>	<i>areolatum</i>
<i>Scleroderma</i>	<i>cepa</i>
<i>Scutellinea</i>	<i>margaritacea</i>
<i>Scutellinia</i>	<i>scutellata</i>
<i>Sphaerobolus</i>	<i>stellatus</i>
<i>Stereum</i>	<i>complicatum</i>
<i>Stereum</i>	<i>hirsutum</i>
<i>Thaxterogaster</i>	<i>basipurpureum</i>
<i>Thaxterogaster</i>	<i>luteirufescens</i>
<i>Thelephora</i>	<i>terrestris</i>
<i>Torrendia</i>	<i>arenaria</i>
<i>Tremella</i>	<i>aurantia</i>
<i>Trichoglossum</i>	<i>hirsutum</i>
<i>Tricholoma</i>	<i>eucalypticum</i>
<i>Tricholomopsis</i>	<i>rutilans</i>
<i>Tubaria</i>	<i>rufofulva</i>
<i>Volvariella</i>	<i>speciosa</i>
<i>Xerula</i>	<i>australis</i>
<i>Xylaria</i>	<i>hypoxylon</i>
<i>Xylaria</i>	<i>polymorpha</i>
<i>Zelleromyces</i>	<i>daucinus</i>

8. Discussion

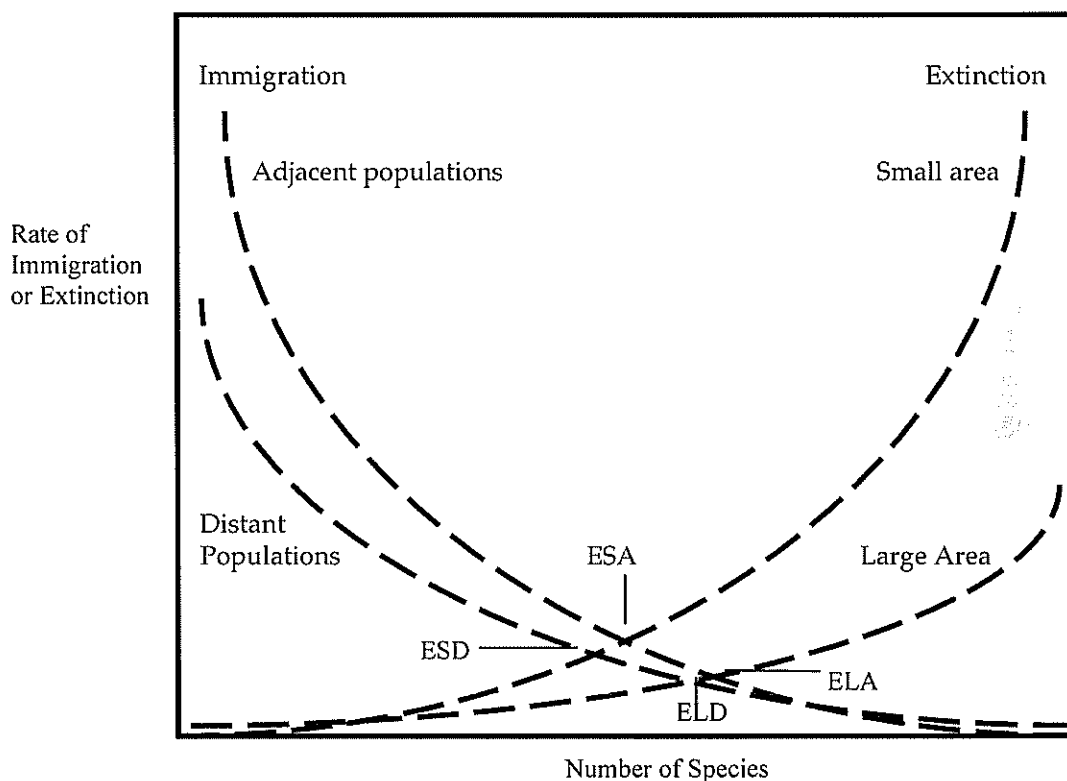
The Shrinking Core of the Mt Hallowell Reserve

The results of the Denmark Environment Centre's Mt Hallowell Survey indicate that the intact core of the Reserve is diminishing. The core is the area with the highest biodiversity and the lowest impacts from introduced exotic species. The core provides valuable information when viewed in the context of island biogeography and has valuable implications for the biodiversity of the area.

Island biogeography is the study of biodiversity in relation to the area of intact vegetation and the capacity for immigration of species to that area. In short, the larger the intact area and the greater the species immigration rate, the greater the biodiversity.

In Fig 8.1, adapted from *A Natural Legacy: Ecology in Australia* (Lunney, D. and Recher H.F. 1996), the equilibrium number of species is indicated and is the balance between the rate at which species become extinct and the rate at which new species colonize the area. Large areas support more species than small areas, and areas with adjacent populations are more easily colonised than those with distant populations.

Fig 8.1 Equilibrium Number of Species



ESD equilibrium number (E) of species in a small (S) area with distant (D) surrounding populations
ESA equilibrium number (E) of species in a small (S) area with adjacent (A) surrounding populations
ELD equilibrium number (E) of species in a large (L) area with distant (D) surrounding populations
ELA equilibrium number (E) of species in a large (L) area with adjacent (A) surrounding populations

8.2 Current Fuel Load Model In Use

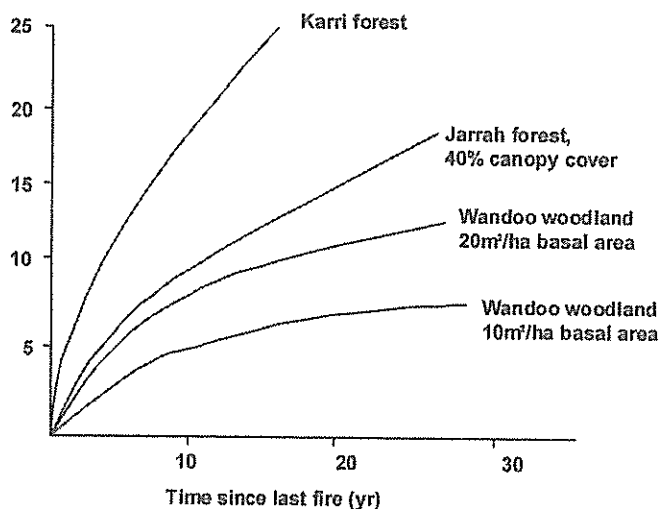


Fig 8.3 Possible Fuel Load Model

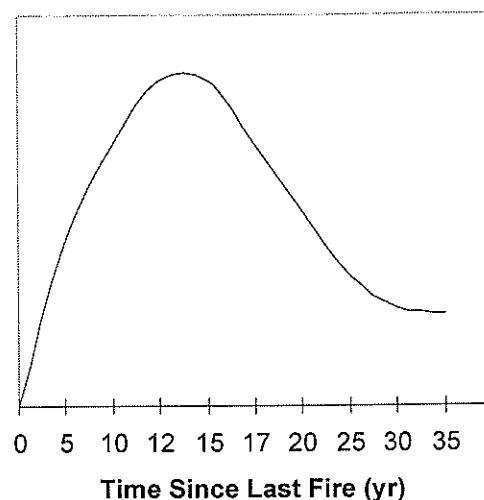


Fig 8.2 and Fig 8.3 represent the accumulation of fallen vegetation in jarrah/karri forest over time. Fig 8.2 is a widely used model for the accumulation of fallen vegetation available to fuel fires (Bradstock, Williams, Gill 2002). Fig 8.3 represents a possible view of how fuel loads accumulate over a duration of time. To date, limited research or scientific data on fuel loads in long-unburnt areas is available. Figs 8.4 and 8.5 are photographs of an area on the west side of the Mt Hallowell Reserve and has a fire age of 67 years. The area has minimal burnable understorey and minimal fallen vegetation. If the current widely used model of fuel load accumulation is used for these areas (Fig 8.2), the area should have significant levels of fallen vegetation. However, as shown, it does not.



Fig 8.4 The west side of Mt Hallowell Reserve. 67 year old fire age with minimal fallen vegetation and burnable understorey.

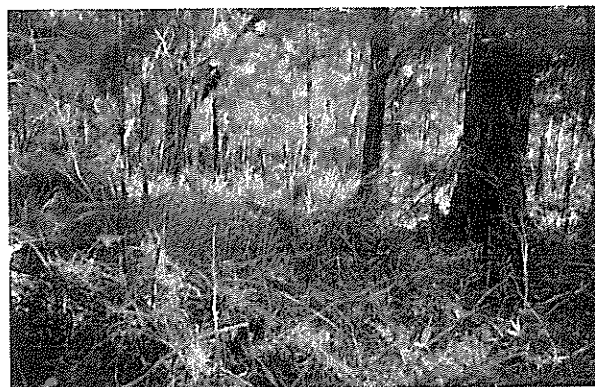


Fig 8.5 The west side of Mt Hallowell Reserve. 67 year old fire age with minimal fallen vegetation and burnable understorey.

This report does not advocate either of the fuel accumulation models outlined in Fig 8.2 or Fig 8.3, but does acknowledge the wealth of scientific knowledge that can be gathered from the Reserve to better understand this important issue.

The scientific importance of the Mt Hallowell Reserve takes on added significance when viewed in a regional context. With the majority of crown and private land in the south west burnt on a rotational basis, the Reserve contains some of the last examples of long-unburnt vegetation in Western Australia and must be protected accordingly.

The Mt Hallowell Survey and Research Project 2004

This Project of the Denmark Environment Centre Inc was made possible by a grant from The Ian Potter Foundation.

10. Conclusion

The Mt Hallowell Reserve is one of the last remaining long-unburnt areas in the South West. The biodiversity contained within its borders, is not only of irreplaceable scientific knowledge, but is also a valued part of the Denmark community. With limited ability for new native species to establish themselves in the Reserve, and a diminishing intact area within the Reserve, protecting the remaining biodiversity must be of utmost importance. As the integrity of the Reserve is further reduced, we will lose our remaining opportunity to safeguard this truly unique area. The DEC has supplied the first step in ensuring the integrity of the area by identifying the impacts that may cause the biodiversity of the Reserve to be reduced. The Shire of Denmark and wider community must now ensure that the recommendations contained within this report are acted upon and maintained.

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Appendix 1

Mt Hallowell Reserve Management Plan 1995 Species List

FAUNA LIST

(2a) Birds

White-faced Heron	<i>Ardea novaehollandiae</i>
Australian Shelduck	<i>Tadorna tadornoides</i>
Pacific Black Duck	<i>Anas superciliosa</i>
Grey Teal	<i>Anas gibberifrons</i>
Maned Duck	<i>Chenonetta jubata</i>
Osprey	<i>Pansion haliaetus</i>
Square-tailed Kite	<i>Lophoictinia isura</i>
Brown Goshawk	<i>Accipiter cirrhocephalus</i>
Collared Sparrowhawk	<i>Accipiter cirrocephalus</i>
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>
Little Eagle	<i>Hieraaetus morphnoides</i>
Marsh Harrier	<i>Circus aeruginosus</i>
Australian Hobby	<i>Falco longipennis</i>
Brown Falcon	<i>Falco berigora</i>
Australian Kestrel	<i>Falco cenchriodes</i>
Painted Button-quail	<i>Turnix varia</i>
Common Bronzewing	<i>Phaps chalcoptera</i>
Brush Bronzewing	<i>Phaps elegans</i>
Red-tailed Black-Cockatoo	<i>Calyptorhynchus magnificus</i>
White-tailed Black-Cockatoo	<i>Calyptorhynchus baudinii</i>
Purple-crowned Lorikeet	<i>Clossopsitta porphyrocephala</i>
Red-capped Parrot	<i>Purpureicephalus squarius</i>
Western Rosella	<i>Platycercus icterotis</i>
Port Lincoln Ringneck	<i>Barnardius zonarius</i>
Fan-tailed Cuckoo	<i>Cuculus pyrrhophanus</i>
Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>
Southern Boobook	<i>Ninox novaeseelandiae</i>
Tawny Frogmouth	<i>Podargus strigoides</i>
Laughing Kookaburra	<i>Dacelo novaeguineaea</i>
Sacred Kingfisher	<i>Halcyon sancta</i>
Rainbow Bee-eater	<i>Merops ornatus</i>
Welcome Swallow	<i>Hirundo neoxena</i>
Tree Martin	<i>Cecropis nigricans</i>
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>
Scarlet Robin	<i>Petroica multicolor</i>
White-breasted Robin	<i>Eopsaltria georgiana</i>
Western Yellow Robin	<i>Eopsaltria griseogularis</i>
Crested Shrike-tit	<i>Falcunculus frontatus</i>
Golden Whistler	<i>Pachycephalus pectoralis</i>
Grey Shrike-thrush	<i>Colluricincla haemonica</i>
Restless Flycatcher	<i>Myiagra inquieta</i>
Grey Fantail	<i>Rhipidura fuliginosa</i>
Willie Wagtail	<i>Rhipidura leacophrys</i>
White-browed Babbler	<i>Pomatostomus superciliosus</i>
Splendid Fairy-wren	<i>Malurus splendens</i>
Red-winged Fairy-wren	<i>Malurus elegans</i>

Birds continued

White-browed Scrubwren	Sericornis frontalis
Western Gerygone	Gerygone fusca
Inland Thornbill	Acanthiza apicalis
Western Thornbill	Acanthiza inornata
Yellow-rumped Thornbill	Acanthiza chrysorrhoa
Varied Sittella	Dapoenositta chrysoptera
Rufus Treecreeper	Climacteris rufa
Red Wattlebird	Anthochaera carunculata
Little Wattlebird	Anthochaera chrysoptera
White-naped Honeyeater	Melithreptus lunatus
Brown Honeyeater	Lichmera indistincta
New Holland Honeyeater	Phylidonyris novaehollandiae
Tawny-crowned Honeyeater	Phylidonyris melanops
Western Spinebill	Acanthorhynchus superciliosus
Spotted Pardalote	Pardalotus punctatus
Striated Pardalote	Pardalotus striatus
Silvereye	Zosterops lateralis
*Red-eared Firetail	Emblema oculatum
Australian Magpie-lark	Grallina cyanopterus
Dusky Woodswallow	Artamus cyanopterus
Grey Butcherbird	Cracticus torquatus
Australian Magpie	Gymnorhina tibicen
Grey Currawong	Strepera versicolor
Australian Raven	Corvus coronoides

**Included on list of rare and Endangered Species: WA Government Gazette, 16 Nov 1990. "In need of special protection."*

Compiled by: L M Broadhurst – PO Box 71, Denmark 6333 – 13 Dec 1991

(2b) MAMMAL LIST

This list is compiled from unconfirmed sightings and/or scat observations

Order Diprotodonta

Family Macropoditae

Western Grey Kangaroo
(*Macropus fuliginosus*)

Western Brush Wallaby
(*Macropus irma*)

Quokka
(*Setonix brachyurus*)

Woylie
(*Bettongia penicillata*)

Family Phalangeridae

Common Brush Tail Possum
(*Trichosurus vulpecular*)

Family Petauridae

Common Ring Tail Possum
(*Pseudocheirus peregrinus*)

Family Burramyidae

Western Pygmy Possum
(*Cercartetus concinnus*)

Family Tarsipedidae

Honey Possum
(*Tarsipes rostratus*)

Order Polyprotodonta

Family Peramelidae

Southern Brown Bandicoot
(*Isoodon obesulus*)

Family Dasyuridae

Western Quoll or Chuditch
(*Dasyurus geoffroii*)

Brush-Tailed Phascogale
(*Phascogale tapoatafe*)

Yellow-Footed Antechinus
(*Antechinus flavipes*)

Grey-bellied Dunnart
(*Sminthopsis griseoventor*)

Order Rodentia

Family Muridae

Bush Rat
(*Rattus fuscipes*)

Water Rat
(*Hydromys chrysogaster*)

Order Monotremata

Family Tachyglossidae

Echidna
(*Tachyglossus aculeatus*)

EXOTIC MAMMAL LIST

Family Felidae

Cat
(*Felis catus*)

Family Canidae

Fox
(*Vulpes vulpes*)

Order Rodentia

Family Muridae

House Mouse
(*Mus musculus*)

Black Rat
(*Rattus rattus*)

Order Lagomorpha

Family Leporidae

Rabbit
(*Oryctolagus cuniculus*)

2(c) REPTILE LIST

This list is compiled from unconfirmed sightings and/or scat observations

Order Squamata

Family Gekkonidae

Marbled Gecko
(*Phylladactylus marmoratus*)

Family Scincidae

Bobtail
(*Tiliqua rugosa*)

Smith's Skink
(*Egermia kingii*)

Burrowing Skink
(*Hemiegis peronni peronii*)

New Holland Skink
(*Leiopisma trilineatum*)

Bungarra
(*Varanus rosenbergi*)

Family Elapidae

Dugite
(*Pseudonaja affinis affinis*)

Black Tiger Snake
(*Notechis ater occidentalis*)

Crowned Snake
(*Drysdalia coronata*)

Square-nosed Snake
(*Rhinoplocephalus bicolor*)

Appendix 2

Small Mammal Survey Results

SITE #	EAST	NORTH	TUBE/ BAIT	GROUND COVER	FALLEN VEG	EXPOSED GRANITE	WEEK 1			WEEK 2			WEEK 3		
							DATE SET	WEEK 1	WEEK 2	DATE SET	WEEK 1	WEEK 2	DATE SET	WEEK 1	WEEK 2
129	528073	6127503	SS	5	0	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
130	528063	6127452	SP	6	0	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
131	528065	6127410	LS	4	0	0	6-Jan-04	X	X	X	R. fuscipes	R. fuscipes	T. vulpecula	T. vulpecula	
132	528057	6127359	LP	4	0	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes/C. familiaris	R. fuscipes	R. fuscipes	R. fuscipes	
133	528368	6127631	SS	6	0	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. rattus	R. fuscipes	R. fuscipes	R. fuscipes	
134	528373	6127681	SS	5	0	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
135	528383	6127740	LS	3	0	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
136	528397	6127775	LP	2	0	0	6-Jan-04	C. familiaris	C. familiaris	C. familiaris	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
137	528704	6127552	SS	4	0	0	6-Jan-04	X	X	X	R. fuscipes/I. obesulus	R. fuscipes	R. fuscipes	R. fuscipes	
138	528676	6127625	SS	3	0	0	6-Jan-04	I. obesulus	I. obesulus	I. obesulus	X	X	X	C. familiaris	
139	528692	6127688	LS	3	0	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
140	528725	6127732	LP	2	1	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
141	528479	6127585	SS	1	0	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
142	528489	6127537	SS	2	1	0	6-Jan-04	R. rattus	R. rattus	R. rattus	R. fuscipes	R. fuscipes	R. fuscipes	M. fuliginosus	
143	528502	6127499	LS	7	0	0	6-Jan-04	X	X	X	X	X	X	R. fuscipes	
144	528502	6127447	LP	6	0	0	6-Jan-04	R. fuscipes/C. familiaris	R. fuscipes/C. familiaris	R. fuscipes/C. familiaris	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes/C. familiaris	
145	528756	6127466	SS	4	0	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
146	528733	6127432	SP	3	0	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes/C. familiaris	R. fuscipes	R. fuscipes	R. fuscipes	
147	528737	6127360	LS	4	0	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
148	528731	6127314	LP	3	0	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes/I. obesulus	R. fuscipes/C. familiaris	R. fuscipes/C. familiaris	R. fuscipes/C. familiaris	
149	528750	6127237	SS	2	0	0	6-Jan-04	X	X	X	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
150	528766	6127160	SP	2	2	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes/C. familiaris	
151	528780	6127075	LS	5	0	0	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	X	X	X	Rattus Sp	
152	528787	6127033	LP	2	2	1	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
153	528787	6126972	SS	2	1	1	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	X	X	X	R. fuscipes	
154	528793	6126937	SP	2	2	1	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
155	528818	6126905	LS	2	1	2	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
156	528771	6126877	LP	2	2	1	6-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	X	X	X	X	
157	528937	6127376	SS	2	1	0	17-Jan-04	N	N	N	T. vulpecula	T. vulpecula	T. vulpecula	R. fuscipes	
158	528914	6127411	SP	2	1	0	17-Jan-04	N	N	N	R. fuscipes/C. familiaris	R. fuscipes/C. familiaris	R. fuscipes	R. fuscipes	
159	528861	6127425	LS	2	2	0	17-Jan-04	N	N	N	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
160	528850	6127443	LP	3	1	0	17-Jan-04	N	N	N	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
181	526436	6127324	SS	7	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
182	526421	6127346	SP	7	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
183	526409	6127382	LS	5	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes/C. familiaris	R. fuscipes/C. familiaris	R. fuscipes	R. fuscipes	
184	526412	6127411	LP	6	0	0	7-Jan-04	C. familiaris	C. familiaris	C. familiaris	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
185	526419	6127458	SS	3	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
186	526443	6127479	SP	3	0	0	7-Jan-04	R. fuscipes/C. familiaris	R. fuscipes/C. familiaris	R. fuscipes/C. familiaris	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
187	526449	6127493	LS	5	0	0	7-Jan-04	C. familiaris	C. familiaris	C. familiaris	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
188	526466	6127521	LP	4	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
189	526575	6127388	SS	8	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
190	526578	6127345	SP	7	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. rattus	R. rattus	R. rattus	R. rattus	
191	526580	6127316	LS	7	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
192	526582	6127278	LP	7	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
193	526578	6127243	SS	5	0	0	7-Jan-04	M. musculus/A. flavipes	M. musculus/A. flavipes	M. musculus/A. flavipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
194	526583	6127235	SP	2	1	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	I. obesulus	I. obesulus	I. obesulus	I. obesulus	
195	526579	6127200	LS	2	1	0	7-Jan-04	F. catus	F. catus	F. catus	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes/I. obesulus	
196	526591	6127157	LP	2	1	0	7-Jan-04	A. flavipes	A. flavipes	A. flavipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
197	526579	6127118	SS	2	1	0	7-Jan-04	R. fuscipes/F. catus	R. fuscipes/F. catus	R. fuscipes/F. catus	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
198	526591	6127059	SP	2	2	1	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
199	526612	6127040	LS	2	1	1	7-Jan-04	T. vulpecula	T. vulpecula	T. vulpecula	R. fuscipes	R. fuscipes	R. fuscipes	T. vulpecula	
200	526609	6127031	LP	2	1	1	7-Jan-04	T. vulpecula	T. vulpecula	T. vulpecula	C. familiaris/T. vulpecula	C. familiaris/T. vulpecula	T. vulpecula	T. vulpecula	
201	526694	6127434	SS	4	0	0	7-Jan-04	I. obesulus	I. obesulus	I. obesulus	X	X	X	R. fuscipes	
202	526714	6127461	SP	3	0	0	7-Jan-04	A. flavipes	A. flavipes	A. flavipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
203	526741	6127450	LP	4	0	0	7-Jan-04	I. obesulus	I. obesulus	I. obesulus	X	X	X	F. catus	
204	526769	6127431	LS	8	0	0	7-Jan-04	X	X	X	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
205	526794	6127423	SS	6	0	0	7-Jan-04	R. fuscipes/A. flavipes	R. fuscipes/A. flavipes	R. fuscipes/A. flavipes	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	

TUBE/ GROUND FALLEN EXPOSED

SITE #	EAST	NORTH	TUBE/ BAIT	GROUND COVER	FALLEN VEG	EXPOSED GRANITE	WEEK 1		WEEK 2		WEEK 3	
							DATE	SET	DATE	SET	DATE	SET
206	526791	6127392	SP	7	0	0	7-Jan-04	R. rattus	R. fuscipes	R. fuscipes	R. fuscipes/l. obesulus	
207	526801	6127355	LS	6	0	0	7-Jan-04	Rattus Sp	R. fuscipes	R. fuscipes/l. obesulus	R. fuscipes	
208	526832	6127346	LP	6	0	0	7-Jan-04	R. fuscipes/l. obesulus	R. fuscipes/M. musculus	R. fuscipes	R. fuscipes	
209	526782	6127304	SS	8	0	0	7-Jan-04	R. fuscipes	R. fuscipes/C. familiaris/l. obesulus	R. fuscipes	R. fuscipes	
210	526775	6127288	SP	5	0	0	7-Jan-04	R. fuscipes/l. obesulus	R. fuscipes	R. fuscipes	R. fuscipes	
211	526767	6127255	LS	5	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
212	526771	6127240	LP	6	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
213	527424	6127462	SS	5	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
214	527126	6127432	SP	5	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	M. fuliginosus	
215	527123	6127387	LS	5	0	0	7-Jan-04	R. fuscipes	X	X	X	
216	527126	6127364	LP	6	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
217	527136	6127331	SS	7	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	X	
218	527140	6127305	SP	5	0	0	7-Jan-04	R. fuscipes/C. familiaris	R. fuscipes	R. fuscipes	R. fuscipes	
219	527143	6127280	LS	7	0	0	7-Jan-04	C. familiaris	X	X	X	
220	527158	6127259	LP	5	0	0	7-Jan-04	R. rattus	R. fuscipes	R. fuscipes	X	
221	527330	6127432	SS	6	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
222	527317	6127410	SP	7	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
223	527327	6127390	LS	7	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	T. vulpecula	
224	527322	6127327	LP	6	0	0	7-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes/T. vulpecula	
241	527318	6127418	SS	9	0	0	8-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
242	527348	6127406	SP	9	0	0	8-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
243	527452	6127441	LS	7	0	0	8-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
244	527457	6127445	LP	9	0	0	8-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
245	527508	6127446	SS	10	0	0	8-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
246	527532	6127435	SP	10	0	0	8-Jan-04	R. fuscipes	R. fuscipes/C. familiaris	R. fuscipes	R. fuscipes/C. familiaris	
247	527599	6127421	LS	10	0	0	8-Jan-04	R. fuscipes	X	X	X	
248	527650	6127427	LP	6	0	0	8-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. rattus	
249	527728	6127396	SS	10	0	0	8-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
250	527767	6127294	SP	5	0	0	8-Jan-04	R. fuscipes	R. rattus	R. rattus	R. fuscipes	
251	527783	6127222	LS	5	0	0	8-Jan-04	R. fuscipes	X	X	R. fuscipes	
252	527792	6127131	LP	6	0	0	8-Jan-04	T. vulpecula	R. fuscipes	R. fuscipes	R. fuscipes	
253	527810	6127042	SS	5	0	0	8-Jan-04	T. vulpecula	R. fuscipes	R. fuscipes	R. fuscipes	
254	527801	6126996	SP	3	0	0	8-Jan-04	T. vulpecula	T. vulpecula	T. vulpecula	T. vulpecula	
255	527796	6126969	LS	3	2	1	8-Jan-04	T. vulpecula	T. vulpecula	T. vulpecula	T. vulpecula	
256	527829	6126934	LP	4	2	1	8-Jan-04	T. vulpecula	T. vulpecula	T. vulpecula	T. vulpecula	
257	527858	6126872	SS	4	2	1	8-Jan-04	X	T. vulpecula	T. vulpecula	T. vulpecula	
258	527885	6126823	SP	4	1	2	8-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
259	527904	6126782	LS	4	1	2	8-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
260	527920	6126766	LP	4	1	2	8-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
261	527918	6126688	SS	4	2	2	8-Jan-04	T. vulpecula	R. fuscipes/T. vulpecula	R. fuscipes	R. fuscipes	
262	527927	6126680	SP	5	2	2	8-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
263	527933	6126649	LS	4	2	2	8-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	R. fuscipes	
264	527903	6126565	LP	3	2	2	8-Jan-04	R. fuscipes	R. fuscipes	R. fuscipes	A. flavipes	
265	527888	6126459	SS	5	2	2	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
266	527888	6126428	SP	5	2	1	17-Jan-04	N	X	X	R. fuscipes	
267	527876	6126422	LS	3	2	2	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
269	528126	6126613	SS	1	2	1	17-Jan-04	N	I. obesulus	R. fuscipes	R. fuscipes	
270	528084	6126540	SP	2	2	0	17-Jan-04	N	R. fuscipes/l. obesulus	R. fuscipes	R. fuscipes	
271	528073	6126509	LS	2	2	1	17-Jan-04	N	R. fuscipes	T. vulpecula	T. vulpecula	
272	528092	6126469	LP	1	2	2	17-Jan-04	N	R. fuscipes	T. vulpecula	T. vulpecula	
273	528098	6126424	SS	1	2	2	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
274	528117	6126390	SP	2	2	2	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
275	528123	6126381	LS	2	2	2	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
276	528119	6126335	LP	2	2	2	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
277	527520	6126381	SS	6	1	1	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
278	527488	6126427	SP	6	2	1	17-Jan-04	N	R. fuscipes/T. vulpecula	R. fuscipes	R. fuscipes	
279	527467	6126451	LS	4	2	2	17-Jan-04	N	R. fuscipes	Rattus Sp	Rattus Sp	

SITE #	EAST	NORTH	TUBE/ BAIT	GROUND COVER	FALLEN VEG	EXPOSED GRANITE	WEEK 1		WEEK 2		WEEK 3	
							DATE SET	N	DATE SET	N	DATE SET	N
280	527463	6126489	LP	3	2	2	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
281	527460	6126528	SS	3	2	2	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
282	527468	6126549	SP	2	2	2	17-Jan-04	N	T. vulpecula	R. fuscipes	R. fuscipes	
283	527465	6126584	LS	1	2	2	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
284	527459	6126621	LP	3	2	2	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
285	527146	6126299	SS	5	1	2	17-Jan-04	N	T. vulpecula	X	X	
286	527117	6126297	SP	5	1	2	17-Jan-04	N	T. vulpecula/f. obesulus	Rattus Sp	Rattus Sp	
287	527038	6126303	LS	4	0	2	17-Jan-04	N	Rattus Sp	R. fuscipes	R. fuscipes	
288	526992	6126302	LP	2	2	1	17-Jan-04	N	T. vulpecula	R. fuscipes	R. fuscipes	
289	526944	6126300	SS	3	1	0	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
290	526879	6126292	SP	2	2	1	17-Jan-04	N	R. fuscipes	Rattus Sp	Rattus Sp	
291	526811	6126324	LS	1	2	2	17-Jan-04	N	T. vulpecula	Rattus Sp	Rattus Sp	
292	526770	6126342	LP	3	1	1	17-Jan-04	N	T. vulpecula	T. vulpecula	T. vulpecula	
293	526707	6126343	SS	2	1	1	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
294	526656	6126345	SP	2	2	1	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
295	526611	6126361	LS	2	2	1	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
296	526567	6126360	LP	2	1	1	17-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
297	526771	6126566	SS	6	2	2	24-Jan-04	N	R. fuscipes	R. fuscipes	R. fuscipes	
298	526760	6126622	SP	4	2	1	24-Jan-04	N	N	N	N	
299	526778	6126647	LS	4	2	2	24-Jan-04	N	N	N	N	
300	526767	6126690	LP	2	2	2	24-Jan-04	N	N	N	N	

MT HALLOWELL FAUNA SURVEY RESULTS 2004

Species	Week 2	Week 3	Week 4	Total
Rattus Sp	2	1	6	9
Rattus fuscipes (Bush Rat)	91	128	134	353
Rattus rattus (Black Rat)	3	3	4	10
Felina catus (Cat)	5	5	3	13
Canine familiaris (Dog)	11	10	9	30
Trichosurus vulpecula (BT Pos)	11	30	32	73
Antichinus flavipes (Mardo)	4	1	3	8
Isoodon obesulus (SB Bandicoot)	11	12	12	35
M. musculus (House Mouse)	1	2	0	3
Macropus fuliginosus (WG Kang)	1	0	2	3
No Tube Set	53	4	0	57
No Sample Collected	8	16	7	31
Samples Collected	140	192	205	537
Total Tubes Set	144	193	190	527

Appendix 3

National Estate Nomination Details



Place Details

Mount Hallowell Reserves, Ocean Beach Rd, Denmark, WA

Photographs: None
List: Register of the National Estate
Class: Natural
Legal Status: [Indicative Place](#)
Place ID: 14995
Place File No: 5/01/074/0004

Nominator's Statement of Significance:

An important remnant bushland area containing forest types representative of the Denmark area. Despite a recent fire in the area there are still parts of the reserves which have not been burnt for seventy years and which form an important scientific reference area.

The area is significant for the maintenance of faunal processes as it contains undisturbed remnant forest communities of karri (*Eucalyptus diversicolour*); karri/marri (*Eucalyptus diversicolour/Eucalyptus calophylla*); karri/yate (*Eucalyptus diversicolour/Eucalyptus cornuta*); jarrah (*Eucalyptus marginata*); jarrah/blackbutt/bullich (*Eucalyptus marginata/Eucalyptus patens/Eucalyptus megacarpa*); jarrah/ marri (*Eucalyptus marginata/ calophylla*);marri (*Eucalyptus calophylla*); and woodlands of mixed jarrah (*Eucalyptus marginata*), blackbutt (*Eucalyptus patens*) and paperbark (*Melaleuca* sp.); shrublands and heathlands with vegetation associated with granite outcrops also being prominent. The Reserve provides habitats for 70 documented species of birds (see Mount Hallowell Reserve Management Plan, Shire of Denmark November 1995) including the red capped parrot, (*Purpureicephalus spurius*) and the red eared firetail finch (*Emblema oculatum*).

It contains a range of landforms, soils and vegetation communities characteristic of the eastern extremity of karri forest occurrence. It consists mainly of virgin (unlogged) forest with little disturbance and all the Reserve is old growth vegetation. It has extremely high landscape values and visual amenity and has important values for tourism.

It has an important benchmark area. The Reserve is one of a small number of forested areas managed to exclude all fire ie. no planned burn (Christensen P and Abbott I. - see Table1). The Mount Hallowell Reserve includes habitat for a number of endemic fauna species, including: Red Capped Parrot, (*Purpureicephalus spurius*); Red Winged Fairy Wren, (*Malurus elegans*); Peregrine Falcon (*Falco peregrinus*); Quokka, (*Setonix crachyurus*); Honey Possum, (*Tarsipes rostratus*); Western Brush Wallaby, (*Macropus irma*); Woylie, (*Bettongia penicillata*); Common Brushtail possum, (*Trichosurus vulpecula*); Common Ringtail possum, (*Pseudocheirus peregrinus*); Western Pygmy possum (*Cercartetus concinnus*); Southern Brown Bandicoot (*Isodon obesulus*); Western Quoll or Chuditch (*Dasyurus geoffroii*); Brush-tailed Phascogale (*Phascogale tapoatafa*); Yellow-footed Antechinus (*Antechinus flavipes*); Bush Rat (*Rattus fuscipes*); Water Rat (*Hydromys chrysogaster*); Echidna (*Tachyglossus aculeatus*); Square Nosed Snake (*Rhinoplocephalus bicolor*); Dugite, (*Pseudonaja affinis affinis*); Black Tiger Snake, (*Notechis ater occidentalis*); Marbled Gecko, (*Phyllodactylus marmoratus*); Smith's Skink, (*Egernia napoleonis*); Burrowing Skink, (*Hemiegis peronii peronii*) and New Holland Skink, (*Leiopisma trilineatum*).

The Reserve contains known populations of endemic flora species, including: *Eucalyptus cornuta* and *Dryandra serra*. The area is also important for maintaining forest and woodland processes. The topographic diversity of this area contributes to high aesthetic values and scenic

grandeur. The area contains uncommon geomorphic features of rock outcrops and monadnocks which are significant reasons for abundance and diversity of flora and fauna taxa and habitats. Despite its small size, the Reserve provides wilderness values for many visitors.

Official Values: Not Available

Description:

The Mount Hallowell Reserve is located 3.5km NNW of the mouth of Wilson Inlet on the south coast of Western Australia. It consists of an extremely diverse landscape with hills and ridges generally with a 50m to 100m of local relief but rising to 300m at the summit Mount Hallowell. Granite outcrops on the upper and mid slopes occur as prominent domes and pinnacles. Soils are dominated by Keystone (K) units (after Churchward HM et.al.CSIRO 1988). The area contains a significant diversity of vegetation comprising forests of karri; karri/marri; karri/yate; jarrah; jarrah/blackbutt/bullich; jarrah/marri; marri; and woodlands of mixed jarrah, blackbutt and paperbark; shrublands and heathlands. Vegetation associated with granite outcrops is also prominent.

History: Not Available

Condition and Integrity:

Most of the area is undisturbed (96%). A small part on the northern boundary was used for sand extraction in the 1980s. Some timber was selectively extracted from a discrete area on the northern slopes during the 1950s. The Shiela Hill Memorial Walk Trail (which doubles as part of the Perth to Albany Bibbulmun Walk Track) passes through the Reserve. It is bordered to the west and north by grazing farmland, to the south by rural subdivisions and by urban residential to the east. The Reserve has good condition and integrity with the majority carrying very old fire age (65 years) vegetation.

Location:

About 532ha, Ocean Beach Road, 5km south-west of Denmark, comprising Reserves 46618 and 14239.

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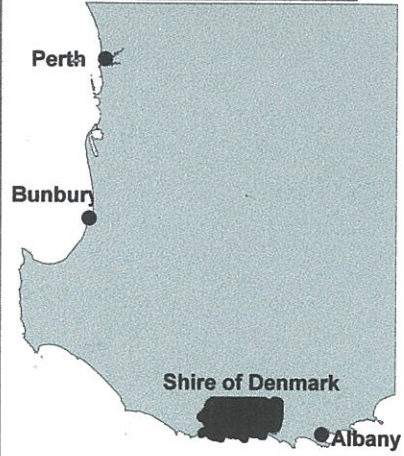
Shire of Denmark. (February 1999) Trails Master Plan.

Shire of Denmark Mount Hallowell Reserve Management Plan (November 1995).

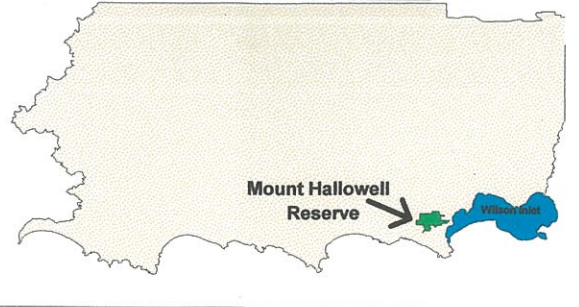
Appendix 4

Mapping

LOCATION MAP



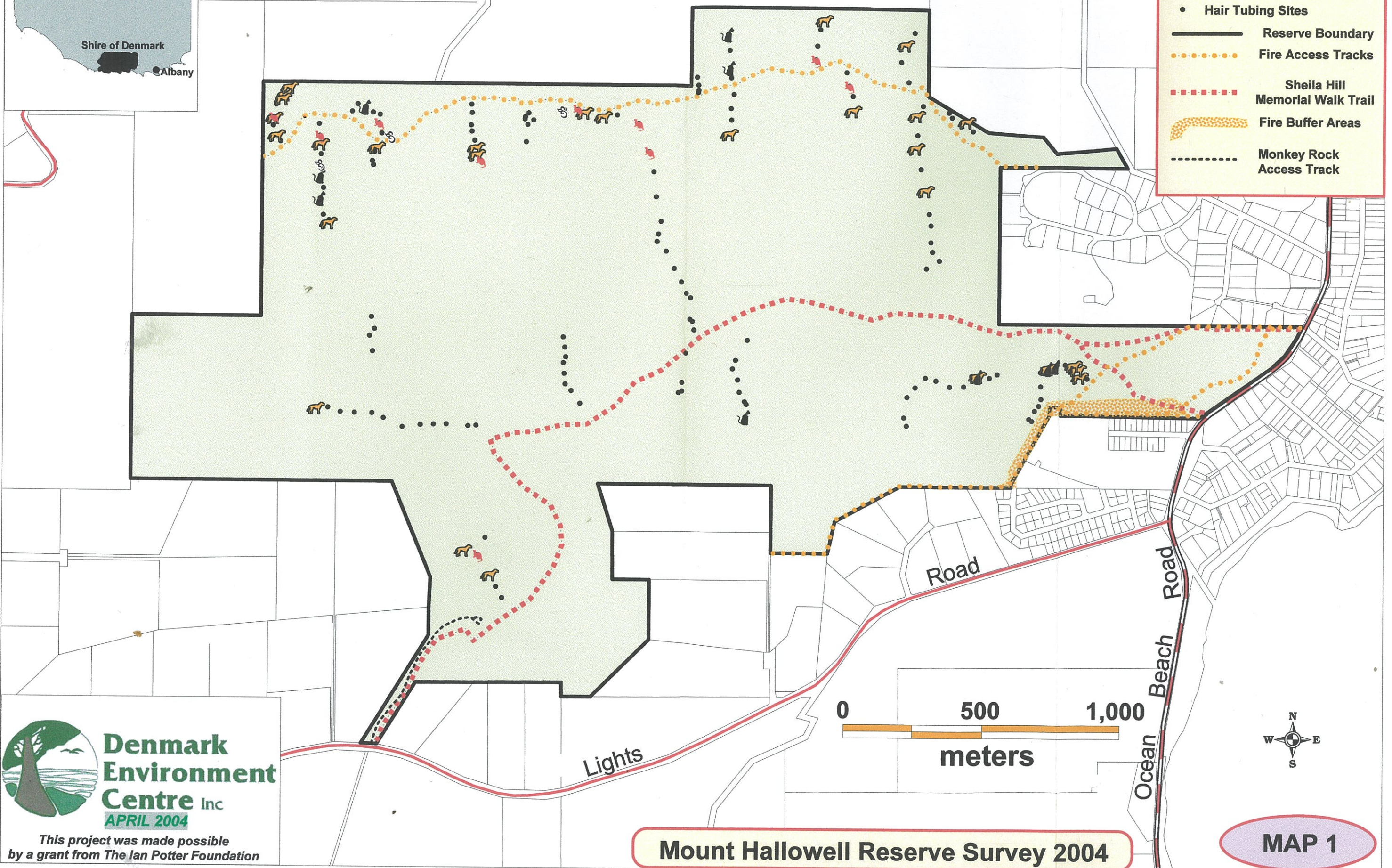
SHIRE OF DENMARK



Introduced Mammal Species

KEY

- Dog (*C. familiarus*)
- Cat (*F. catus*)
- Black Rat (*R. rattus*)
- House Mouse (*M. musculus*)
- Hair Tubing Sites
- Reserve Boundary
- Fire Access Tracks
- Sheila Hill Memorial Walk Trail
- Fire Buffer Areas
- Monkey Rock Access Track

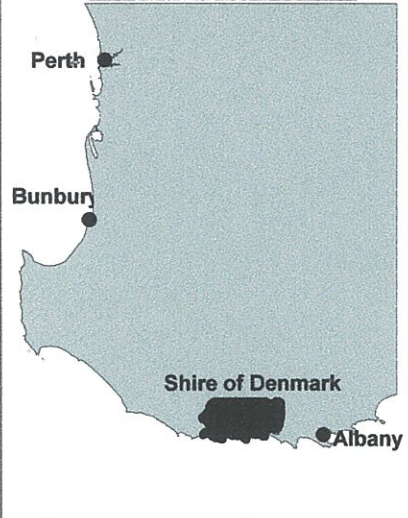



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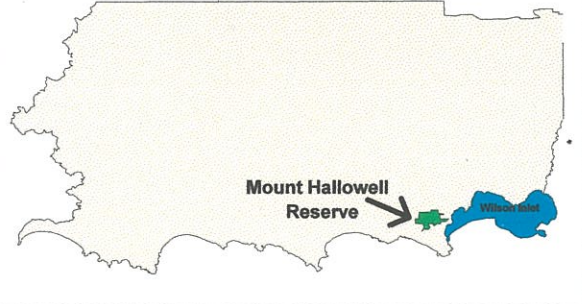
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MAP 1

LOCATION MAP



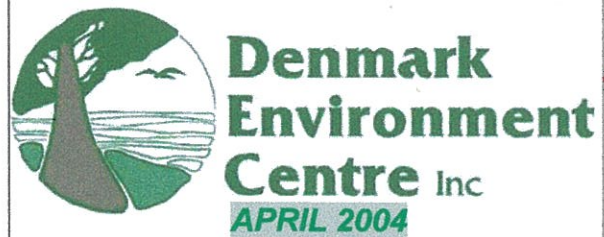
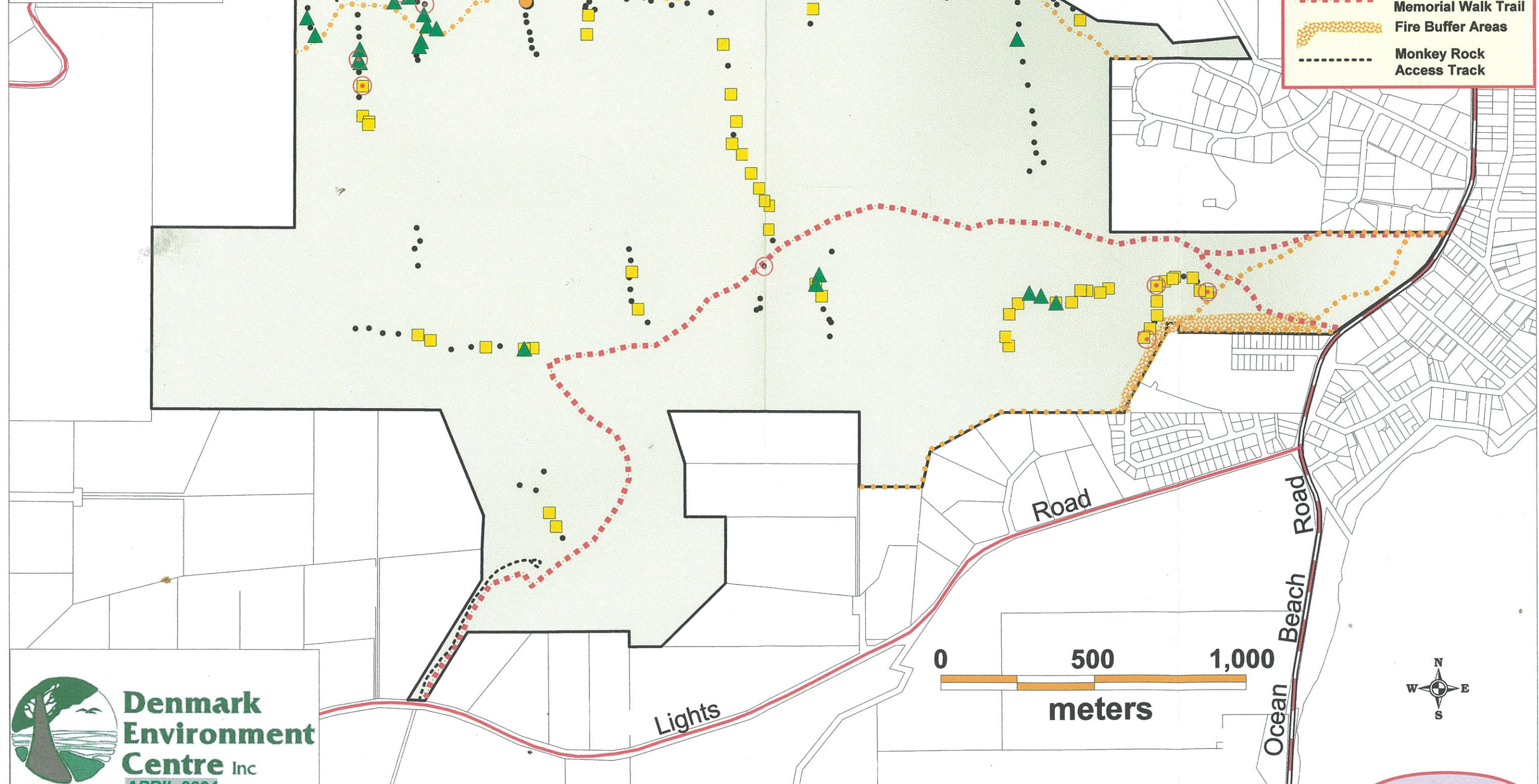
SHIRE OF DENMARK



Small Mammal Survey

KEY

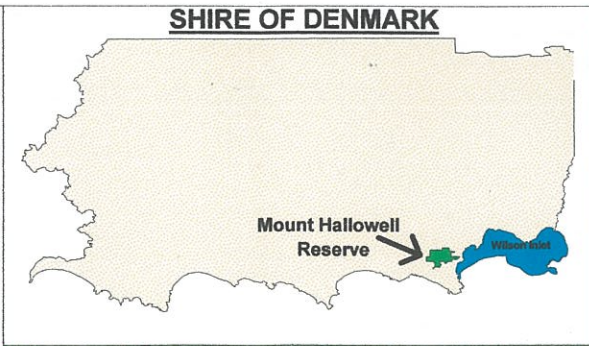
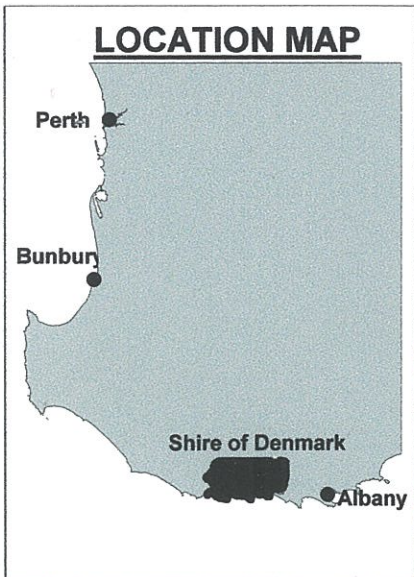
- Brush Tail Possum (*T. vulpecular*)
- Southern Brown Bandicoot (*I. obesulus*)
- Mardo (*A. flavipes*)
- Western Grey Kangaroo (*M. fuliginosus*)
- Bush Rat (*R. fuscipes*) was found extensively throughout the Reserve**
- Reserve Boundary
- Hair Tubing Sites
- Fire Access Tracks
- Sheila Hill Memorial Walk Trail
- Fire Buffer Areas
- Monkey Rock Access Track



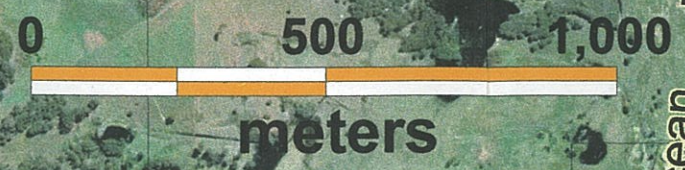
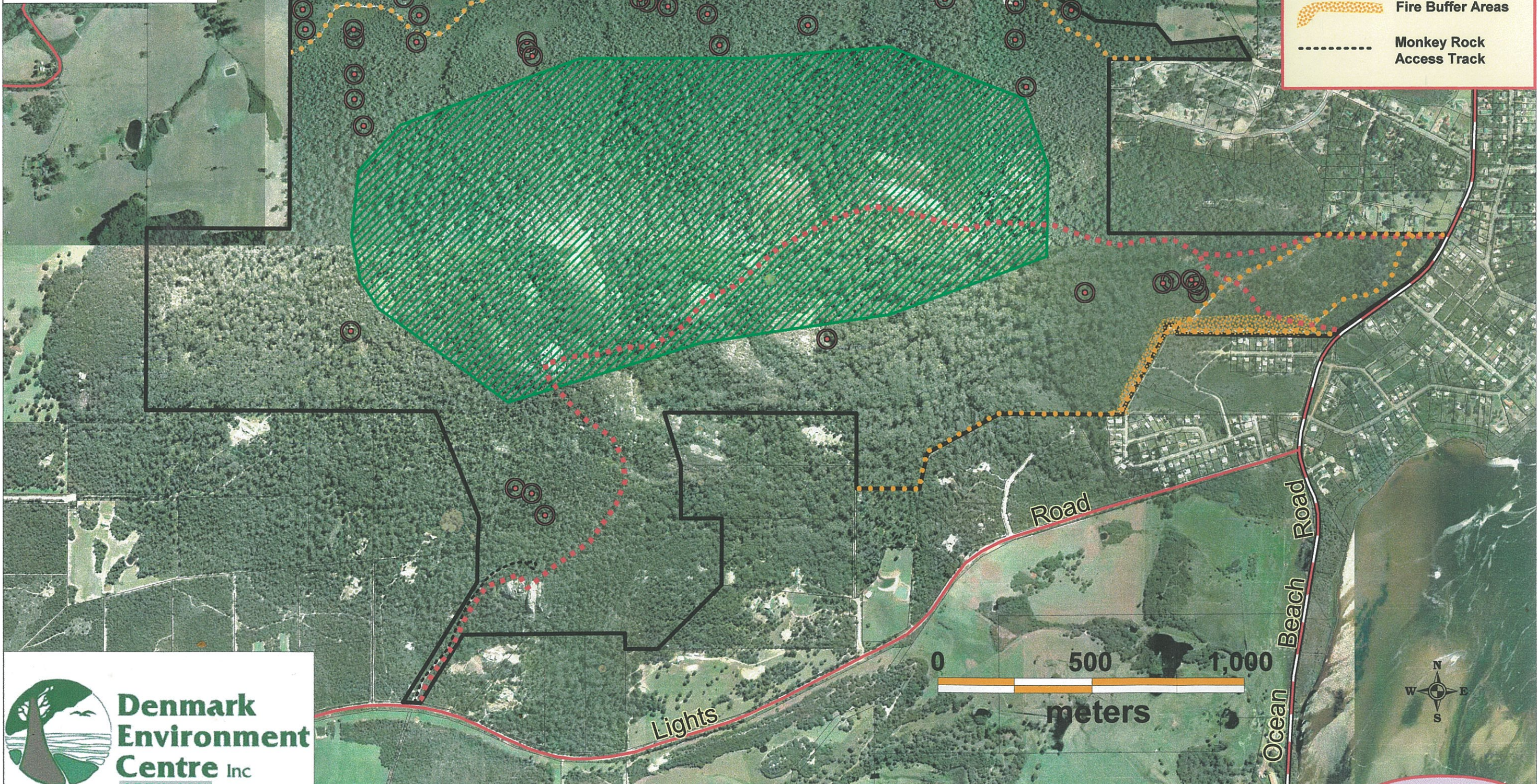
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MAP 2



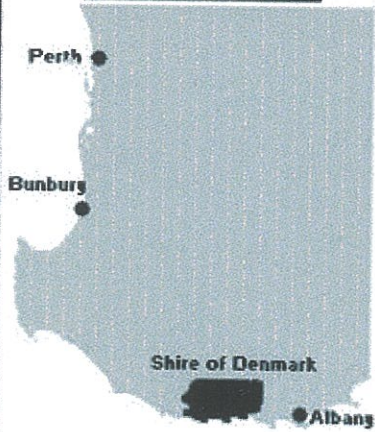
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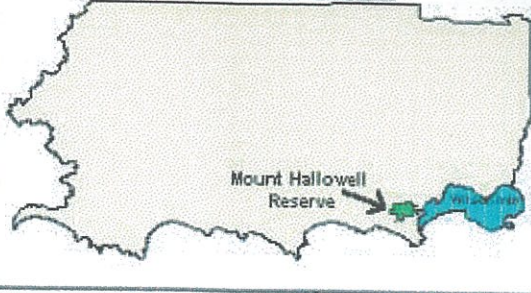
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LOCATION MAP



SHIRE OF DENMARK

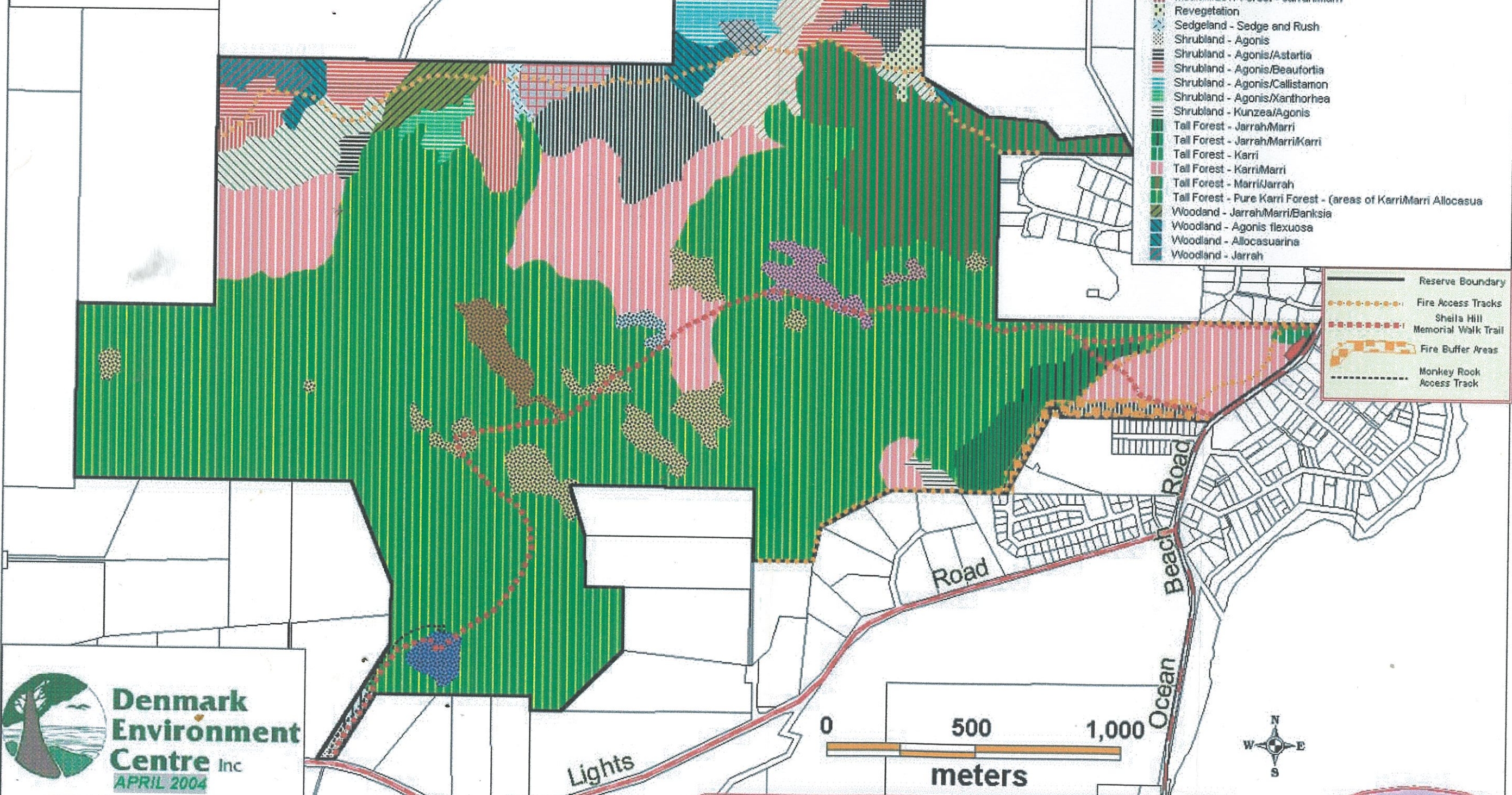


Vegetation Structure and Composition

KEY

- Fire Station - Highly Disturbed
- Granite Monadnock
- Granite Monadnock - Prominent eastern peak
- Granite Monadnock-Kooryunderup-Yate/Bullich/Marri/Allocasuarina
- Granite Monadnock-Large Eastern Peak-Agonis flexuosa/Eutaxia
- Granite Monadnock-Large-Agonis/Eutaxia/Stypandra
- Granite Monadnock-Monkey Rock-Yate
- Low Forest - Allocasuarina/Banksia
- Low Forest - Allocasuarina/Jarrah
- Low Forest - Jarrah/Allocasuarina
- Medium Forest - Jarrah/Marri
- Medium Forest - Karri/Marri
- Medium/Low Forest - Allocasuarina
- Medium/Low Forest - Allocasuarina/Jarrah
- Medium/Low Forest - Allocasuarina/Jarrah/Banksia
- Medium/Low Forest - Jarrah/Marri
- Revegetation
- Sedgeland - Sedge and Rush
- Shrubland - Agonis
- Shrubland - Agonis/Astartia
- Shrubland - Agonis/Beaufortia
- Shrubland - Agonis/Callistamon
- Shrubland - Agonis/Xanthorhea
- Shrubland - Kunzea/Agonis
- Tall Forest - Jarrah/Marri
- Tall Forest - Jarrah/Marri/Karri
- Tall Forest - Karri
- Tall Forest - Karri/Marri
- Tall Forest - Marri/Jarrah
- Tall Forest - Pure Karri Forest - (areas of Karri/Marri Allocasua)
- Woodland - Jarrah/Marri/Banksia
- Woodland - Agonis flexuosa
- Woodland - Allocasuarina
- Woodland - Jarrah

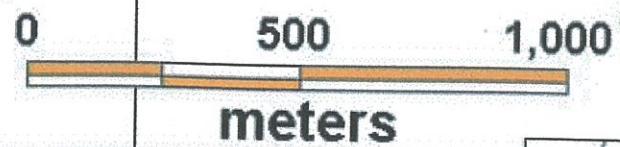
- Reserve Boundary
- Fire Access Tracks
- Sheila Hill Memorial Walk Trail
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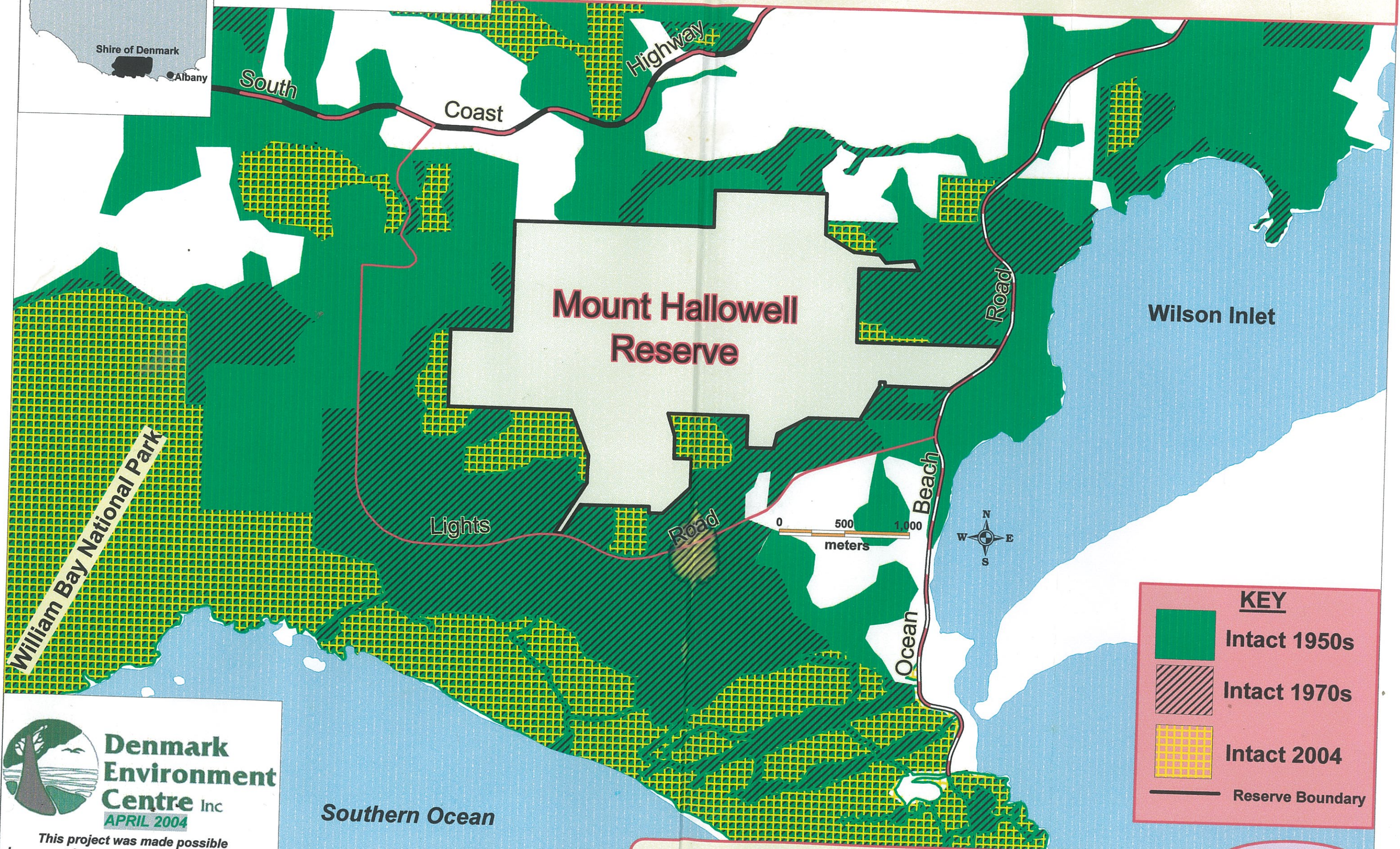
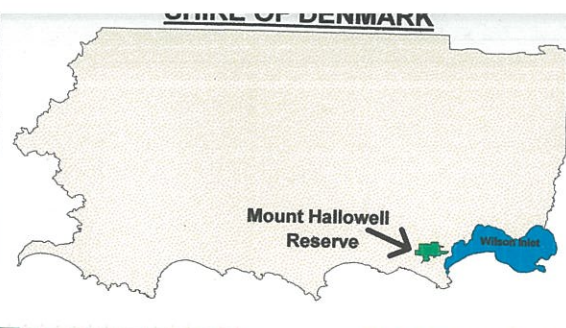
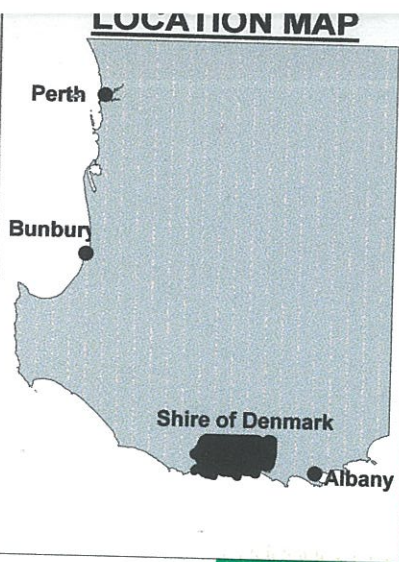
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MAP 4







Loss of Adjoining and Nearby Intact Vegetation Over Time



William Bay National Park

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KEY

-  Intact 1950s
-  Intact 1970s
-  Intact 2004
-  Reserve Boundary

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MAP 5