C A L M

# science

SUPPLEMENT TWO FEBRUARY 1995

WESTERN AUSTRALIAN JOURNAL OF

CONSERVATION AND LAND MANAGEMENT

DEPARTMENT OF CONSERVATION
AND LAND MANAGEMENT

**CALM**Science

Published by the Department of Conservation and Land Management, PO Box 104, Como, Western Australia 6152

## AIM

To foster awareness, understanding and support for the science on which CALM's nature conservation and natural land management activities in Western Australia are based.

## SCIENCE PUBLICATIONS UNIT

**Coordinator:** Kevin F. Kenneally
**Editor:** Marianne R.L. Lewis
**Assitant Editor:** Wendy Searle

The Science Publications Unit links the work of two CALM divisions: Science and Information and Corporate Relations. It forms part of the latter's Programs and Publications section. Its purpose is to present the scientific work of CALM to a professional readership on a regular basis. *CALMScience* is one product of the unit.

## SCIENCE PUBLICATIONS COMMITTEE

Dr Ian Abbott
Dr James Armstrong
Dr Ray Bailey
Dr Per Christensen
Mr Ron Kawalilak
Dr Neville Marchant
Dr Tony Start

## PROJECT FUNDING

This project was funded by the States Cooperative Program 1987-1990, Australian Nature Conservation Agency (formerly Australian National Parks and Wildlife Service).

## ENQUIRIES

Enquiries regarding distribution and subscriptions should be addressed to the Marketing Manager, Corporate Relations Division, Department of Conservation and Land Management.
Phone: (09) 334 0296 Fax: (09) 334 0498

© Copyright CALM, 1995, ISSN 1320 145X
All material in this journal is copyright and may not be reproduced except with the written permission of the publishers.

Department of Conservation and Land Management, Western Australia.

C A L M
science
SUPPLEMENT TWO FEBRUARY 1995

WESTERN AUSTRALIAN
JOURNAL OF CONSERVATION
AND LAND MANAGEMENT

PAGES 1-206

# Survey of rare and poorly known eucalypts of Western Australia

ANNE E. KELLY, ANNA C. NAPIER AND
STEPHEN D. HOPPER

## CONTENTS

PAGE 1

SUMMARY

INTRODUCTION

PAGE 2

SURVEY ORGANISATION

PAGE 14

RESULTS OF THE SURVEY

PAGE 23

PROBLEMS AND RECOMMENDATIONS

RARE AND POORLY KNOWN EUCALYPTS OF WESTERN AUSTRALIA

*Eucalyptus absita*
*Eucalyptus acies*
*Eucalyptus aequioperta*
*Eucalyptus angustissima* subsp. *angustissima*
*Eucaylptus annuliformis*
*Eucalyptus aquilina*
*Eucalyptus 'arborella'*
*Eucalyptus arenaria*
*Eucalyptus argutifolia*
*Eucalyptus articulata*
*Eucalyptus aspersa*
*Eucalyptus balanites*
*Eucalyptus beardiana*
*Eucalyptus bennettiae*
*Eucalyptus blaxellii*
*Eucalyptus bleeseri*
*Euaclyptus brachyandra*
*Eucalyptus* aff. *brachycalyx*
*Eucalyptus brachyphylla*
*Euaclyptus brevipes*
*Eucalyptus brevistylis*
*Eucalyptus brockwayi*
*Eucalyptus burdettiana*
*Eucalyptus caesia* ssp. *caesia*
*Eucalyptus caesia* ssp. *magna*
*Eucalyptus calcicola*
*Eucalyptus carnabyi*
*Eucalyptus ceracea*
*Eucalyptus cerasiformis*
*Eucalyptus chlorophylla*
*Eucalyptus chrysantha*
*Eucalyptus clavigera*
*Eucalyptus collina*
*Eucalyptus confluens*
*Eucalyptus 'continens'*
*Eucalyptus coronata*
*Eucalyptus corrugata*
*Eucalyptus creta*
*Eucalyptus crispata*
*Eucalyptus crucis* ssp. *crucis*
*Eucalyptus crucis* ssp. *lanceolata*

*Eucalyptus crucis* ssp. *praecipua*
*Eucalyptus cuprea*
*Eucalyptus cupularis*
*Eucalyptus deflexa*
*Eucalyptus densa* ssp. *improcera*
*Eucalyptus depauperata*
*Eucalyptus deserticola*
*Eucalyptus desmondensis*
*Eucalyptus dielsii*
*Eucalyptus 'diminuta'*
*Eucalyptus dissimulata*
*Eucalyptus dolichorhyncha*
*Eucalyptus dolorosa*
*Eucalyptus ebbanoensis* ssp. *photina*
*Eucalyptus effusa*
*Eucalyptus erectifolia*
*Eucalyptus erythrandra*
*Eucalyptus exigua*
*Eucalyptus exilis*
*Eucalyptus famelica*
*Eucalyptus ficifolia*
*Eucalyptus fitzgeraldii*
*Eucalyptus flavida*
*Eucalyptus foecunda*
*Eucalyptus foecunda* ssp. "Cliff Head"
*Eucalyptus formanii*
*Eucalyptus forrestiana*
*Eucalyptus fraseri* ssp. "blackbutt"
*Eucalyptus georgei* ssp. *fulgida*
*Eucalyptus georgei* ssp. *georgei*
*Eucalyptus goniantha* ssp. *goniantha*
*Eucalyptus goniantha* ssp. *notactites*
*Eucalyptus 'graniticola'*
*Eucalyptus griffithsii* ssp. "small fruited"
*Eucalyptus guilfoylei*
*Eucalyptus halophila*
*Eucalyptus herbertiana*
*Eucalyptus histophylla*
*Eucalyptus impensa*
*Eucalyptus incrassata* ssp. "narrow"
*Eucalyptus incrassata* ssp. "robust"
*Eucalyptus insularis*
*Eucalyptus jacksonii*
*Eucalyptus jimberlanica*
*Eucalyptus johnsoniana*
*Eucalyptus jutsonii*
*Eucalyptus kalganensis*
*Eucalyptus kruseana*
*Eucalyptus kumarlensis*
*Eucalyptus lamprocalyx*
*Eucalyptus lanepoolei*
*Eucalyptus* aff. *lanepoolei*
*Eucalyptus latens*
*Eucalyptus lateritica*
*Eucalyptus lehmannii* ssp. "Quoin Head"
*Eucalyptus leprophloia*
*Eucalyptus ligulata*
*Eucalyptus litorea*
*Eucalyptus* aff. *longicornis*
*Eucalyptus macrandra*
*Eucalyptus macrocarpa* ssp. *elachantha*
*Eucalyptus megacornuta*
*Eucalyptus melanophitra*
*Eucalyptus merrickiae*
*Eucalyptus microschema*
*Eucalyptus 'mimica'*
*Eucalyptus misella*
*Eucalyptus mooreana*
*Eucalyptus newbeyi*
*Eucalyptus nigrifunda*
*Eucalyptus "nutans"*
*Eucalyptus occidentalis* var. *stenantha*
*Eucalyptus 'olivacea'*
*Eucalyptus orbifolia*
*Eucalyptus ornata*
*Eucalyptus ovularis*
*Eucalyptus pendens*
*Eucalyptus 'petila'*
*Eucalyptus petrensis*
*Eucalyptus phylacis*
*Eucalyptus pilbarensis*
*Eucalyptus pimpiniana*
*Eucalyptus* aff. *platypus*
*Eucalyptus polita*
*Eucalyptus prominens*
*Eucalyptus pruiniramis*
*Eucalyptus pterocarpa*
*Eucalyptus pyrophora*
*Eucalyptus rameliana*
*Eucalyptus 'recondita'*
*Eucalyptus 'redacta'*
*Eucalyptus rhodantha* var. *petiolaris*
*Eucalyptus rhodantha* var. *rhodantha*
*Eucalyptus rigens*
*Eucalyptus 'rivalis'*
*Eucalyptus rudis* ssp. *cratyantha*
*Eucalyptus* aff. *salmonophloia*
*Eucalyptus sargentii*
*Eucalyptus semiglobosa*
*Eucalyptus sepulcralis*
*Eucalyptus* sp. C (aff. *diversifolia*)
*Eucalyptus* sp. M (aff. *olcosa*)
*Eucalyptus* sp. U (aff. *pileata*)
*Eucalyptus sparsa*
*Eucalyptus steedmanii*
*Eucalyptus stoatei*
*Eucalyptus stowardii*
*Eucalyptus subangusta* ssp. *pusilla*
*Eucalyptus suberea*
*Eucalyptus subtilis*
*Eucalyptus synandra*
*Eucalyptus talyuberlup*
*Eucalyptus terebra*
*Eucalyptus websteriana*
*Eucalyptus woodwardii*
*Eucalyptus zopherophloia*

PAGE 182

ACKNOWLEDGEMENTS

REFERENCES

PAGE 187

GLOSSARY

PAGE 188

APPENDICES

INSIDE BACK COVER

NOTES ON CONTRIBUTORS

INSTRUCTIONS TO AUTHORS

CALMScience Supplement 2: 1-207 (1995)

# Survey of rare and poorly known eucalypts of Western Australia

ANNE E. KELLY[1], ANNA C. NAPIER[2] AND STEPHEN D. HOPPER[3]

Illustrations by Susan J. Patrick (CALM) unless stated otherwise.

[1]BioConservation Group, Department of Conservation and Land Management, Herbarium, Como 6151, Western Australia

[2]Main Roads Western Australia, East Perth 6004, Western Australia

[3]Kings Park and Botanic Garden, West Perth 6005, Western Australia

## SUMMARY

The survey of rare and poorly known eucalypts was a cooperative project funded by the Australian Nature Conservation Agency with assistance from the Western Australian Department of Conservation and Land Management. It ran over a three-year period from March 1987 to June 1990 and involved the use of volunteer recorders to survey for rare and poorly known eucalypt taxa. One hundred and fifty-seven taxa were targeted for survey, including 36 Declared Rare Flora, many poorly collected and recently recognized taxa, and a number of widely cultivated eucalypts that are uncommon in the wild (e.g. *Eucalyptus woodwardii*, *E. erythrocorys*, *E. caesia*, *E. ficifolia*). An additional 23 taxa which had been listed by previous authors as rare but were known to be more common on the basis of recent surveys were also included.

The volunteers and coordinators conducted surveys and recorded information on location, habitat, population size, reserve status and associated species. Some 90 volunteers were involved and 57 made an active contribution by completing record sheets. The volunteers included CALM staff, amateur botanists and local interest groups, and were distributed throughout the State from Kununurra and Broome in the Kimberley to Kalbarri, Kalgoorlie, Esperance and Albany in the south-west.

The survey made use of a sophisticated computer system (FLORAPLOT) which enabled point plotting of locations according to specific criteria. A comprehensive report of the distribution of taxa was obtained by collating data from various sources, including herbarium collections, Departmental Rare Flora files, field notebooks, unpublished surveys and research work, discussion with botanists and a survey of the literature.

Records totalling 1075 were made for 103 taxa, 66 per cent of the total targeted for survey. Major achievements included discovery of five new taxa (*E. 'arborella'*, *E. lehmannii* ssp. "Quoin Head", *E.* aff. *platypus*, *E. 'rhomboidea'*, *E. 'surgens'*), and new populations for 13 Declared Rare Flora. Range extensions were recorded for a number of taxa, the most significant of these including *E. jutsonii*, *E. kalganensis*, *E. macrandra*, *E. 'petila'* and *E. pimpiniana*. There were 40 records of presumed hybrids, 24 of these occurring between taxa previously not known to hybridize. Some 300+ specimens were collected during the survey and dispatched to the Western Australian Herbarium.

Results of the survey are presented in individual treatments which include data on distribution, population size, conservation status and habitat. Recommendations for changes to conservation status are made based on the results of the survey. *Eucalyptus merrickiae* and *E. mooreana* are recommended for deletion from the schedule of Declared Rare Flora as they are no longer believed to be at risk. *Eucalyptus jimberlanica* is recommended for inclusion on the schedule, because no further populations were located after adequate survey. *Eucalyptus acies*, *E. aspersa*, *E. creta*, *E. erythrandra*, *E. formanii*, *E. ligulata* and *E. pimpiniana* were found to be more common than previously recognized and can be removed from the Priority Flora List.

Many taxa believed by previous authors to be rare or threatened were actually poorly known. The survey established that these taxa were, in fact, abundant and not at risk. Examples include *E. brevistylis*, *E. brockwayi*, *E. corrugata*, *E. ficifolia*, *E. forrestiana*, *E. georgei*, *E. guilfoylei*, *E. halophila*, *E. jacksonii*, *E. kruseana*, *E. macrandra*, *E. orbifolia*, *E. ornata*, *E. sargentii*, *E. stowardii* and *E. woodwardii*.

## INTRODUCTION

Eucalypts rank as Australia's best known and most useful native plants. Given their economic, cultural, ecological and aesthetic values, it is surprising how little is known of the biology of the vast majority of the *ca* 800 taxa.

Indeed, many taxa have only recently been described, and more than 100 await formal description by taxonomists (Brooker and Kleinig 1990; Brooker and Hopper 1991, 1993; Hill and Johnson 1992). Western Australia (WA) contains the largest concentration of these recently identified eucalypt taxa.

There is a coincidence of areas extensively cleared for agriculture with centres of exceptionally high native plant diversity and endemism in south-west WA (Hopper 1979a). This explains why the State has almost half (43 per cent) of Australia's total of 3329 plant taxa listed as rare and threatened by Briggs and Leigh (1988). The majority occur in the wheatbelt and other areas where extensive clearing and modification of the native vegetation have occurred. Threats to the flora include clearing for agriculture and other purposes, disease infection, weed invasion and inappropriate fire regimes (Hopper 1979b; Hopper *et al.* 1990).

WA is renowned for its abundant eucalypts, many displaying spectacular buds, fruits and flower colours. About 87 per cent of the 280 southern WA taxa treated in Brooker and Kleinig (1990) are endemic. The south coast region, in particular the Stirling Range and Fitzgerald River National Parks, are rich in eucalypt taxa.

Eucalypts feature prominently in lists of endangered Western Australian flora, with 81 taxa recorded by Briggs and Leigh (1988). There are 128 taxa listed on the Department of Conservation and Land Management (CALM) Declared Rare and Priority Flora List (1991), including the 36 taxa gazetted as rare flora (Appendix 2) under section 23F of the Western Australian Wildlife Conservation Act 1950. The Declared Rare and Priority Flora List includes poorly known taxa that may require special protection but do not meet the survey requirements for gazettal. Hopper *et al.* (1990) explained the legislation pertaining to Declared Rare Flora and the criteria for gazettal. Conservation of WA's rare and endangered eucalypts is significant as there are few areas in the world with such a large number of restricted endemic trees and mallees threatened by widespread destruction of their habitat (Hopper 1990).

The survey of rare and poorly known eucalypts of WA was initiated because of a need to gain more detailed information on the distribution and abundance of many eucalypt taxa. Through effectively coordinated surveys it aimed to document the ranges of rare and poorly known taxa and to gain knowledge on their population size, conservation status and preferred habitat. From these data appropriate and effective protection and management practices can be implemented. Most importantly, threatened taxa can be identified and action taken to ensure against their extinction.

The survey was a cooperative project funded by the Australian Nature Conservation Agency (formerly Australian National Parks and Wildlife Service) with assistance from the WA Department of Conservation and Land Management (CALM). It ran over a three-year period from March 1987 through to June 1990. It was based on the successful nationwide *Banksia Atlas* which involved the use of volunteers for mapping *Banksia* species. The Department of Fisheries and Wildlife (prior to 1984), and then CALM, pioneered volunteer flora surveys in Australia, firstly with pilot projects on kangaroo paws and orchids and then with *The Banksia Atlas* (Taylor and Hopper 1988). Volunteer surveys are of two-fold advantage because they cover a larger area in greater detail than surveys by paid professionals, and they help in promoting interest in the environment to members of the public. They also greatly assist taxonomic research, as many problems of identification arise with a large and interested workforce mapping the taxa of concern.

The survey included 157 taxa which were known or believed to be rare, geographically restricted or for which there was insufficient information to assess their conservation status. The total included the 36 Declared Rare Flora, many poorly collected and recently recognized taxa, and a number of widely cultivated eucalypts (e.g. *E. woodwardii*, *E. erythrocorys*, *E. caesia*, *E. ficifolia*) that are uncommon in the wild. The majority are endemic to Western Australia while a few occur as more widespread taxa with disjunct outliers in Western Australia. Also included were 23 'common' taxa which had been listed by previous authors as rare but are now known to be more common and at no risk. The large number of taxa of interest is a reflection of active research over recent years and increased surveys in previously inaccessible areas. Indeed the number increased from 99 at the commencement of the survey to 157 by 1988, as the real magnitude of the task was realized with accelerated taxonomic and survey efforts.

## SURVEY ORGANIZATION

### Administration

The survey of rare and poorly known eucalypts was a volunteer project structured on *The Banksia Atlas* (Taylor and Hopper 1988). It was overseen by Dr Stephen Hopper and coordinated by consultant botanists (Anne Kelly, Anna Napier and Anne Taylor) working on a 'job-share' basis. The coordinators were located at CALM's Wildlife Research Centre at Woodvale. Their duties included overall administration of the project, preparation of field guides and the volunteer recording kit, recruitment of volunteers, answering inquiries, assisting with identification of eucalypt taxa, coordinating field surveys by CALM staff and volunteers, checking record sheets, processing specimens and conducting surveys for the taxa of interest.

### Determining Taxa of Interest

The list of taxa to be surveyed was compiled from references on possibly rare and vulnerable species (Specht *et al.* 1974; Hartley and Leigh 1979; Marchant and Keighery 1979; Leigh *et al.* 1981; Pryor 1981; Rye and Hopper 1981; Patrick and Hopper 1982; Rye 1982; CALM Declared Rare and Priority Flora List). It was supplemented by taxa suggested by Ian Brooker (CSIRO) and Stephen Hopper who have done much work on *Eucalyptus* survey and taxonomy. In 1986 current literature and lists of endangered flora suggested that 99 WA taxa were in need of survey. As a consequence of further research and discoveries made during the survey itself, a total of some 157 taxa were investigated.

Table 1 collates conservation status data from the lists of rare and endangered flora for WA. It also includes CALM conservation status as at 1990 (Hopper *et al.* 1990) and recommended status at the completion of the survey. Interestingly, the first list published (Specht *et al.* 1974) contained only ten species and included jarrah (*Eucalyptus marginata*) as 'a species of geographical importance (with a disjunct or isolated distribution)'. Assessment of conservation status has become more sophisticated and rigorous over the years with 81 eucalypts included by Briggs and Leigh (1988) and some 120+ taxa listed on the most recent CALM Declared Rare and Priority Flora List (1991).

The taxa of interest were divided into CALM Management Regions (Fig. 1) to organize the total into more manageable units. Initial work focused on the South Coast Region where the largest percentage of rare and poorly known taxa was located (Table 2).

## Computing

The survey made use of a sophisticated computer system (FLORAPLOT) developed by CALM's Paul Gioia for projects such as *The Banksia Atlas*. It enables point plotting of locations according to specific criteria (e.g. by taxa, geographic area) and can generate maps at varying scales, from a few hectares to the whole of Australia. A database of records of rare and poorly known taxa was established on the FLORAPLOT system. All survey results were accessed on to FLORAPLOT during the course of the project.

## Collating Available Data

Data for the target taxa were collated by examining specimens at the Western Australian Herbarium, and from Departmental rare flora files, research data, field notebook records of Stephen Hopper, unpublished surveys (e.g. Lievense 1981; Bennett 1982; Burgman 1985a), discussion with botanists and survey of the literature. Location data from specimens at CALM's Kimberley Regional office and from specimens collected for oil content studies at Murdoch University were also included. Unfortunately, the collections in the CALM Regional Herbaria at Karratha and Albany were not examined and may have provided useful data.

The locality and other data (habitat, population size, flowering period) were entered onto the record sheets (see section Data Recording) and then onto the FLORAPLOT computer system. Locations from some sources were imprecise, and while an attempt was made to confirm these during survey work this was not always possible. The latitude and longitude coordinates were completed as accurately as possible but their precision depended upon the exactness of the original recording. Collections with location details that were too vague were excluded. Every effort was made by the coordinators to determine the occurrence of a taxon in conservation reserves from available maps but this was not always possible for some areas.

Throughout the survey, record sheets were completed by the coordinators and volunteers for all new sites and entered onto the database.

## Volunteer Recruitment and Communication

Active recruitment commenced in April 1987 with a press release prepared by CALM and subsequent reporting in several rural newspapers (*Western Farmer*, *Farmers Weekly*, *South West Times* and *Kalgoorlie Miner*) and rural radio. Personal requests to participate in the survey were sent to CALM district and regional offices, wildflower societies, naturalist clubs and active contributors to *The Banksia Atlas*. Short presentations were given by the coordinators at several Wildflower Society meetings and at the Declared Rare Flora Management Workshops conducted by CALM in September 1988 and 1989. A short notice encouraging participation appeared in the Departmental circulars 'CALM News' (Appendix 3) and 'Research News'. It was intended to involve as many CALM staff as possible because they have a good knowledge of their own districts and access to areas that are often not easily accessible to the general public. Many of the volunteers became aware of the survey through acquaintances and made the initial contact with the coordinators.

Some 90 volunteers, including CALM staff, were supplied with recording kits (see section Volunteer Recording Kit) although not all of them were active contributors. They were distributed throughout the State from Kununurra and Broome in the Kimberley to Kalbarri, Kalgoorlie, Esperance and Albany. As recommended in *The Banksia Atlas* (Taylor and Hopper 1988), a high priority was given to personal communication during the project. The volunteers were sent personal letters with the recording kit after their initial expression of interest. Further letters were sent after receiving specimens and completed record sheets. Newsletters detailing progress and recommending areas for further survey were distributed to all volunteers in April 1988, October 1988, April 1989 and November 1989. The volunteers were encouraged to contact the coordinators at any time and to visit the Wildlife Research Centre to discuss any problems and to identify specimens. Every effort was made to visit volunteers when working in their area and several trips were timetabled to include field work with them. In particular, a trip was made to Kalgoorlie to talk at the Naturalists' Club meeting and to spend two days on a 'familiarization tour' of local eucalypts with interested members (Appendix 4).

## Volunteers' Recording Kit

The volunteers' recording kit contained:

Introductory letter (Eucalypt Survey Supplement) providing background information on the survey and detailing modifications required to adapt *The Banksia Atlas* record sheets (see Appendix 5).

Field Guide/s for appropriate regions and list of taxon codes.

Instruction booklet - *Banksia Atlas Instruction Booklet and Supplementary Field Guide* (Taylor and Hopper 1984) - prepared for *The Banksia Atlas* and containing instructions and worked examples showing how to fill in record sheets.

Book of computer-based sight record sheets.

Index to the 1:100 000 topographical map series for WA.

Field guides were prepared by the coordinators for the taxa of interest because at the commencement of the survey an up-to-date and comprehensive reference was not available for eucalypts of WA. Chippendale's (1973) *Eucalypts of the Western Australian Goldfields (and the adjacent wheatbelt)*, although outdated, was an invaluable aid but expensive and difficult to purchase. In the latter part of the survey Brooker and Kleinig's (1990) *Field Guide to Eucalypts, Volume 2* was available.

Because the total number of taxa of interest was large, the field guides were produced by regions. The field guides covered eight of the eleven CALM Regions (Fig. 1):

South Coast

Wheatbelt

Greenough

Goldfields

Forests (Northern, Central and Southern) and Metropolitan

The field guides included FLORAPLOT maps of known distribution, line drawings with distinguishing features indicated, description of habitat, additional field characteristics and a comparison with closely related taxa (Fig. 2). The descriptions were based on the manuscript of the *Field Guide to Eucalypts, Volume 2* (Brooker and Kleinig 1990) and unpublished research results of Ian Brooker, Stephen Hopper, Lawrie Johnson, Ken Hill and Don Blaxell. The guides also included background information on the survey, a key to botanical terms used in reference to *Eucalyptus*, advice on obtaining permits and instructions on collecting and processing eucalypt specimens. Field guides were not prepared for the taxa of interest in the northern regions (Kimberley, Pilbara and Gascoyne) but FLORAPLOT maps, descriptions and other relevant information were distributed to interested people.

The volunteers were provided with the *Banksia Atlas Instruction Booklet and Supplementary Field Guide* (Taylor and Hopper 1984) which gave detailed instructions on completing the sight record sheets. *The Banksia Atlas* record sheets (Fig. 3) were used for the rare and poorly known eucalypt survey as there were sufficient copies available and they required only a few modifications. The changes to adapt the sheets for this project were outlined in the introductory letter in the volunteers' kit (Appendix 5). The record sheets included computer fields for location, habitat (soil, landscape, vegetation), population size, reserve status, associated eucalypts and other biological data (e.g. flowering, response to fire, pollinators).

## Data Recording

The contributors were asked to fill out record sheets (Fig. 3) for the taxa of interest and send them to the coordinators for checking and incorporation onto the database. A sight record sheet recorded data from a single record locality, i.e. the place where one or more of the eucalypts of interest was actually sighted. The record covered a maximum area of 500 x 500 m where the habitat was uniform. If the habitat changed within this area then a new sight record sheet was completed. Only naturally-occurring eucalypts were recorded.

Because of the difficulty in identifying many of the eucalypts and because the survey focused on rare taxa for which a confirmed identification was essential, the volunteers were requested to send in voucher specimens when:

the population was a significant distance from the nearest known location of the taxon;

the recorder was unsure of the identification;

the population represented a new or unusual variant of a taxon.

All specimens forwarded to the Wildlife Research Centre by the volunteers were processed and lodged at the WA Herbarium. Duplicate material from the South Coast Region was sent to the Albany Regional Herbarium.

Throughout the survey record sheets were completed by the coordinators from field observations and also entered onto the database. Other sources of data are listed in the section Collecting Available Data.

## Field work by the Coordinators

The coordinators were actively involved in searching for the taxa of interest and spent a considerable part of their time in the field. Known sites were visited to enable familiarization with both rare and common taxa and to search further for new locations. Many old and doubtful records were searched for to determine whether they still existed and to identify more accurate locations.

Surveys by the coordinators focused on:

areas where there were few volunteers (e.g. north-east wheatbelt);

areas where there was a high density of taxa of interest (e.g. Fitzgerald River National Park and south coast);

taxa that were under threat.

Initial survey work focused on the South Coast Region where the largest number of taxa and greatest percentage of rare and vulnerable taxa were located. Table 3 lists the field trips conducted by the coordinators during the course of the project. Expense and time constraints prevented any survey work by the coordinators in the northern regions and remote inland areas.

TABLE 1

Conservation status of Western Australian eucalypts listed by various authors as rare or threatened.

| | CONSERVATION STATUS[a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| *absita* | | | | | | | V | DRF | DRF |
| *acies* | | F | N | E | R | G(B) | R | P3 | C |
| *aequioperta* | | | | | | | | | P2 |
| *albida* | | | | V | | | | | C |
| *angustissima* ssp. *angustissima* | | | N | | R | | R | | C |
| *annuliformis* | | | | | | | | P1 | P1 |
| *aquilina* | | B | C | E | R | VR | R | P4 | P4 |
| *'arborella'* | | | | | | | | | P3 |
| *arenaria* | | D | | | | | | | P4 |
| *argillacea* | | | | | | | R | | C |
| *argutifolia* | | | | | | | V | DRF | DRF |
| *articulata* | | | | | | | R | DRF | DRF |
| *aspersa* | | | | | | | | P4 | C |
| *balanites* | | | | | | | V | DRF | DRF |
| *beardiana* | | D | | E | | G(B) | V | DRF | DRF |
| *bennettiae* | | | | | | | V | DRF | DRF |
| *blaxellii* | | | | | | | V | DRF | DRF |
| *bleeseri* | | D | | | | | | | C |
| *brachyandra* | | | | V | | | | | C |
| aff. *brachycalyx* | | | | | | | | | P2 |
| *brachyphylla* | | B | N | | | G(A) | V | | P8 |
| *brevipes* | | | | | | | V | DRF | DRF |
| *brevistylis* | | B | C | V | V | G(A) | R | P3 | P4 |
| *brockwayi* | | | V | E | V | | R | | P4 |
| *buprestium* | | F | N | | | G(B) | | | C |
| *burdettiana* | | B | N | E | V | VR | R | DRF | DRF |
| *caesia* ssp. *caesia* | 3 | | V | E | R | | R | P4 | P4 |
| *caesia* ssp. *magna* | | | | | | | | | |
| *calcicola* | | B | E | E | V | R | R | P4 | P4 |
| *carnabyi* | 2 | B | | | | VR | V | | P8 |
| *ceracea* | | | | | | | V | DRF | DRF |
| *cerasiformis* | | D | N | | V | G(A) | V | DRF | DRF |
| *chlorophylla* | | | | | | | | | P3 |
| *chrysantha* | | | | | | | | P2 | P8 |
| *clavigera* | | | | | | | | | C |
| *collina* | | D | | V | | | | | C |
| *comitae-vallis* | | | | V | | | | | C |
| *conferruminata* | | | | | | | | | C |
| *confluens* | | | N | | R | | K | | C |
| *'continens'* | | | | | | | | P1 | P1 |
| *cornuta* | | | | | R | | | | C |
| *coronata* | | B | V | E | R | R | V | DRF | DRF |
| *corrugata* | | | N | | R | | K | | C |
| *creta* | | | | | | | | P3 | C |
| *crispata* | | | | | | | V | DRF | DRF |
| *crucis* ssp. *crucis* | | F | N | V | R | | V | DRF | DRF |
| *crucis* ssp. *lanceolata* | | | | | | | | | C |
| *crucis* ssp. *praecipua* | | | | | | | | DRF | DRF |
| *cuprea* | | | | | | | E | DRF | DRF |
| *cuplaris* | | E | N | E | | | | | P3 |
| *decurva* | 6 | | | | | | | | C |
| *deflexa* | | | N | | V | | V | P4 | P4 |
| *densa* ssp. *densa* | | | | | | | | | C |
| *densa* ssp. *improcera* | | | | | | | | | C |
| *depauperata* | | | | | | | | P3 | P3 |
| *deserticola* | | | | | | | | | C |
| *desmondensis* | 3 | B | V | E | V | R | V | P4 | P4 |
| *dielsii* | | | V | | V | | | | C |
| *'diminuta'* | | | | | | | | P2 | P2 |
| *diptera* | | | | V | | | | | C |
| *discreta* | | | | | | G(A) | | | C |
| *dissimulata* | | | | | | | | | C |
| *dolichorhyncha* | | | | | | | | | P4 |
| *dolorosa* | | | | | | | | DRF | DRF |
| *dundasii* | | | N | | | | | | C |

TABLE 1 (continued)

| | CONSERVATION STATUS[a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| *ebbanoensis* ssp. *photina* | | | | | | | | P2 | P3 |
| *effusa* | | D | N | | R | G(A) | K | | P3 |
| *erectifolia* | | | | | | | V | DRF | DRF |
| *erythrandra* | | | | | | | | P4 | C |
| *erythrocorys* | | | V | V | | | | | C |
| *exigua* | | | | | | | | | P3 |
| *exilis* | | | N | | R | R | R | P4 | P4 |
| *famelica* | | | | | | | | P2 | P3 |
| *ficifolia* | | B | C | E | R | G(A) | R | | C |
| *fitzgeraldii* | | | E | E | R | | R | | P3 |
| *flavida* | | | | | | | | | C |
| *foecunda* | | | | | | | | P4 | P4 |
| *foecunda* ssp. "Cliff Head" | | | | | | | | P3 | P3 |
| *formanii* | | | N | | R | | R | P4 | C |
| *forrestiana* | | | V | | V | | | | C |
| *fraseri* ssp. *fraseri* | | | N | | R | | R | | C |
| *fraseri* ssp. "blackbutt" | | | | | | | | P2 | P2 |
| *gardneri* | | | N | | R | | | | C |
| *georgei* ssp. *fulgida* | | | | | | | R | P2 | P3 |
| *georgei* ssp. *georgei* | | D | N | E | R | G(B) | R | P4 | P4 |
| *gittinsii* | | D | C | | R | | | | C |
| *gomphocephala* | | | C | | | | | | C |
| *goniantha* ssp. *goniantha* | | | | V | | | K | DRF | DRF |
| *goniantha* ssp. *notactites* | | | | | | | | | C |
| *'graniticola'* | | | | | | | | DRF | DRF |
| *griffithsii* ssp. "small fruited" | | | | | | | | P1 | P2 |
| *grossa* | | | | V | | | | | C |
| *guilfoylei* | | B | C | V | V | G(A) | R | | C |
| *haematoxylon* | | | | V | | | | | C |
| *halophila* | | | | E | | | V | | C |
| *herbertiana* | | | | | | | | | C |
| *histophylla* | | | | | | | K | P3 | P4 |
| *impensa* | | | | | | | | DRF | DRF |
| *incrassata* ssp. "narrow" | | | | | | | | | P2 |
| *incrassata* ssp. "robust" | | | | | | | K | | P3 |
| *insularis* | | B | C | E | V | VR | R | DRF | DRF |
| *jacksonii* | | B | V | V | V | G(A) | R | | C |
| *jimberlanica* | | | | | | | | P1 | DRF |
| *johnsoniana* | | D | | E | E | VR | V | DRF | DRF |
| *jutsonii* | | | N | | R | | R | P2 | P4 |
| *kalganensis* | | | | | | | | P2 | P3 |
| *kessellii* | | | N | | | | | | C |
| *kruseana* | | | V | E | V | R | R | P4 | P4 |
| *kumarlensis* | | | | | | | | | P3 |
| *laeliae* | | F | C | | R | G(B) | | | C |
| *lamprocalyx* | | C | | | | | | | C |
| *lanepoolei* | | | | E | | | | | C |
| aff. *lanepoolei* | | | | | | | | | P1 |
| *latens* | | | | | | | V | DRF | P4 |
| *lateritica* | | | | | | | V | DRF | DRF |
| *lehmannii* | | | | V | | | | | C |
| *lehmannii* ssp. "Quoin Head" | | | | | | | | | P2 |
| *leprophloia* | | | | | | | V | DRF | DRF |
| *ligulata* | | | N | | R | | R | P4 | C |
| *litorea* | | | | | | | | P2 | P2 |
| aff. *longicornis* | | | | | | | | | P3 |
| *macrandra* | | | C | | R | | R | | C |
| *macrocarpa* ssp. *elachantha* | | | | | | | | P3 | P4 |
| *marginata* | 6 | | | | | | | | C |
| *megacornuta* | 3 | B | E | E | V | G(A) | R | | P4 |
| *melanophitra* | | | | | | | R | P4 | P4 |
| *melanoxylon* | | | | V | | | | | C |
| *merrickiae* | | | N | | R | | V | DRF | P4 |
| *microschema* | | | | | | | | P3 | P3 |
| *'mimica'* | | | | | | | | P1 | P1 |
| *misella* | | | | | | | | P3 | P2 |
| *mooreana* | | | N | V | R | | V | DRF | P4 |
| *newbeyi* | | | | | | G(A) | R | P3 | P3 |
| *nigrifunda* | | | | | | | | P4 | P4 |

TABLE 1 (continued)

| | CONSERVATION STATUS[a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| *"nutans"* | | | C | | R | | R | | C |
| *obtusiflora* (=*dongarraensis*) | | | | V | | | | | C |
| *occidentalis* var. *stenantha* | | | | | | | | | C |
| *'olivacea'* | | | | | | | V | DRF | DRF |
| *orbifolia* | | | N | | R | | | | C |
| *ornata* | | | | | | | R | | C |
| *ovularis* | | | | | R | | R | P3 | P3 |
| *pachyloma* | | | | V | | | | | C |
| *pendens* | 3 | B | E | E | V | R | R | P4 | P4 |
| *'petila'* | | | | | | | | P2 | P3 |
| *petrensis* | | | | | | | | P3 | P4 |
| *phylacis* | | | | | | | V | DRF | DRF |
| *pilbarensis* | | | | | | | R | P4 | P3 |
| *pimpiniana* | | | N | V | | | R | P3 | C |
| aff. *platypus* | | | | | | | | | P2 |
| *pluricaulis* | | | | | | | | | C |
| *polita* | | | | | | | | | P4 |
| *prominens* | | E | | | | | | | C |
| *pruiniramis* | | | | | | | V | DRF | DRF |
| *pterocarpa* | | | | | | | R | P2 | P2 |
| *pyrophora* | | | | | | | | | P3 |
| *rameliana* | | | | | | | K | PE | DRF |
| *'recondita'* | | | | | | | | | P4 |
| *'redacta'* | | | | | | | K | | P4 |
| *rhodantha* var. *petiolaris* | | | | E | E | VR | V | DRF | DRF |
| *rhodantha* var. *rhodantha* | | | | | | | | | |
| *rigens* | | | | | | | | | C |
| *rigidula* | | | | V | | | | | C |
| *'rivalis'* | | | | | | | | | P2 |
| *roycei* | | E | | | | G(A) | | | C |
| *rudis* ssp. *cratyantha* | | | | | | | | P3 | P2 |
| aff. *salmonophloia* | | | | | | | | P1 | P1 |
| *sargentii* | | | | V | | | | | C |
| *semiglobosa* | | | | | | | | P3 | P3 |
| *sepulcralis* | 3 | B | C | E | R | G(A) | R | | P4 |
| sp. C (aff. *diversifolia*) | | | | | | | V | DRF | DRF |
| sp. M (aff *oleosa*) | | | | | | | | P3 | P3 |
| sp. U (aff. *pileata*) | | | | | | | | P2 | P3 |
| *sparsa* | | | | | | | R | P3 | P3 |
| *steedmanii* | | D | E | E | E | R | V | DRF | DRF |
| *stoatei* | | | E | E | E | | V | P4 | P4 |
| *stowardii* | | | | E | | | | | C |
| *subangusta* ssp. *pusilla* | | | | | | | | | C |
| *suberea* | | | | | | | V | DRF | DRF |
| *subtilis* | | | | | | | | | P3 |
| *synandra* | | | | | | | | DRF | DRF |
| *talyuberlup* | | | | | | G(A) | | | P4 |
| *terebra* | | | | | | | | | C |
| *tetragona* | 6 | | | | | | | | C |
| *websteriana* | | | | | | | | | C |
| *woodwardii* | | | N | E | V | | R | | C |
| *xanthonema* | | | | | V | | | | C |
| *zopherophloia* | | | | | | | R | P4 | P4 |

[a] Conservation Status Codes

1. Specht *et al.* (1974)
   - 2 - endangered (only small colonies remain, under adverse conditions);
   - 3 - rare (population of adequate size but needs constant monitoring);
   - 5 - species known only from original collection (and more information needed on their distribution);
   - 6 - species of geographical importance (with a disjunct or isolated distribution).

2. Marchant and Keighery (1979)
   - B - rare;
   - C - represented in the Western Australian Herbarium only by the type specimen;
   - D - poorly collected. Less than five collections in the Western Australian Herbarium;
   - E - restricted to localities less than 100 km apart;
   - F - restricted to localities less than 160 km apart.

3. Hartley and Leigh (1979)

E - endangered species in serious risk of disappearing from the wild state within one or two decades if present land use and other casual factors continue to operate;
V - vulnerable. Species not presently endangered but at risk over a long period or if land use patterns are introduced which would be deleterious to the species;
N - other species listed under 1 to 5 (see distribution category below) which are not known to occur in national parks and other declared reserves;
C - species listed under 1 to 5 which are not currently endangered or vulnerable, and which are known to occur in national parks and other declared reserves.

1. - species known only from the type collection or type locality. Further study usually needed to ascertain present distribution and taxonomic status;
2. - restricted endemics whose known populations are limited in range (e.g. normally less than 100 km in maximum range);
3. - rare species occurring only in small populations but over a wider area; often restricted to specific habitats (e.g. sandstone areas high mountain peaks);
4. - species of geographical importance, especially those with a disjunct distribution in Australia and overseas and listed only if the Australian populations are localized or sparse;
5. - species not fitting closely into the above categories, but considered to be at risk. This includes some once common species which, though still widely distributed, have suffered marked depletions in overall population size.

4. Pryor (1981)

E - listed by Pryor as those 'species of highly restricted occurrence and endangered or potentially endangered'.
V - 'Species of relatively limited extent which may be threatened in the near future'.

5. Leigh *et al.* (1981).

and

7. Briggs and Leigh (1988).

E - endangered species in serious risk of disappearing from the wild state within one or two decades if present land use and other causal factors continue to operate;
V - vulnerable. Species not presently Endangered but at risk of disappearing from the wild over a longer period (20-50 years) through continued depletion, or which largely occur on sites likely to experience changes in land use that would threaten the survival of the species in the wild;
R - rare. Species which are rare in Australia but which overall are not currently considered endangered or vulnerable;
K - poorly known species that are suspected, but not definitely known, to belong to any of the above categories. At present field distribution information is inadequate.

6. Rye (1982)

R - rare, having less than a few thousand reproductively mature plants in the wild;
VR - very rare, having less than one thousand reproductively mature plants in the wild;
G(A) - geographically restricted, range of less than 100 km;
G(B) - geographically restricted, range between 100 and 160 km.

8. CALM STATUS as in Hopper *et al.* (1990)

and

9. RECOMMENDED CALM STATUS

DRF - Declared Rare Flora (extant taxa),
PE - Declared Rare Flora (presumed extinct taxa),
P1 - Priority One Taxa,
P2 - Priority Two Taxa,
P3 - Priority Three Taxa,
P4 - Priority Four Taxa,
P8 - Priority Eight Taxa,
C - Common, with no immediate conservation concern (see Appendix 6 for detailed explanation of conservation codes).

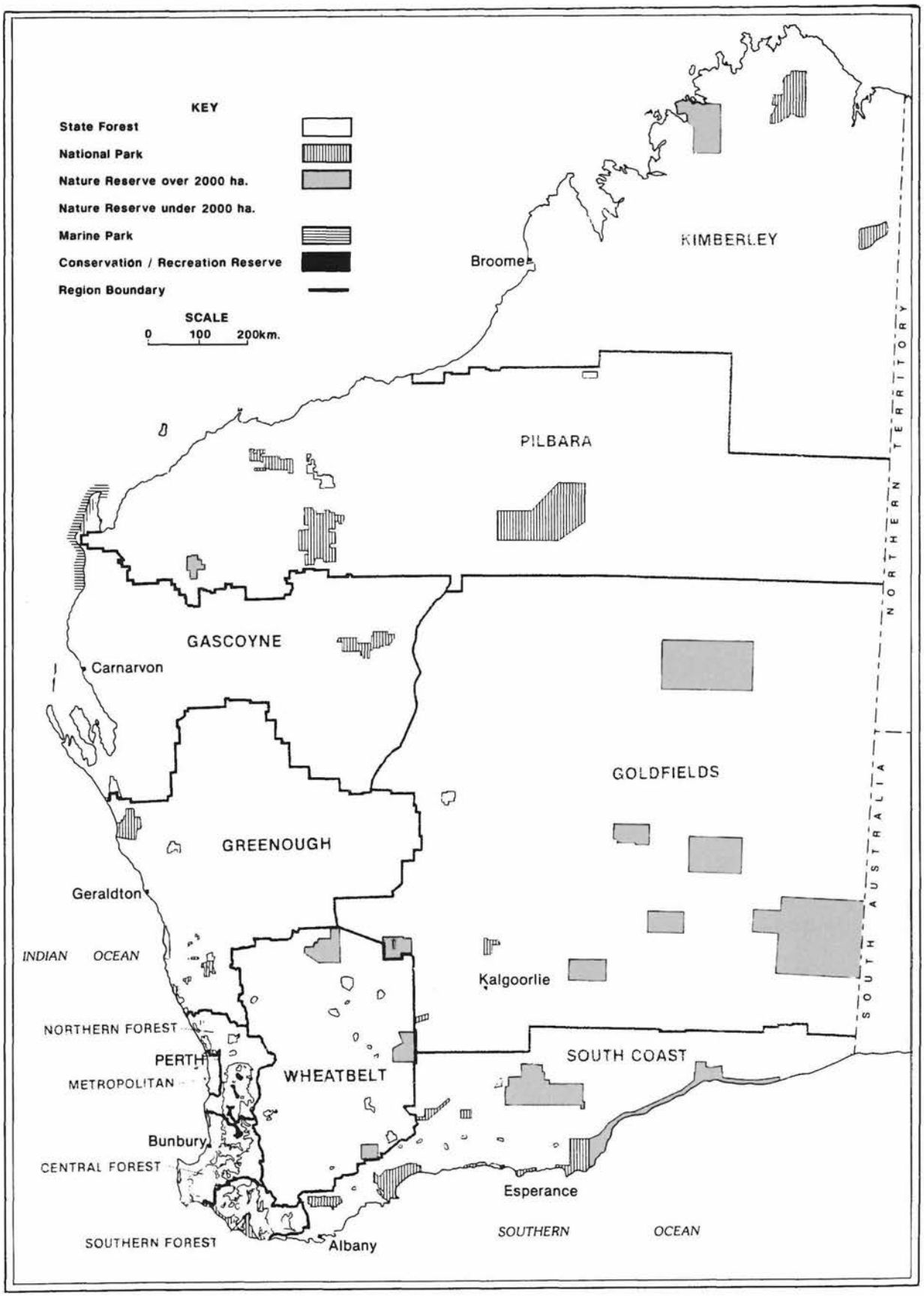



*Figure 1. CALM Management Regions.*

TABLE 2

Numbers of rare and poorly known eucalypts in CALM regions.

| REGION | IUCN CATEGORY[b] | | | | | | |
|---|---|---|---|---|---|---|---|
| | EXTINCT | ENDANGERED | VULNERABLE | RARE | INSUFFICIENTLY KNOWN | COMMON[a] | TOTAL |
| South Coast | - | - | 10 (32.2%) | 31(36.5%) | 23(38.3%) | 6(24.0%) | 70 |
| Wheatbelt | - | - | 2(6.4%) | 16(18.8%) | 9(15.0%) | 8(32.0%) | 35 |
| Greenough | - | 3(100%) | 11(35.6%) | 11(12.9%) | 5(8.2%) | 5(20.0%) | 35 |
| Goldfields | - | - | - | 11(12.9%) | 4(6.7%) | 2(8.0%) | 17 |
| Kimberley | - | - | - | 2(2.4%) | 13(21.7%) | - | 15 |
| Central Forest | - | - | 4(12.9%) | 3(3.5%) | 1(1.7%) | 1(4.0%) | 9 |
| Northern Forest | - | - | 3(9.7%) | 3(3.5%) | 1(1.7%) | 2(8.0%) | 9 |
| Southern Forest | - | - | - | 4(4.7%) | - | 1(4.0%) | 5 |
| Pilbara | - | - | - | 1(1.2%) | 3(5.0%) | - | 4 |
| Metropolitan | - | - | 1(3.2%) | 2(2.4%) | - | - | 3 |
| Gascoyne | - | - | - | 1(1.2%) | 1(1.7%) | - | 2 |
| TOTAL | 0 | 3 | 31(100%) | 85(100%) | 60(100%) | 25(100%) | 204 |

NB. Taxa occurring in more than one Region are counted for each Region.

[a] Taxa listed as common were considered in previously published works to be rare or poorly recorded but are actually common and at no risk on the basis of recent survey.

[b] IUCN Category (Lucas and Synge 1978)

Extinct - species not definitely located in the wild during the past 50 years;
Endangered - taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating;
Vulnerable - taxa believed likely to move into the 'Endangered' category in the near future if the causal factors continue operating;
Rare - taxa with small world populations that are not at present 'Endangered' or 'Vulnerable', but are at risk;
Insufficiently Known - taxa that are suspected but not definitely known to belong to any of the above categories, because of lack of information.

EUCALYPTUS CRUCIS Maiden subsp. CRUCIS

Southern Cross Silver Mallee

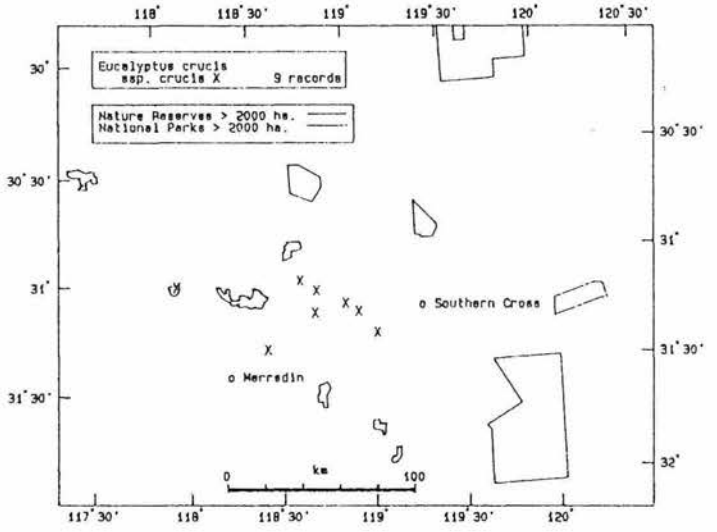
Distribution and Habitat: Restricted to the vicinity of large granite rock outcrops to the north and east of Westonia over a distance of about 55 km. It occurs in shallow granitic soils with species of *Casuarina*, *Acacia*, *Calothamnus* or *Kunzea*.

Flowering Period: December-March.

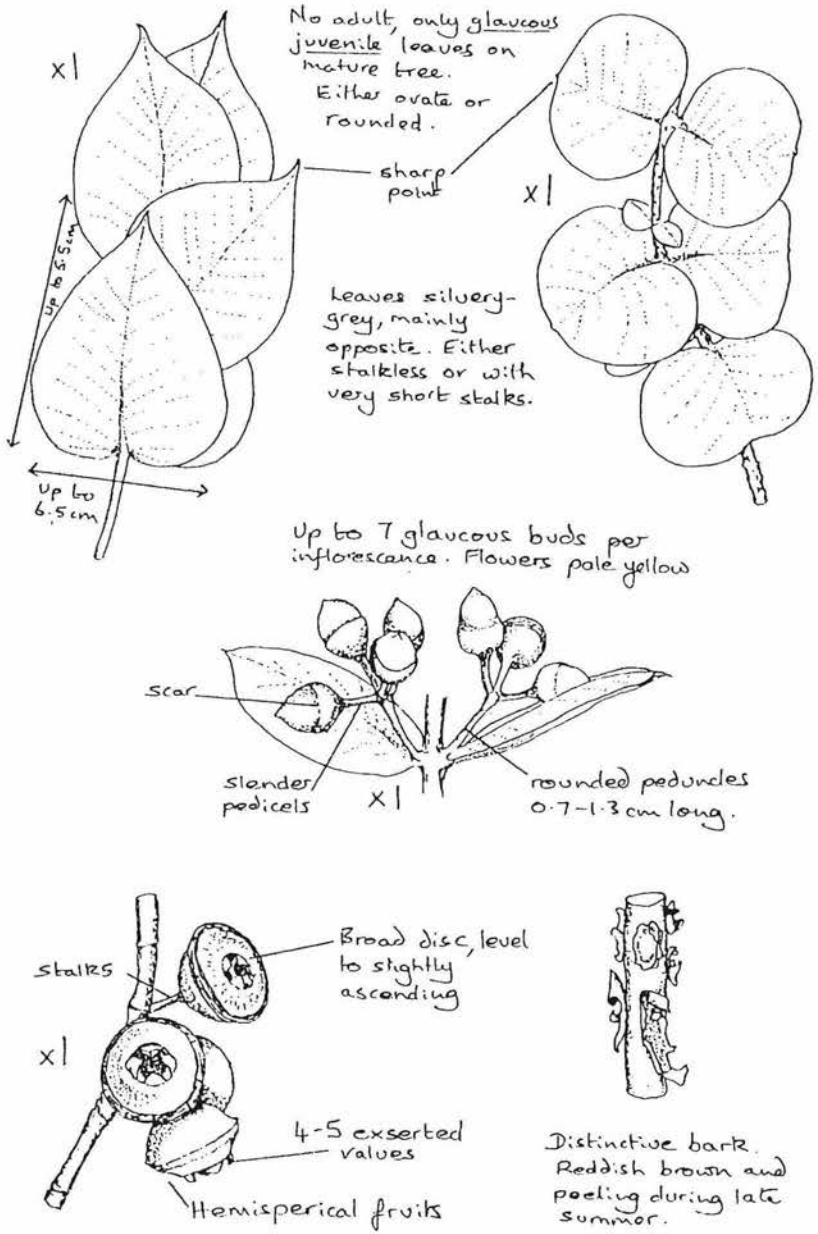
Additional Field Characteristics: A sprawling mallee or small tree up to 6 m in height with silvery-grey juvenile foliage on the mature tree. The basal bark is dark grey, rough and flaky with reddish-brown peeling bark above. The smaller branches, buds and fruits are glaucous. The ovoid buds measure 0.8-1.1 x 0.6-0.8 cm and are on slender pedicels. The fruits are 0.7-0.9 x 1.1-1.6 cm. The seed is grey and compressed-ovoid in shape.

*E. crucis* subsp. *crucis* is similar to *E. orbifolia* differing in its leaves being mostly opposite, generally stalkless and coming to a sharp point at the apex. *E. orbifolia* has rounded leaves which are mostly alternate, on stalks 1-2 cm long, and indented at the apex. *E. crucis* subsp. *crucis* differs from subsp. *lanceolata* in the latter having lanceolate-shaped adult leaves in its mature canopy and being a larger erect (not straggly) tree-mallee.

References: Brooker and Hopper (1982); Chippendale (1973); Elliott and Jones (1986); Brooker and Kleinig (ms).

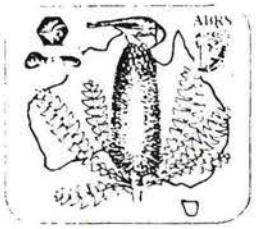



31




32

*Figure 2. An example of information provided in the Field Guides prepared for the survey.*



## BANKSIA ATLAS — SIGHT RECORD SHEET

Use BLOCK LETTERS to fill in blank boxes ☐ inserting one letter per space.
Shaded boxes ☐ are "for office use only".
On dashed lines use own handwriting.
If in doubt about a record, leave space blank.
Write zero as "Ø", seven as "7", letter i as "I", letter Z as "Z".

Observer: RCGEE | State code: WA | Date of Observation Yr Mn Dy: 88Ø628 | Record no. for day: 3

Map used and scale: Natmap Burdett 1:100 000

### LOCALITY

Latitude: GD33|26|24 | Longitude: 122ØØ58 | Locality Resolution code: 1 | Local Authority code: Ø46 | Name of Local Authority (Shire etc.): Esperance

Nearest named place: NP MOUNT BURDETT | Straight line distance from nearest place (km) (last digit ↓): 12 | Direction from nearest place: W (↑ first letter)

Further details of location: LO7·5S KM NORTH ALONG DEMPSTER ROAD FROM SCADDEN ROAD

Reserve or National Park? PR | Y = yes, N = no: Y | Reserve/Park Name: flora and fauna ↑ | Reserve number: 23768 | Reserve class: A

### HABITAT

Altitude (m) (last digit ↓): HT 160

Within 2 km of Coast? N (Y = yes, N = no) | Landform code: FL | Aspect of Slope (last letter): XXX

Surface Soil code: S | Soil Colour code: W | Vegetation Structure code: MA | Vegetation restricted by road verge? N (Y = yes)

If "x" (= other) recorded for any of above, please specify

Signs of Fire? (Y = yes, N = no) | If yes, approx. number of months ago (Ø = less than 1 month) (← last digit)

Dominant species at Record Locality: Banksia media dominated understorey.

### BANKSIAS PRESENT

| Name | Species code | Shrub (S) or Tree (T) | Population code | Flower code | New Shoot growth? (Y = yes, N = no) | Response to fire code | Average Height (metres) (last digit ↓) | Pollinator code | Specify Name of Pollinator if Known |
|---|---|---|---|---|---|---|---|---|---|
| OB E. erythrandra | ERY | S | B | F | Y | | 3·0 | | |
| OB E. uncinata | UNC | | | | | | | | |
| OB E. incrassata | INC | | | | | | | | |
| OB | | | | | | | | | |
| OB | | | | | | | | | |

BS3 ← Number of Banksia species at this Locality

Additional Remarks: Eucalyptus erythrandra in early flower. Dominant species in area.

*Figure 3. An example of a computer-based sight record sheet completed for the eucalypt survey.*

TABLE 3
Field trips conducted by the coordinators of the eucalypt survey.

| | |
|---|---|
| 9 - 13 Sep'87 | Ravensthorpe, Fitzgerald River National Park, Hopetoun |
| 5 - 10 Oct '87 | Stirling Range National Park, Porongurup National Park, Albany, Cape Riche, West Cape Howe National Park |
| 10 - 17 Nov '87 | Hyden-Norseman track, Esperance, Frank Hann National Park, Cape Le Grand National Park, Peak Charles National Park |
| 27 Jan - 2 Feb' 88 | West Cape Howe National Park, Denmark, Cape Riche, Pallinup River, Beaufort Inlet, Green Range, Warriup, Bluff Creek, South Sister Nature Reserve |
| 24 - 25 Feb' 88 | Mukinbudin. Guest speaker at meeting of Mukinbudin Branch, W.A. Wildflower Society. |
| 13 - 16 Jun' 88 | Koorda, Wyalkatchem, Manmanning, Kalannie |
| 6 Jul '88 | Wanneroo, Yanchep National Park |
| 12 - 14 Jul '88 | Wongan Hills, Ballidu, Dalwallinu, Cadoux |
| 8 - 12 Aug '88 | Quairading, Bruce Rock, Merredin, Narembeen, Kondinin, Corrigin |
| 18 Aug '88 | Burns Beach |
| 13 - 16 Sep '88 | Corrigin, Kondinin, Newdegate, Hyden, Dragon Rocks Nature Reserve |
| 3 - 4 Nov '88 | Badgingarra, Watheroo National Park, Dandaragan |
| 11 Nov '88 | Seabird, Gingin |
| 16 - 21 Jan '89 | Hyden, Newdegate, Jerramungup, Fitzgerald River National Park, Bremer Bay |
| 16 - 17 Feb '89 | Wandering, Jarrahdale |
| 21 - 23 Feb '89 | Leeuwin Naturaliste National Park |
| 14 - 16 Mar '89 | Badgingarra National Park, Alexander Morrison National Park, South Eneabba Nature Reserve, Yandanooka Nature Reserve, Arrowsmith |
| 29 Mar - 4 Apr '89 | Yelbeni, Geeranning Rock, Southern Cross, Marvel Loch, Coonana, Comet Vale. Guest speaker at Goldfields Naturalist Club meeting and two day trips with volunteers to see species of interest in the Kalgoorlie area. |
| 18 - 20 Apr '89 | Boothendarra Hill, Alexander Morrison National Park, South Eneabba Nature Reserve, Lesueur National Park |
| 10 - 11 May '89 | Wedge Island, Cervantes, Hill River, Coolimba |
| 22 - 26 May '89 | Yealering, Newdegate, Pingrup, Lake Magenta Nature Reserve |
| 23 Jun '89 | Gosnells, Beverley, Boyagin Rock Nature Reserve, Wandering |
| 6 - 8 Jun '89 | Katanning, Corackerup Nature Reserve, Fitzgerald River National Park, Cranbrook |
| 28 Jun '89 | Sorrento, Mogumber, Dandaragan |
| 17 - 21 Jul '89 | Moresby Range, Kalbarri National Park, Walkaway, Mt Adams, Boothendarra Hill |
| 28 Aug - 1 Sep '89 | Ravensthorpe, Dunn Rock Nature Reserve, Lake King, Karlgarin, Hyden |
| 28 Sep '89 | Fremantle, Mandurah |
| 8 Oct '89 | Wagerup |
| 10 Oct '89 | Mandurah, Yalgorup National Park |
| 31 Oct - 2 Nov '89 | Beaufort River, Albany |
| 15 Nov '89 | Waroona |
| 21-24 Nov '89 | Marchagee, Carnamah, Arrino, Morawa, Yandanooka |

## RESULTS OF THE SURVEY

The project made a significant contribution to the knowledge of the distribution and conservation status of the taxa of interest by confirming their occurrence at particular sites, recording new populations and extending known ranges. Records totalling 1075 were made for 103 taxa, 66 per cent of the total targeted for survey. Figure 4 maps the distribution of the rare and poorly known taxa in WA at the completion of the project in June 1990.

Table 2 shows the number of taxa according to CALM Region and IUCN rarity code (Lucas and Synge 1978). The eleven Regions are ranked according to the number of rare and threatened taxa, with the largest percentage occurring in the South Coast Region. The low number of rare and poorly known taxa in the Kimberley, Pilbara, Gascoyne and Goldfields Regions reflects, to a degree, the poor access and limited surveys in these areas.

Of the 90 volunteers who were sent recording kits, 57 contributed to the survey by completing record sheets for rare and poorly known taxa. Many others are known to have conducted surveys without successfully locating any of the eucalypts of interest. All those who contributed are listed in the acknowledgements.

Major achievements of the project included discovery of five new taxa and new records for 13 Declared Rare Flora. Observations of Declared Rare Flora are of particular importance as any new finds are a significant increase to the knowledge of their conservation status. New recordings and range extensions were made for many poorly known and restricted taxa. Major achievements of the survey are detailed in Table 4. Some 300+ rare, poorly known, presumed hybrid and 'interesting' eucalypt specimens were processed and dispatched to the WA Herbarium. There were 182 new records made for those taxa included in the survey as 'common' (Appendix 1).

The results for individual taxa are presented in the following treatments. No detailed statistical analyses were undertaken, because for a number of fields (e.g. population size) the data collated from the various sources were often inadequate.

Table 5 lists the conservation data and recommended status of taxa included in the survey. It helps in assessing the conservation status of each taxon by presenting the total number of records, number of new records, percentage of populations in conservation reserves and percentage of populations restricted to road verges. This Table must be consulted with caution because, as mentioned previously, the data for a number of taxa are incomplete.

Table 5 makes recommendations for changes to the Declared Rare Flora schedule and Priority Flora List based on the results of the survey. Taxa gazetted as Declared Rare Flora are protected under the provisions of the *Wildlife Conservation Act 1950* and may not be damaged or destroyed without special written consent from the Minister for Conservation and Land Management. Populations of priority taxa require protection from accidental damage or destruction until their conservation status can be accurately assessed. They may be gazetted as Declared Rare Flora if adequate surveys find them to be truly rare, endangered or in need of special protection. Appendix 6 provides an explanation of the conservation codes.

*Eucalyptus merrickiae* and *E. mooreana* are recommended for deletion from the Declared Rare Flora schedule as they are no longer believed to be at risk. *Eucalyptus jimberlanica* is recommended for inclusion on the schedule, because after adequate survey no further populations were recorded. *Eucalyptis acies, E. aspersa, E. creta, E. erythrandra, E. formanii, E. ligulata* and *E. pimpiniana* were found to be more common than previously recognized and can be removed from the Priority Flora List. A number of taxa are recommended for inclusion on the Priority Flora List and the status of many taxa already listed is recommended to be changed. Further survey is still required for many of the taxa of interest, particularly those occurring in remote areas.

A number of presumed hybrids were found during the survey, including some between taxa previously not known to hybridize (Table 6). They should be regarded as presumed hybrids only, as confirmation of their status depends on a number of factors which have not been fully assessed. In most cases the hybrids were recorded as one or only a few plants among the parent taxa (e.g. *E. "nutans"* x *E. astringens, E. occidentalis* x *E. burdettiana*). In some instances (e.g. *E. macrandra* x *E. 'petila'*) they were found as large 'hybrid swarms'.

Taxonomic problems were often encountered during the survey, particularly where closely related taxa began to intergrade at the junction of their ranges. Variations on typical characteristics were observed for many taxa and difficulties were sometimes experienced in distinguishing between varieties, subspecies and forms of various species. Where the identification problems could not be rectified, the records were not included. In this way errors in recordings were reduced to a minimum. The numerous unusual observations made during the project are not treated in this publication.

Despite the number of contributors to the survey the response from volunteers was relatively poor, with the majority of records made by the coordinators and a few others. Unfortunately, the volunteers experienced considerable difficulties in identifying both the rare and common eucalypt taxa. The project did succeed, however, in promoting an interest in the State's rare and endangered flora, and in particular rare and poorly known eucalypts. It inspired two trips to the Alfred and Marie Ranges in the Gibson Desert to search for presumed extinct *Eucalyptus rameliana*. Both trips were unsuccessful in finding this species, and it was later relocated south-east of Newman, the first collection in 115 years (Hopper 1992).
The project provided an opportunity for the coordinators to compile data from various sources to give a comprehensive report of the distribution of taxa. The information obtained as a result of the survey will contribute to the formulation of appropriate conservation and management strategies for the rare and poorly known taxa (e.g. Sampson *et al.* 1990). Continuing surveys and monitoring are required so that the current information on conservation status can be maintained.

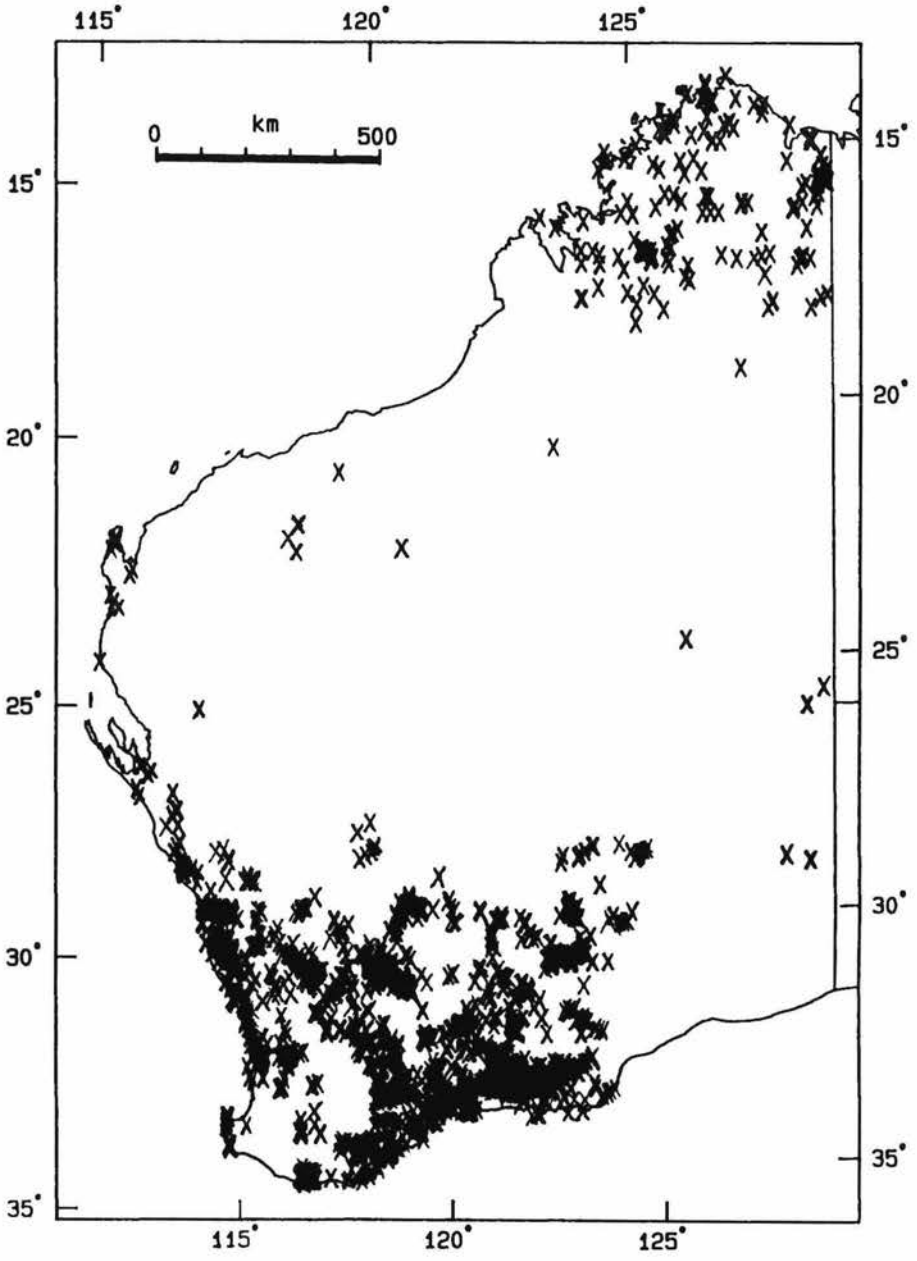



*Figure 4. Distribution of all rare and poorly known eucalypts in Western Australia at the completion of the survey in June 1990.*

TABLE 4

Significant achievements of the survey.

NEW TAXA RECORDED

*Eucalyptus 'arborella'* - new species closely related to *E. lehmannii*. Four populations were recorded from the Fitzgerald River National Park.

*Eucalyptus lehmannii* ssp. "Quoin Head" - a possible new subspecies of *E. lehmannii* recorded at three sites west of Hopetoun in Fitzgerald River National Park.

*Eucalyptus 'rhomboidea'* - not included in the survey because of its recent discovery. Allied to *E. transcontinentalis* and endemic to the Bremer Range.

*Eucalyptus* aff. *platypus* - taxon allied to *E. platypus* and *E. "nutans"*, found at four sites in the Corackerup Creek area near Boxwood Hill.

*Eucalyptus 'surgens'* - not included in the survey because of its recent discovery. Allied to *E. concinna* and known only from Toolinna.

DECLARED RARE FLORA

*Eucalyptus argutifolia* - several new records from between Wanneroo and Guilderton, the result of intensive surveys by CALM staff.

*Eucalyptus articulata* - three new records made from the vicinity of known sites south of Lake Minigwal in the Great Victoria Desert.

*Eucalyptus bennettiae* - range extended 65 km south-west with two new records from the Fitzgerald River National Park. Previously known from a single population in the Ravensthorpe Range.

*Eucalyptus cerasiformis* - eleven records consisting of several thousand plants in the Mt Day-Lake Hope area.

*Eucalyptus coronata* - three new records from the Eyre Range in the Fitzgerald River National Park.

*Eucalyptus crispata* - six new records from Boothendarra Hill north to near Mt Adams. Previously known from only one locality.

*Eucalyptus goniantha* ssp. *goniantha* - new records from south of the Stirling Range, near Narrikup and east of Quoin Head. Previously known from only three sites in the Mt Manypeaks area.

*Eucalyptus impensa* - five records resulting from surveys south of Eneabba. Previously known from only one other population nearby.

*Eucalyptus johnsoniana* - eleven new records south of Eneabba. Populations were small, usually of only a few plants.

*Eucalyptus merrickiae* - ten new records from the Coolgardie-Esperance Highway east toward Mt Ridley. Recorded north to near the Salmon Gums Nature Reserve.

*Eucalyptus 'olivacea'* - two new populations from a nature reserve south-east of Pingaring. Previously not recorded from this reserve.

*Eucalyptus steedmanii* - new populations containing many thousands of plants recorded near Lake Cronin. Previously unrecorded from northern sites.

*Eucalyptus synandra* - three new records from the Gutha area and an extra record from Karroun Hill Nature Reserve.

RARE AND POORLY KNOWN TAXA

*Eucalyptus acies* - five new records, representing a few thousand plants, from the Hassell Beach area north-east of Albany.

*Eucalyptus aspersa* - seventeen records from the Northern Forest, Central Forest and Wheatbelt Regions. Occurs mostly within State forest as scattered, but not particularly uncommon populations.

*Eucalyptus brachyphylla* - eight new records resulting from surveys in the vicinity of previously recorded populations near Karonie and Binyarinyinna Rock.

*Eucalyptus brockwayi* - thirty new records from the Norseman area for this restricted but locally abundant species.

*Eucalyptus* aff. *calcicola* - recorded in West Cape Howe National Park. *E. calcicola* known only from the Leeuwin-Naturaliste National Park. Possibly a new subspecies.

*Eucalyptus corrugata* - several thousand trees (50 records) from the Southern Cross-Marvel Loch areas. Several other new records scattered from Mt Correll south to the Hyden-Norseman track.

TABLE 4 (continued)

*Eucalyptus crucis* ssp. *lanceolata* - ten new records, including populations from nature reserves east of Damboring and at Karroun Hill.

*Eucalyptus densa* ssp. *improcera* - thirteen new records resulting from surveys west of Ravensthorpe.

*Eucalyptus dissimulata* - over fifty new records, largely from the Newdegate-Pingrup-Lake Magenta area where it is frequent in small populations. Range extended south to near Hopetoun and Boxwood Hill.

*Eucalyptus erythrandra* - fifteen new records from the Bremer Bay area to east of Esperance, including several from Fitzgerald River National Park.

*Eucalyptus famelica* - many thousands of plants (34 records) found in Lake Shaster Nature Reserve and surrounding farmland. Previously known from only three records.

*Eucalyptus flavida* - many records extending its distribution in the sandalwood reserves east of Kalgoorlie. New populations recorded in the north of its range at Arcoona.

*Eucalyptus foecunda* - seventeen records from north and south of Perth. Northern range extension of over 180 km to north-west of Eneabba.

*Eucalyptus formanii* - well surveyed in the Diemals-Die Hardy Range-Johnson Rocks area with over twenty new records, including several from Mt Manning Nature Reserve. A disjunct population recorded south of Boondine Hill.

*Eucalyptus forrestiana* - nineteen records from north and east of Esperance. Easternmost population recorded north-west of Sparkle Hill.

*Eucalyptus georgei* ssp. *georgei* - seven new records from the Hyden-Norseman track and south to Maggie Hays Hill. Previously known from only two records in this area.

*Eucalyptus goniantha* ssp. *notactites* - well surveyed with 21 new records from coastal areas between Albany and Beaufort Inlet. Appears relatively common.

*Eucalyptus halophila* - number of records doubled for this species. Found to be frequent in the area north of Esperance.

*Eucalyptus incrassata* ssp. "robust" - five new records from near the Porongurups and the Stirling Range National Park. Previously known from only one locality. Possible hybrids with *E.* aff. *xanthonema* recorded at two sites.

*Eucalyptus jimberlanica* - first collection made for the Western Australian Herbarium. Only other material for this taxon is in eastern States' herbaria.

*Eucalyptus jutsonii* - seventeen new records from Comet Vale, Carr Boyd Rocks, Goongarrie National Park and Binti Binti Rocks. Range for this species extended south-east by *ca* 40 km.

*Eucalyptus kalganensis* - new record from near Wellstead, a range extension of *ca* 80 km. Otherwise known only from the Stirling Range National Park.

*Eucalyptus kruseana* - over twenty new records extending its distribution in the Binyarinyinna Rock and Karonie areas. New populations discovered west of previous records at Cowan Hill and near Yalca Hill.

*Eucalyptus latens* - eight new records between Mt Talbot and south-east of Williams. One record is from Boyagin Rock Nature Reserve with the remainder from State forest. Only two populations previously recorded.

*Eucalyptus* aff. *longicornis* - seven new records between Ravensthorpe and Hopetoun, including one from Fitzgerald River National Park. Prior to the survey recorded from only two sites close to Ravensthorpe.

*Eucalyptus macrandra* - nineteen new records, the majority from Fitzgerald River National Park. Population recorded in the Borgey State Forest, *ca* 160 km north of the nearest known location in the Stirling Range.

*Eucalyptus macrocarpa* ssp. *elachantha* - fifteen new records from areas south of Mingenew and Eneabba.

*Eucalyptus megacornuta* - seven new records from the vicinity of previous records near Ravensthorpe and the Hamersley River.

*Eucalyptus melanophitra* - four new records in the Pallinup River-Corackerup Creek area.

*Eucalyptus microschema* - seven new records from the Dunn Rock area south-east of Newdegate.

*Eucalyptus newbeyi* - large population of several hundred plants recorded at Swan Gully north of Cape Riche. Two plants recorded in Fitzgerald River National Park with suspected *E. newbeyi* x *E. lehmannii* hybrids.

*Eucalyptus nigrifunda* - new records from west of Rason Lake in the Great Victoria Desert.

*Eucalyptus "nutans* - several new records from south of Ravensthorpe and eastern Fitzgerald River National Park. Appears relatively common in this area.

TABLE 4 (continued)

*Eucalyptus occidentalis* var. *stenantha* - fourteen new records from granite outcrops between Queen Victoria Rock and Swallow Rock.

*Eucalyptus orbifolia* - seventeen new records over a range of *ca* 250 km, from Rainy Rocks and Beeringgnurding Hill in the north to Weowanie Rock in the south.

*Eucalyptus ornata* - found in large numbers in Dragon Rocks Nature Reserve and on adjoining property. Several hundred trees recorded in nature reserves north of Karlgarin.

*Eucalyptus 'petila'* - previously known only from Corackerup Creek Nature Reserve. Four new records from the Fitzgerald River National Park and an additional population from the nature reserve. Mass hybridization with *E. macrandra* observed.

*Eucalyptus petrensis* - fifteen new records ranging from south-west of Wedge Island to Yalgorup National Park. Includes records from Yanchep National Park and State forest. Previously known from only three locations.

*Eucalyptus pimpiniana* - total of nineteen new records, mostly from south and east of Lake Minigwal. Recorded for the first time in Great Victoria Desert Nature Reserve. Previously known from only three locations south of Lake Minigwal.

*Eucalyptus polita* - four new records from a timber reserve south of Norseman. Also recorded north of Norseman and west of Ninety Mile Tank.

*Eucalyptus 'recondita'* - five new records near the Kalgan River south of the Stirling Range.

*Eucalyptus 'redacta'* - thirteen new records including several from Fitzgerald River National Park and Corackerup Creek Nature Reserve. Range extended to east of Ravensthorpe.

*Eucalyptus rigens* - well recorded north of Esperance to east of Mt Burdett. Large populations recorded in Truslove Nature Reserve.

*Eucalyptus sargentii* - recorded at 48 sites in the wheatbelt between Coorow and south-east of Newdegate. New populations recorded in five nature reserves.

*Eucalyptus stowardii* - 29 new records from north-east of Coorow to south of Yelbeni.

*Eucalyptus* aff. *talyuberlup* - recorded in the Ravensthorpe Range. Typical *E. talyuberlup* only known from the Stirling Range area.

*Eucalyptus terebra* - westerly range extension with five new records near Mt Glasse and Ninety Mile Tank. Other new recordings from north-west of Norseman, Dundas Nature Reserve and two localities to the south.

*Eucalyptus websteriana* - 43 new records for this species. Large populations recorded in the north-east of its range near Rason Lake and east of Queen Victoria Spring. Well recorded south of Kalgoorlie with several populations from a nature reserve and three timber reserves.

*Eucalyptus woodwardii* - many, often large, populations recorded in two sandalwood reserves east of Kalgoorlie. Recorded for the first time in Queen Victoria Springs Nature Reserve.

TABLE 5

Conservation data and recommended status of eucalypts included in the survey.

| | TOTAL NO. OF RECORDS | NO. OF NEW RECORDS | CALM REGIONS[A] | % POPS IN CONSERVATION RESERVES | % POPS RESTRICTED TO ROAD VERGE | CALM STATUS[B] (HOPPER *ET AL.* 1990) | RECOMMENDED STATUS[B] |
|---|---|---|---|---|---|---|---|
| *absita* | 3 | - | GR | 33 | 33 | DRF | DRF |
| *acies* | 12 | 5 | SC | 50 | 0 | P3 | C ++ |
| *aequioperta* | 6 | - | W,GO | 0 | 0 | - | P2 |
| *angustissima* ssp. *angustissima* | 18 | 8 | SC | 33 | 0 | - | C |
| *annuliformis* | 1 | - | GR | 0 | 0 | P1 | P1 |
| *aquilina* | 8 | 1 | SC | 100 | 0 | P4 | P4 |
| *'arborella'* | 4 | 4 | SC | 100 | 0 | - | P3 |
| *arenaria* | 10 | - | K | 50 | 0 | - | P4 |
| *argutifolia* | 8 | 3 | NF | 0 | 0 | DRF | DRF |
| *articulata* | 6 | 3 | GO | 0 | 0 | DRF | DRF |
| *aspersa* | 36 | 24 | NF,W,CF,SF | 3 | 3 | P4 | C ++ |
| *balanites* | 1 | - | GR | 100 | 0 | DRF | DRF |
| *beardiana* | 10 | - | GR,GA | 10 | 20 | DRF | DRF |
| *bennettiae* | 3 | 2 | SC | 67 | 0 | DRF | DRF |
| *blaxellii* | 9 | - | GR | 22 | 0 | DRF | DRF |
| *bleeseri* | 14 | - | K* | 7 | 0 | - | C |
| *brachyandra* | 26 | - | K* | 19 | 0 | - | C |
| aff. *brachycalyx* | 4 | 3 | SC | 25 | 25 | - | P2 |
| *brachyphylla* | 11 | 8 | GO | 18 | 0 | - | P8 |
| *brevipes* | 2 | - | W | 50 | 0 | DRF | DRF |
| *brevistylis* | 19 | 14 | SF | 16 | 0 | P3 | P4 ++ |
| *brockwayi* | 41 | 30 | SC | 0 | 2 | - | P4 |
| *burdettiana* | 2 | - | SC | 100 | 0 | DRF | DRF |
| *caesia* ssp. *caesia* | 11 | 1 | W | 55 | 0 | P4 | P4 |
| *caesia* ssp. *magna* | 8 | - | W | 62.5 | 0 | P4 | P4 |
| *calcicola* | 8 | - | CF | 100 | 0 | P4 | P4 |
| *carnabyi* | 4 | - | GR | 0 | 25 | - | P8 |
| *ceracea* | 1 | - | K | 0 | 0 | DRF | DRF |
| *cerasiformis* | 13 | 11 | SC | 0 | 0 | DRF | DRF |
| *chlorophylla* | 12 | - | K* | 0 | 0 | - | P3 |
| *chrysantha* | 3 | 1 | SC | 100 | 0 | P2 | P8 ++ |
| *clavigera* | 4 | - | K* | 0 | 0 | - | C |
| *collina* | 12 | - | K | 33 | 0 | - | C |
| *confluens* | 20 | 2 | K | 5 | 0 | - | C |
| *'continens'* | 3 | 2 | W | 0 | 0 | P1 | P1 |
| *coronata* | 7 | 3 | SC | 100 | 0 | DRF | DRF |
| *corrugata* | 80 | 63 | GO,W | 1 | 9 | - | C |
| *creta* | 24 | 1 | SC | 0 | 0 | P3 | C ++ |
| *crispata* | 7 | 5 | GR | 14 | 0 | DRF | DRF |
| *crucis* ssp. *crucis* | 7 | - | W | 14 | 0 | DRF | DRF |
| *crucis* ssp. *lanceolata* | 36 | 10 | W | 58 | 0 | - | C |
| *crucis* ssp. *praecipua* | 1 | - | GR | 0 | 0 | DRF | DRF |
| *cuprea* | 4 | - | GR | 0 | 25 | DRF | DRF |
| *cupularis* | 9 | - | K* | 11 | 0 | - | P3 |
| *deflexa* | 16 | 1 | W,SC | 12.5 | 0 | P4 | P4 |
| *densa* ssp. *improcera* | 23 | 13 | SC | 13 | 13 | - | C |
| *depauperata* | 7 | 3 | W,SC | 43 | 0 | P3 | P3 |
| *deserticola* | 2 | - | P* | 50 | 0 | - | C |
| *desmondensis* | 18 | 2 | SC | 0 | 5.5 | P4 | P4 |
| *dielsii* | 31 | 5 | SC | 10 | 3 | - | C |
| *'diminuta'* | 6 | 3 | GR | 17 | 0 | P2 | P2 |
| *dissimulata* | 67 | 56 | W,SC | 6 | 19 | - | C |
| *dolichorhyncha* | 24 | 3 | SC | 8 | 33 | - | P4 |
| *dolorosa* | 1 | - | GR | 0 | 0 | DRF | DRF |
| *ebbanoensis* ssp. *photina* | 8 | 3 | GR | 0 | 0 | P2 | P3 ++ |
| *effusa* | 12 | - | SC,GR,GO | 0 | 0 | - | P3 |
| *erectifolia* | 18 | - | SC | 100 | 0 | DRF | DRF |
| *erythrandra* | 30 | 15 | SC | 37 | 23 | P4 | C ++ |
| *exigua* | 10 | 5 | W,SC | 10 | 0 | - | P3 |
| *exilis* | 14 | 1 | GR,NF,W | 50 | 0 | P4 | P4 |
| *famelica* | 38 | 35 | SC | 16 | 0 | P2 | P3 ++ |

TABLE 5 (continued)

| | TOTAL NO. OF RECORDS | NO. OF NEW RECORDS | CALM REGIONS[A] | % POPS IN CONSERVATION RESERVES | % POPS RESTRICTED TO ROAD VERGE | CALM STATUS[B] (HOPPER *ET AL.* 1990) | RECOMMENDED STATUS[B] |
|---|---|---|---|---|---|---|---|
| *ficifolia* | 26 | 17 | SF | 31 | 0 | - | C |
| *fitzgeraldii* | 4 | - | K | 0 | 0 | - | P3 |
| *flavida* | 24 | 17 | GO | 4 | 0 | - | C |
| *foecunda* | 31 | 19 | GR,NF,M,CF | 13 | 0 | P4 | P4 |
| *foecunda* ssp. "Cliff Head" | 4 | 2 | GR | 0 | 0 | P3 | P3 |
| *formanii* | 29 | 23 | GO,W | 28 | 0 | P4 | C ++ |
| *forrestiana* | 73 | 19 | SC | 27 | 23 | - | C |
| *fraseri* ssp "blackbutt" | 1 | - | SC | 0 | 0 | P2 | P2 |
| *georgei* ssp. *fulgida* | 5 | 3 | W | 0 | 0 | P2 | P3 ++ |
| *georgei* ssp. *georgei* | 11 | 7 | W,SC | 0 | 0 | P4 | P4 |
| *goniantha* ssp. *goniantha* | 7 | 3 | SC | 14 | 14 | DRF | DRF |
| *goniantha* ssp. *notactites* | 32 | 22 | SC | 22 | 0 | - | C |
| *'graniticola'* | 1 | - | CF | 0 | 0 | DRF | DRF |
| *griffithsii* ssp. "small fruited" | 3 | 3 | GO | 0 | 0 | P1 | P2 ++ |
| *guilfoylei* | 46 | 39 | SF,SC | 30 | 0 | - | C |
| *halophila* | 48 | 25 | SC | 23 | 10.5 | - | C |
| *herbertiana* | 13 | - | K* | 31 | 0 | - | C |
| *histophylla* | 10 | 4 | SC | 20 | 0 | P3 | P4 ++ |
| *impensa* | 6 | 5 | GR | 0 | 0 | DRF | DRF |
| *incrassata* ssp. "narrow" | 5 | - | W,SC | 0 | 0 | - | P2 |
| *incrassata* ssp. "robust" | 7 | 6 | SC | 14 | 0 | - | P3 |
| *insularis* | 3 | - | SC | 100 | 0 | DRF | DRF |
| *jacksonii* | 23 | 19 | SF | 74 | 0 | - | C |
| *jimberlanica* | 1 | - | SC | 0 | 0 | P1 | DRF ++ |
| *johnsoniana* | 22 | 12 | GR | 41 | 0 | DRF | DRF |
| *jutsonii* | 19 | 17 | GO | 21 | 0 | P2 | P4 ++ |
| *kalganensis* | 9 | 1 | SC | 78 | 11 | P2 | P3 ++ |
| *kruseana* | 31 | 23 | GO | 6 | 0 | P4 | P4 |
| *kumarlensis* | 6 | 3 | SC | 0 | 0 | - | P3 |
| *lamprocalyx* | 22 | - | K | 9 | 0 | - | C |
| *lanepoolei* | 55 | 1 | GR,NF,M | 11 | 2 | - | C |
| aff. *lanepoolei* | 1 | - | CF | 0 | 0 | - | P1 |
| *latens* | 10 | 3 | NF,W | 20 | 0 | DRF | P4 ++ |
| *lateritica* | 13 | - | GR | 54 | 0 | DRF | DRF |
| *lehmannii* ssp. "Quoin Head" | 3 | 3 | SC | 100 | 0 | - | P2 |
| *leprophloia* | 1 | - | GR | 0 | 0 | DRF | DRF |
| *ligulata* | 23 | 4 | SC | 83 | 0 | P4 | C ++ |
| *litorea* | 1 | - | SC | 50 | 0 | P2 | P2 |
| aff. *longicornis* | 9 | 7 | SC | 11 | 11 | - | P3 |
| *macrandra* | 29 | 19 | W,SC | 72 | 0 | - | C |
| *macrocarpa* ssp. *elachantha* | 39 | 15 | GR | 8 | 23 | P3 | P4 ++ |
| *megacornuta* | 16 | 7 | SC | 31 | 0 | - | P4 |
| *melanophitra* | 10 | 4 | SC | 30 | 0 | P4 | P4 |
| *merrickiae* | 20 | 10 | SC | 10 | 15 | DRF | P4 ++ |
| *microschema* | 12 | 7 | W | 25 | 0 | P3 | P3 |
| *'mimica'* | 5 | 4 | W | 0 | 40 | P1 | P1 |
| *misella* | 5 | - | SC | 0 | 0 | P3 | P2 ++ |
| *mooreana* | 8 | - | K | 0 | 0 | DRF | P4 ++ |
| *newbeyi* | 5 | 3 | SC | 40 | 0 | P3 | P3 |
| *nigrifunda* | 12 | 10 | GO | 0 | 0 | P4 | P4 |
| *"nutans"* | 24 | 7 | SC | 12.5 | 4 | - | C |
| *occidentalis* var. *stenantha* | 23 | 14 | GO,W,SC | 22 | 0 | - | C |
| *'olivacea'* | 5 | 2 | W | 80 | 0 | DRF | DRF |
| *orbifolia* | 36 | 18 | GR,GO,W | 25 | 0 | - | C |
| *ornata* | 25 | 23 | W | 76 | 4 | - | C |
| *ovularis* | 12 | 1 | SC | 17 | 0 | P3 | P3 |

TABLE 5 (continued)

| | TOTAL NO. OF RECORDS | NO. OF NEW RECORDS | CALM REGIONS[A] | % POPS IN CONSERVATION RESERVES | % POPS RESTRICTED TO ROAD VERGE | CALM STATUS[B] (HOPPER *ET AL.* 1990) | RECOMMENDED STATUS[B] |
|---|---|---|---|---|---|---|---|
| *pendens* | 24 | 1 | GR | 21 | 0 | P4 | P4 |
| *'petila'* | 6 | 5 | SC | 100 | 0 | P2 | P3 ++ |
| *petrensis* | 18 | 15 | GR,NF,CF,M | 17 | 6 | P3 | P4 ++ |
| *phylacis* | 1 | - | CF | 0 | 0 | DRF | DRF |
| *pilbarensis* | 5 | - | P | 20 | 0 | P4 | P3 ++ |
| *pimpiniana* | 22 | 19 | GO* | 9 | 0 | P3 | C ++ |
| aff. *platypus* | 4 | 4 | SC | 75 | 0 | - | P2 |
| *polita* | 13 | 6 | W,SC | 8 | 0 | - | P4 |
| *prominens* | 19 | - | GR,GA | 26 | 0 | - | C |
| *pruiniramis* | 4 | - | GR | 25 | 25 | DRF | DRF |
| *pterocarpa* | 5 | 4 | SC | 0 | 0 | P2 | P2 |
| *pyrophora* | 8 | - | K* | 37.5 | 0 | - | P3 |
| *rameliana* | 1 | - | P | 0 | 0 | PE | DRF |
| *'recondita'* | 17 | 5 | SC | 24 | 0 | - | P4 |
| *'redacta'* | 21 | 13 | SC | 33 | 5 | - | P4 |
| *rhodantha* var. *petiolaris* | 2 | - | GR | 0 | 0 | DRF | DRF |
| *rhodantha* var. *rhodantha* | 7 | - | GR | 0 | 43 | DRF | DRF |
| *rigens* | 48 | 24 | SC | 42 | 6 | - | C |
| *'rivalis'* | 2 | - | NF,CF | 50 | 0 | - | P2 |
| *rudis* ssp. *cratyantha* | 4 | - | CF | 0 | 25 | P3 | P2 ++ |
| aff. *salmonophloia* | 2 | 1 | SC | 0 | 0 | P1 | P1 |
| *sargentii* | 66 | 48 | GR,NF,W | 27 | 0 | - | C |
| *semiglobosa* | 12 | 1 | SC | 33.3 | 17 | P3 | P3 |
| *sepulcralis* | 12 | 4 | SC | 100 | 0 | - | P4 |
| sp. C (aff. *diversifolia*) | 2 | - | SC | 0 | 0 | DRF | DRF |
| sp. M (aff. *oleosa*) | 14 | 2 | GO,SC | 14 | 0 | P3 | P3 |
| sp. U (aff. *pileata*) | 10 | - | SC | 10 | 0 | P2 | P3 ++ |
| *sparsa* | 3 | - | GO* | 0 | 0 | P3 | P3 |
| *steedmanii* | 12 | 10 | W | 0 | 0 | DRF | DRF |
| *stoatei* | 31 | 3 | SC | 6 | 6 | P4 | P4 |
| *stowardii* | 49 | 29 | GR,W | 8 | 18 | - | C |
| *subangusta* ssp. *pusilla* | 21 | 2 | GRW | 24 | 0 | - | C |
| *suberea* | 15 | - | GR | 73 | 0 | DRF | DRF |
| *subtilis* | 6 | 2 | SC | 0 | 0 | - | P3 |
| *synandra* | 9 | 1 | GR,W | 22 | 0 | DRF | DRF |
| *talyuberlup* | 15 | 2 | SC | 73 | 0 | - | P4 |
| *terebra* | 29 | 9 | SC | 10 | 0 | - | C |
| *websteriana* | 52 | 43 | GO,SC | 4 | 0 | - | C |
| *woodwardii* | 23 | 18 | GO | 4 | 0 | - | C |
| *zopherophloia* | 11 | 4 | GR | 0 | 18 | P4 | P4 |

A CALM REGIONS = CF-Central Forest, GA-Gascoyne, GO-Goldfields, GR-Greenough, K-Kimberley, M-Metropolitan, NF-Northern Forest, P-Pilbara, SC-South Coast, SF-Southern Forest, W-Wheatbelt, *-occurs outside Western Australia.

NB. The CALM Northern Forest and Metropolitan Regions are now amalgamated into the new Swan Region. This change has not been reflected in this list.

B CALM STATUS = DRF-Declared Rare Flora (extant taxa), PE-Declared Rare Flora (presumed extinct taxa), P1-Priority One Taxa, P2-Priority Two Taxa, P3-Priority Three Taxa, P4-Priority Four Taxa, P8-Priority Eight Taxa, C-Common, with no immediate conservation concern. See Appendix 6 for a detailed explanation of conservation codes.

++ denotes recommended change in conservation status resulting from this survey

TABLE 6
Presumed hybrids recorded during the survey.

Both new and previously known hybrids recorded during the survey are listed. * denotes new discovery.

| PRESUMED HYBRID | LOCATION |
|---|---|
| *E. acies* x *E. marginata* | Mt Manypeaks, Bluff Creek |
| *E. angulosa* x *E. conglobata* | east of Hopetoun |
| *E. angulosa* x *E. cornuta* | north-west of Mt Gardner, West Cape Howe |
| **E. angulosa* x *E. incrassata* | Mt Le Grand |
| **E. angulosa* x *E. occidentalis* (mallee) | Boxwood Hill |
| **E. astringens* x *E. "nutans"* | north of Kundip |
| *E. buprestium* x *E. marginata* | Hassell Hwy |
| **E. burdettiana* x *E. occidentalis* | East Mt Barren |
| *E. caesia* x *E. orbifolia* | Walyahmoning Rock |
| **E. conferruminata* x *E. cornuta* | east of Mt Gardner |
| **E. conglobata* x *E. platypus* var. *heterophylla* | east of Hopetoun |
| *E. coronata* x *E. preissiana* | north-east and south-east of Annie Peak |
| **E. coronata* x *E. sepulcralis* | north-east of Annie Peak |
| *E. decipiens* x *E. petrensis* | Yalgorup National Park |
| **E. eremophila* x *E. erythronema* | Yelbeni |
| **E. erythrandra* x *E. tetraptera* | north-west of Annie Peak |
| *E. erythronema* x *E. spathulata* | north-east of Calingiri, east of Bolgart |
| **E. falcata* x *E. incrassata* | north-east of Hopetoun |
| **E. falcata* x *E. longicornis* | Lomos |
| **E. grossa* x *E. histophylla* | Mt Buraminya |
| *E. incrassata* x *E. occidentalis* | north-east of Hopetoun |
| **E. incrassata* x *E. pileata* | Kundip Nature Reserve |
| *E. incrassata* ssp. "robust" x *E. medialis* | north of Porongurups, southern Stirling Range National Park |
| **E. incrassata* ssp. "robust" x *E.* aff. *xanthonema* | Stirling Range National Park |
| **E. lehmannii* x *E. newbeyi* | south-west of Mt Drummond |
| *E. loxophleba* x *E. wandoo* | north-west of Wagin |
| **E. macrandra* x *E. occidentalis* | north-west of Mt Drummond, Quaalup |
| **E. macrandra* x *E. 'petila'* | north-west of Mt Drummond |
| *E. macrocarpa* x *E. pyriformis* | south-east of Geraldton |
| *E. marginata* x *E. pachyloma* | south of Stirling Range, Stirling Range National Park |
| **E. occidentalis* x *E. phaenophylla* | north-east of Hopetoun |
| **E. occidentalis* x *E. platypus* var. *heterophylla* | east of Hopetoun |
| **E.* aff. *occidentalis* x *E. redunca* | East Mt Barren |
| *E. pachyloma* x *E. staeri* | Stirling Range National Park |
| **E. platypus* var. *platypus* x *E. suggrandis* | north of Kundip |
| *E. preissiana* x *E. staeri* | Wellstead |
| **E. 'redacta'* x *E. rudis* | south of Stirling Range |
| *E. salubris* x *E. spathulata* | north of Calingiri |
| *E. stoatei* x *E. tetraptera* | Jerdacuttup |
| *E. subangusta* x *E. wandoo* | north-east of Calingiri |

## PROBLEMS AND RECOMMENDATIONS

A volunteer survey on such a diverse and taxonomically difficult genus may have been a bit ambitious, as without a good knowledge of the common taxa many volunteers became discouraged. A number of volunteers did not contribute records although it is known that they undertook surveys and were unsuccessful in locating populations of the taxa of interest. Recent taxonomic revisions within the genus and the lack of a comprehensive field guide (for both rare and common taxa) for the majority of the project contributed to the problems.

A number of volunteers expressed an interest in surveying for 'all' eucalypts (i.e. a genus-based survey) rather than those that were rare and poorly known. The logistics of surveying such a large genus, with some 280 taxa in southern WA alone, made such a project impossible.

During the project the volunteers were not asked to report on all areas they searched, so it was sometimes difficult to accurately assess conservation status. In a survey of rare and poorly known taxa, a negative result (i.e. no populations within a given area) is just as valuable as a positive one. Recording in this way may result in errors, however, if areas are inadequately surveyed.

Results from this survey and past experience from *The Banksia Atlas* indicate that a small number of competent volunteers is better than a large number of poorly trained ones. Successful volunteers required a reasonable knowledge of eucalypts and/or a considerable amount of time and interest. All volunteers were sent a recorders' kit after the initial contact and it is recommended that in future surveys an information sheet be sent to potential volunteers, followed by a kit if they continue to express interest.

## RARE AND POORLY KNOWN EUCALYPTS OF WESTERN AUSTRALIA

The following treatments present data for each eucalypt in alphabetical order. Unpublished taxa are listed as they appear in Brooker and Kleinig (1990). Taxa to be described by Brooker (and others) are given as manuscript names and enclosed in parentheses. Those being published by other authors are given an alphabetical listing with their closest affinity. Taxa not appearing in the above reference (i.e. northern region species) follow Chippendale (1988).

The treatments collate the data for total number of records, population size, conservation status (percentage restricted to road verge, percentage in conservation reserves), height and flowering period. Percentage figures have generally been rounded-off to the nearest whole number. The height and flowering data may not be a complete record for any taxon and are intended as a supplement to already published information. The discussion gives a summary of the range, habitat, conservation status and most commonly associated eucalypts. Management recommendations were made, where possible, based on knowledge of their distribution, biology and conservation status. For some taxa it was not possible to make specific recommendations, particularly where further surveys and assessment of conservation status were required. A short description of each taxon and its distinguishing features are also provided. Figure 5 illustrates the leaf, bud and fruit shapes of eucalypts.

The distribution maps are a summary of the available data at the completion of the survey in June 1990. The data were compiled from various sources (see section Collating Available Data) additional to the sight records completed by the coordinators and volunteers. The maps, therefore, include some historic records which may no longer be extant. Distributions of taxa will undoubtedly change as further populations are identified.

The presence of a eucalypt on the distribution map is indicated by a cross. The cross may represent anything from a single individual to several hundred plants. Therefore, a concentration of crosses in an area does not necessarily indicate an abundance of plants. In the case of *E. brachyphylla* the abundance of crosses is owing to the systematic recording of a number of small populations. In contrast, the concentration of records in the Southern Cross area for *E. corrugata* indicates an abundance of plants.

For many of the taxa treated there is an obvious lack of detail relating to population sizes, habitat and flowering. This is owing to inadequacies in the data collated from the various sources.

Very little is known about the northern taxa (Kimberley, Pilbara and Gascoyne Regions) as there have been only limited surveys and taxonomic research on eucalypts in these areas. All details obtained for these taxa were from herbarium records, literature and communication with CALM staff in the Regions. While the treatments and maps summarize the available data they may not accurately represent the true distribution and status of these taxa.

Some taxa found during the survey were recognized as new taxa in time to be surveyed and included in this publication (e.g. *E. 'arborella'*, *E.* aff. *platypus*, *E. lehmannii* ssp. "Quoin Head"). Other taxa resulting from continued surveys and research work (e.g. *E. 'rhomboidea'*, *E. surgens*, *E. abdita*, *E. arachnaea* ssp. *arrecta*) were recognized too late to be included. New taxa will undoubtedly be discovered in the future as a result of continuing eucalypt research.

Maps of those taxa listed as 'common' (i.e. considered in previous works to be rare or poorly recorded but now known to be more common and at no risk) are compiled in Appendix 1.

The record sheets compiled during the survey are retained at the WA Herbarium and can be readily accessed if further information relating to any of the rare and poorly known eucalypts is required. All records for the Declared Rare Flora were forwarded to CALM's Wildlife Branch for inclusion on the Declared Rare Flora database. Records represented by specimens in the WA Herbarium can be accessed through the herbarium specimen database (WAHERB). The database of records for the survey is archived at the WA Wildlife Research Centre.

General references for eucalypts of WA are Maiden (1903-1933), Blakely (1965), Chippendale (1973, 1988), (1983), Boland *et al.* (1984), and Brooker and Kleinig (1990). Specific references, including original descriptions and relevant research, are listed in the individual treatments.

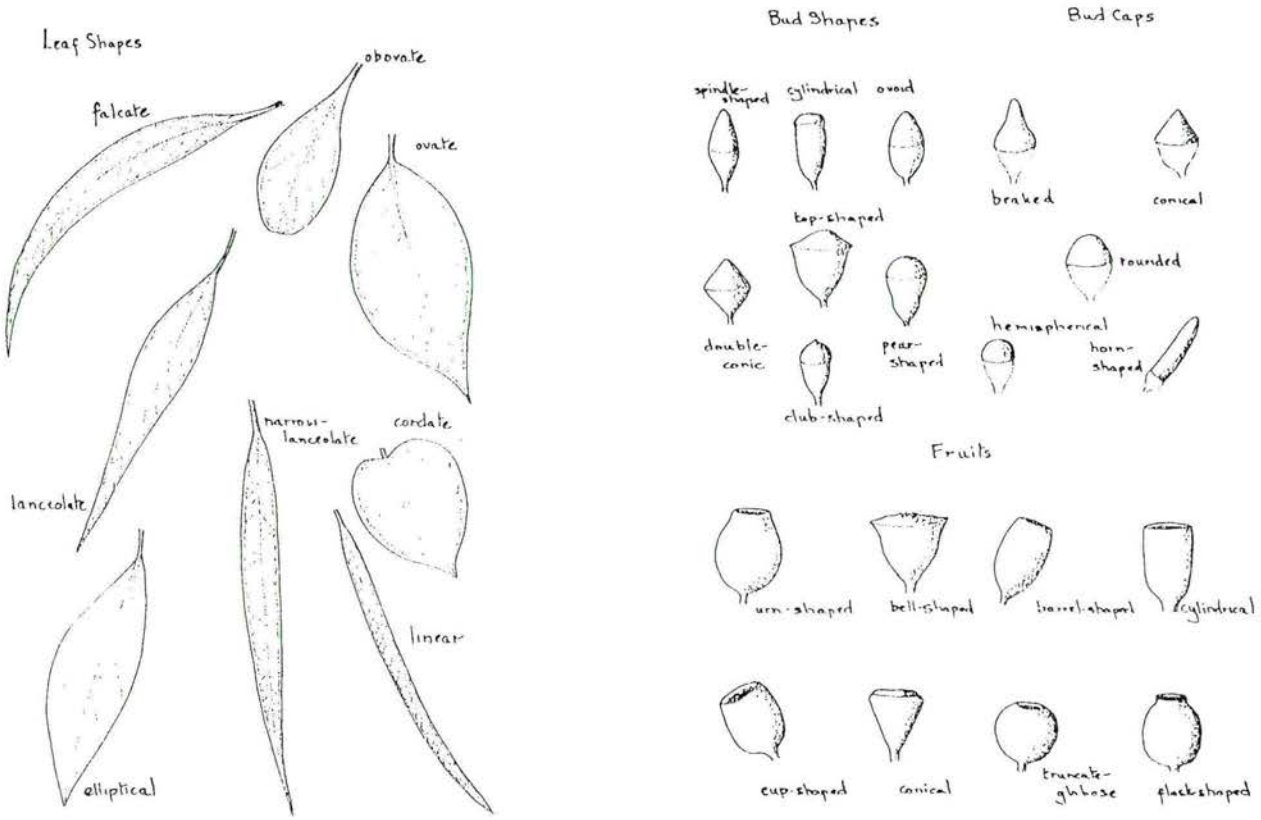



*Figure 5. Illustrations of leaf, bud and fruit shapes of eucalypts.*

**EUCALYPTUS ABSITA** Grayling & Brooker

**Badgingarra Box**

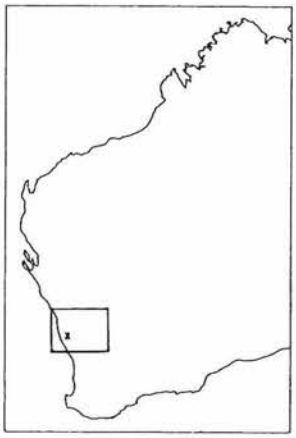
Number of records: 3

Population Size
<10(3) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (33%), Not (67%), Unspecified (0%)
In conservation reserve (33%), Not (67%), Unspecified (0%)

Height: 2.5 - 10 m

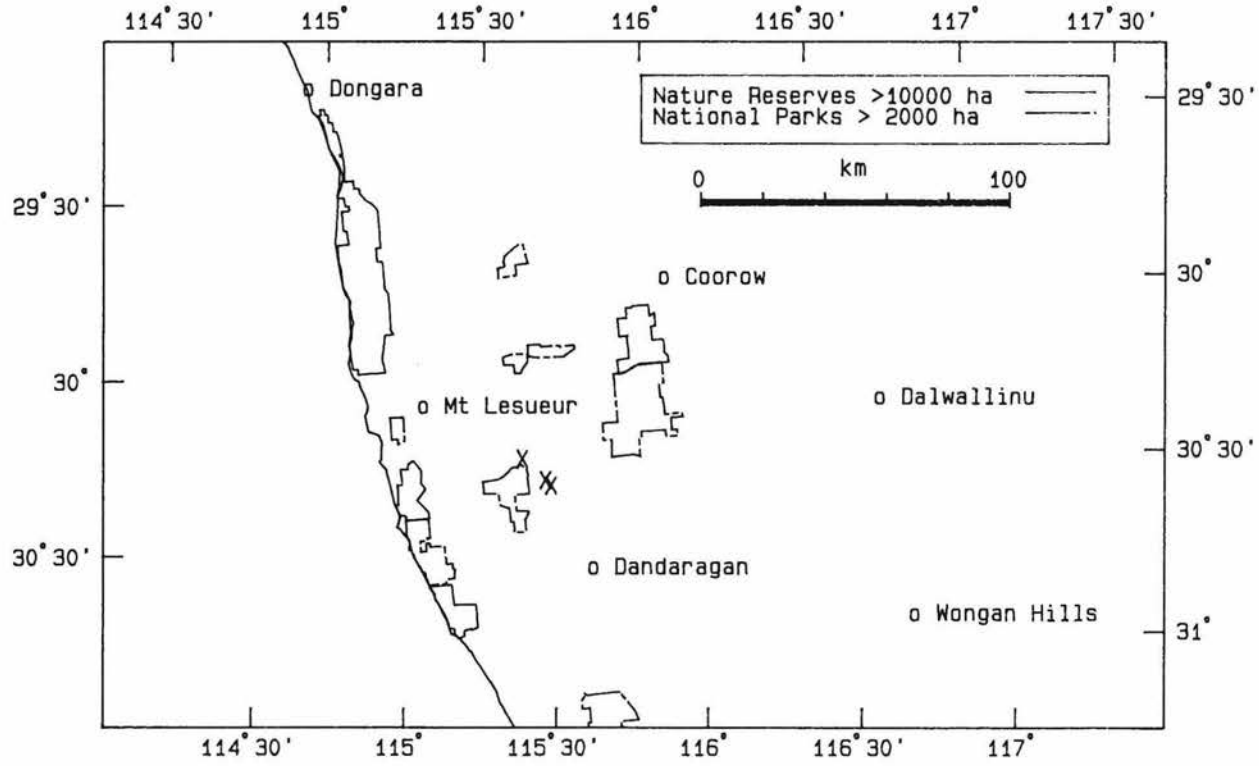
Flowering period: March - August



A rare species known from only three small populations over a 15 km range in the Badgingarra area. The two southern populations are from cleared farmland and road verge and consist of five and one 'clumps' respectively. They grow on sandy flats in remnant heath vegetation dominated by myrtaceous and proteaceous species. The northern population, of apparently four 'clumps', is from a nature reserve where it grows on the sandy floodplain adjacent to the Hill River. Surrounding vegetation is mixed heath dominated by *Calothamnus*, *Acacia* and *Isopogon* species. The nature reserve plants are apparently sterile, suggesting that the population may consist of a single clonal individual (Grayling 1989). The other populations produce an abundance of fertile seed. Recent research (Grayling 1989) indicates that *Eucalyptus absita* may be hybridizing with *E. loxophleba* at the private property site, an unusual event in such taxonomically distant species. The surrounding area is largely cleared but further surveys may find additional populations on private land. Collection of seed and further research is necessary. Close liaison with land managers regarding protection of the populations is essential. It is gazetted as Declared Rare Flora [Appendix 2].

*E. absita* grows as a small, smooth-stemmed mallee (to 2.5 m) or a larger mallee (to 10 m) with rough, box-type bark at the base. The leaves are glossy green with few or no oil glands. The club-shaped buds and conical to cupular fruits are in apparently terminal inflorescences. It is most closely related to *E. cuprea*.

Specific References: Grayling (1989), Grayling and Brooker (1992).



**EUCALYPTUS ACIES** Brooker

**Woolbernup Mallee**

Number of records: 12

Population Size
<10(0) 10-20(0) 20-50(2) 50-100(1) 100-500(3) >500(1) unspecified(5)

Conservation Status
Restricted to road verge (0%), Not (83%), Unspecified (17%)
Inconservation reserve (50%), Not (50%), Unspecified (0%)

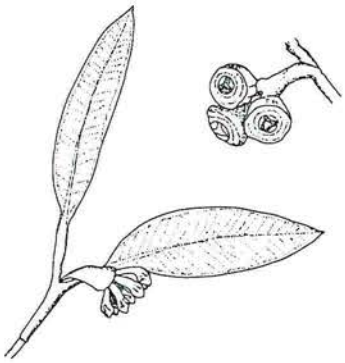
Height: 1-3.5 m

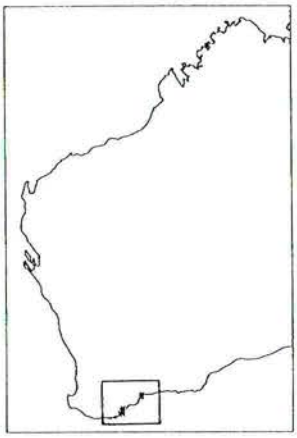
Flowering period: September - November

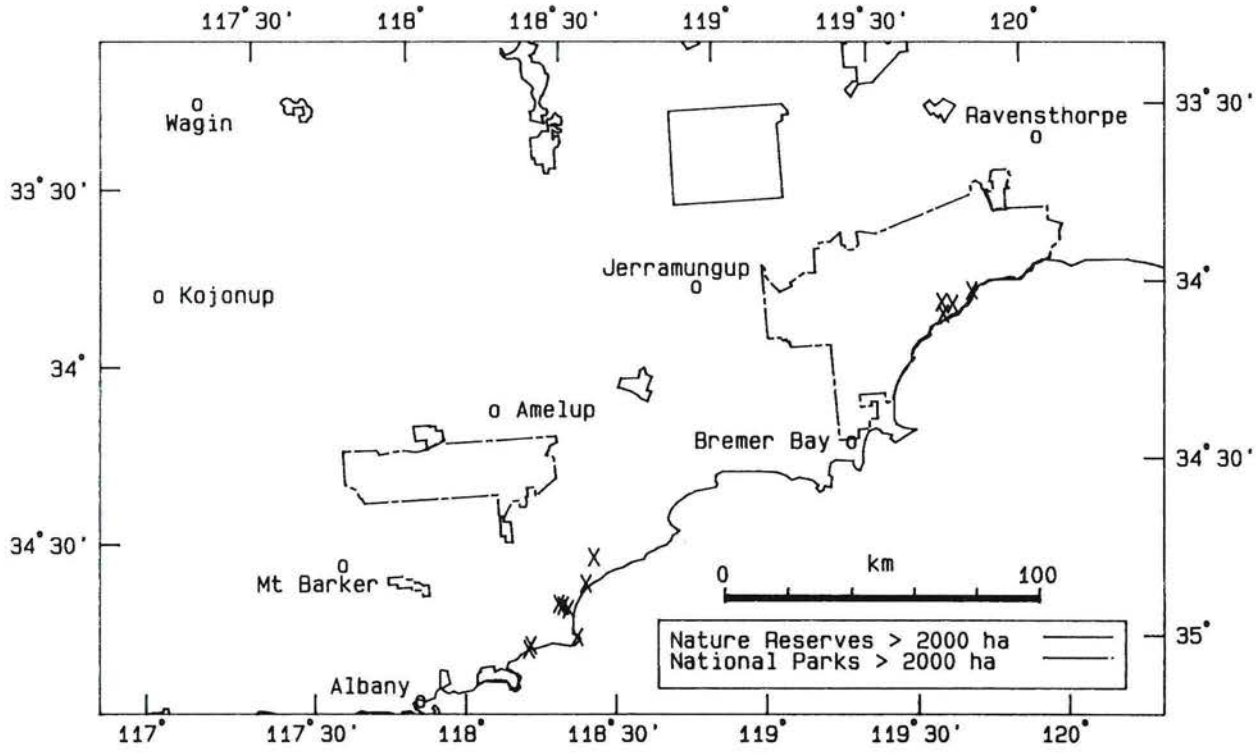
A coastal and semi-coastal species with a scattered distribution between Mt Manypeaks and Thumb Peak. It is found on hillslopes in rocky sand or occasionally loam over limestone, laterite or granite. It is locally common and sometimes dominant in coastal heath and low mallee. Associated species include *Eucalyptus doratoxylon, E. preissiana, E. lehmannii* and *E. staeri*. Large populations have been recorded from Fitzgerald River National Park, Waychinicup Nature Reserve, private property and vacant Crown land. It is likely that further populations occur in poorly accessed areas. Two apparently stable hybrid populations of *E. acies* and *E. marginata* have been observed at Bluff Creek and Mt Manypeaks.

*E. acies* is a distinctive straggling shrub or low mallee with smooth stems, angular branchlets and thick, glossy leaves. The ribbed buds and fruits on a flattened and usually down-curved peduncle are also characteristic.

Specific References: Brooker (1972), Hall and Brooker (1977a), Pryor (1981), Elliot and Jones (1986).







**EUCALYPTUS AEQUIOPERTA** Brooker & Hopper

Number of records: 6

Population Size
<10(0) 10-20(0) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(5)

Conservation Status
Restricted to road verge (0%), Not (50%), Unspecified (50%)
In conservation reserve (0%), Not (67%), Unspecified (33%)

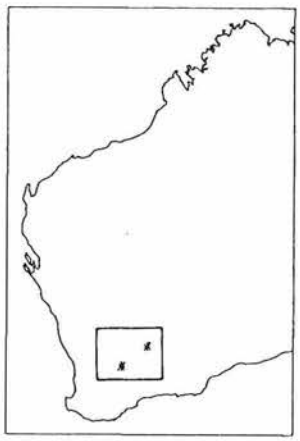
Height: 8 m

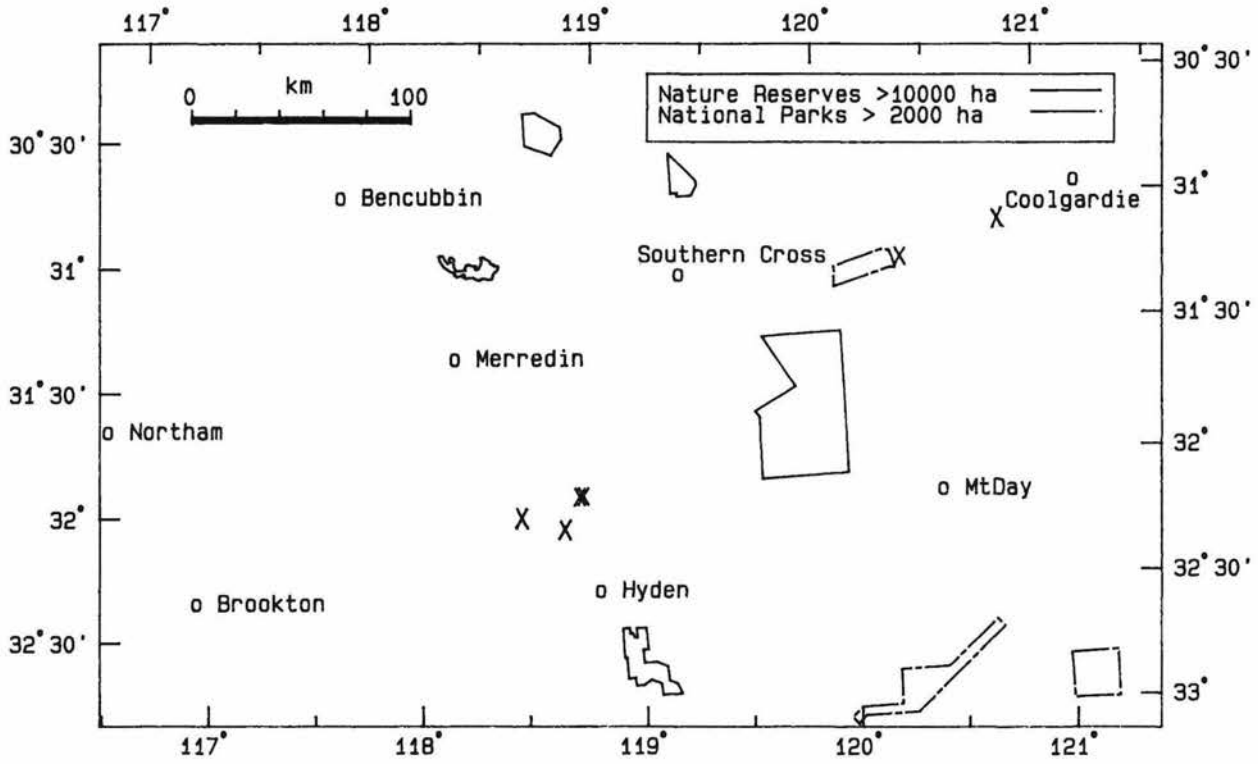
Flowering period: unknown

*Eucalyptus aequioperta* is a poorly collected species recorded over a range of 260 km between Bendering and Coolgardie. Habitat is mostly flat with soils including sands, clays and loams. *E. salmonophloia, E. eremophila* and *E. sheathiana* are associated in the surrounding mallee and woodland vegetation. Most of the records are from agricultural areas with no confirmed occurrences in conservation reserves. Its poor collection may be owing to its likeness to other local species, particularly *E. myriadena*.

*E. aequioperta* grows as a mallee or tree with rough, grey bark on the lower trunk and smooth, grey to coppery bark above. It has narrow, glossy leaves and is similar in overall appearance to *E. myriadena, E. ovularis* and *E. brachycorys*. It differs in the shape and size of its leaves, buds and fruits.

Specific Reference: Brooker and Hopper (1993).





**EUCALYPTUS ANGUSTISSIMA** F. Muell. ssp. **ANGUSTISSIMA**

**Narrow-leaved mallee**

Number of records: 18

Population Size
<10(4) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0)
unspecified(14)

Conservation Status
Restricted to road verge (0%), Not (67%), Unspecified (33%)
In conservation reserve (33%), Not (61%), Unspecified (6%)

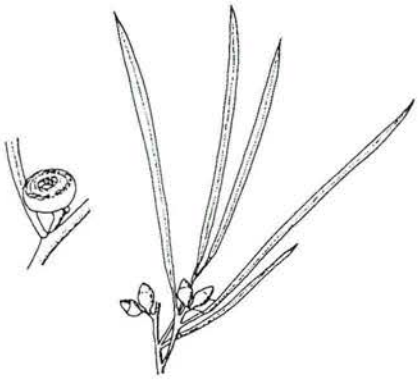
Height: 1.5-5 m

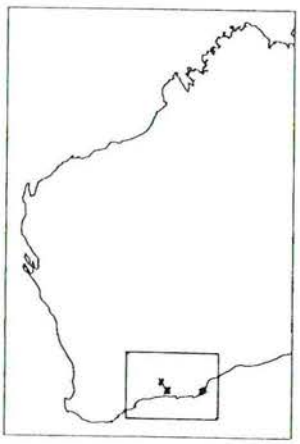
Flowering period: August - January

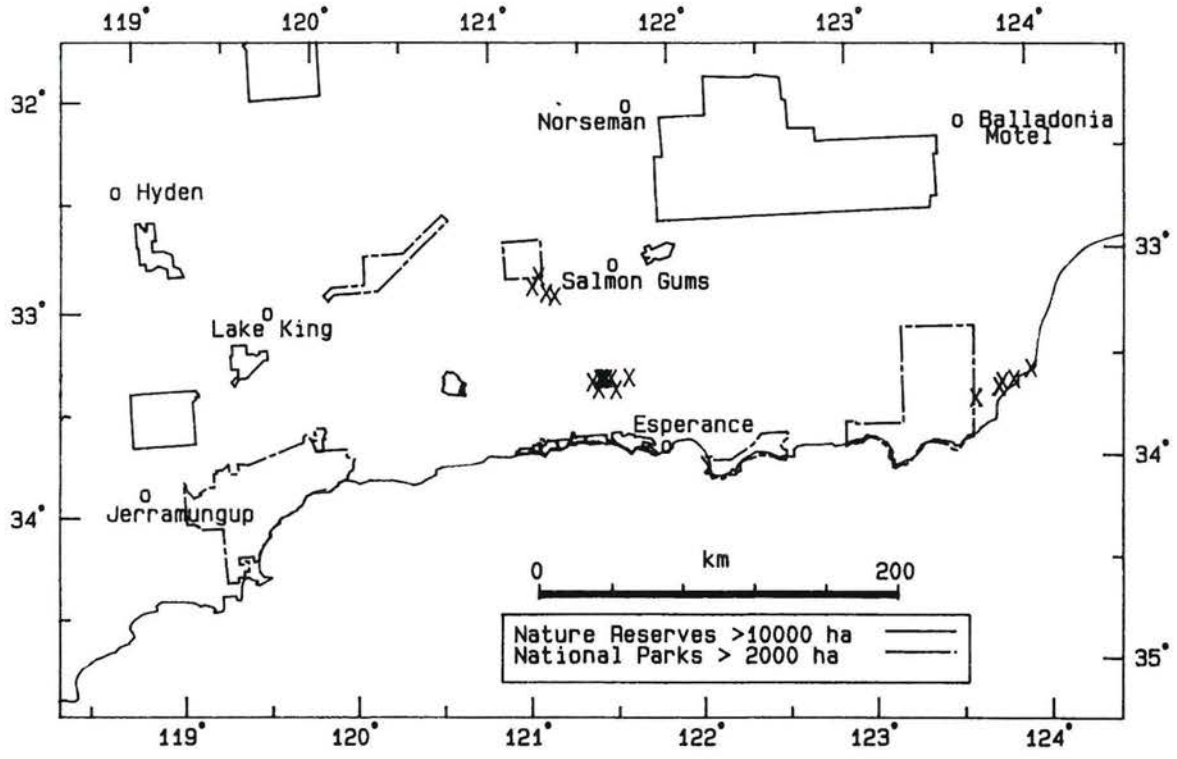
*Eucalyptus angustissima* ssp. *angustissima* is known from disjunct population groups north of Esperance, south of Peak Charles and near Israelite Bay. It occurs on usually sandy soils in flat or gently sloping country, sometimes along creeks and drainage lines. The habitat was often recorded as salty. Surrounding vegetation is mallee-heath and shrubland including *Acacia, Melaleuca* and various *Eucalyptus* species. Thirty-three per cent of the known records occur in conservation reserves, five records in Nuytsland Nature Reserve and one in a nature reserve north of Esperance. Where specified, population size was small, although this may not be indicative of all populations. The recently described ssp. *quaerenda* occurs near Pingrup and intergrades between the two subspecies occur north of Ravensthorpe.

*E. angustissima* ssp. *angustissima* is a mallee with thin, smooth-barked stems and a dense crown of erect, narrow leaves which give it the appearance of some *Acacia* species. It resembles *E. misella* and is distinguished by its extremely narrow leaves, shorter peduncles and fruits with level to protruding valves.

Specific References: Mueller (1863-64), Elliot and Jones (1986), Hill and Johnson (1992).







**EUCALYPTUS ANNULIFORMIS** Grayling & Brooker

Number of records: 1

Population Size
<10(1) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0)
unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

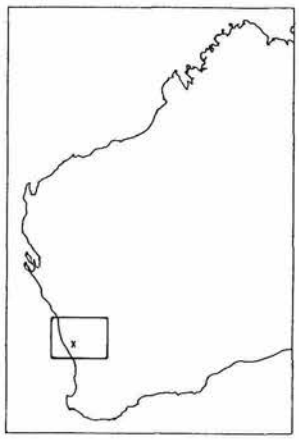
Height: 3 m

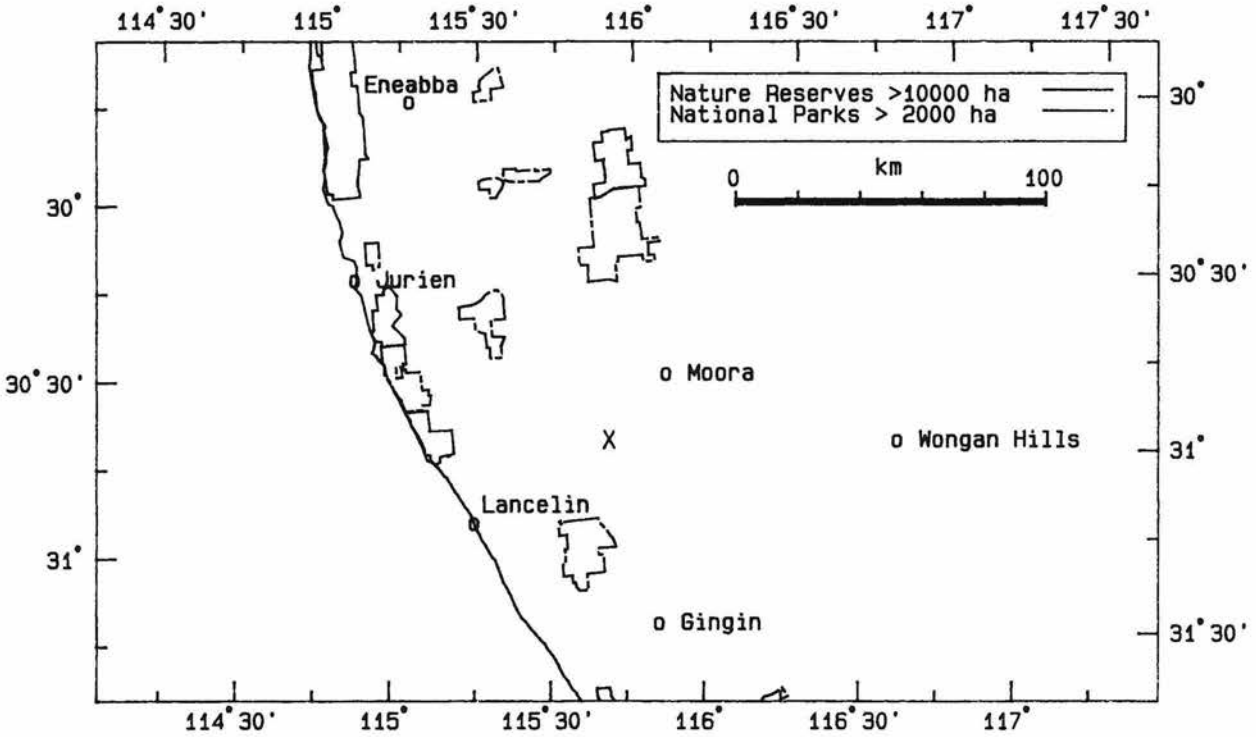
Flowering period: July - September

*Eucalyptus annuliformis* is known from a single stand on private property south-east of Dandaragan where it grows on the side of a rocky laterite hill. The population consists of an isolated cluster of stems that may be one or possibly two individuals. Although it produces numerous flowers and fruits no viable seed has been collected. Recent studies suggest that it may be a polyploid variant of *E. drummondii* (Grayling 1989). Such an occurrence has not been reported in any species of *Eucalyptus* but is known to occur in many other genera of the Myrtaceae family (Rye 1980). It has not been gazetted as Declared Rare Flora owing to its uncertain taxonomic status. Alternatively, it may be a sterile clone of *E. drummondii* (Hopper, personal communication). Further research is required.

*E. annuliformis* is a mallee with dull leaves and smooth, grey bark deciduous in small flakes. It is distinguished from *E. drummondii* by its larger non-glaucous buds, beaked opercula and larger fruit with an inward-sloping disc.

Specific References: Grayling (1989), Grayling and Brooker (1992).





**EUCALYPTUS AQUILINA** Brooker

**Cape Le Grand Mallee**

Number of records: 8

Population Size
<10(1) 10-20(0) 20-50(0) 50-100(0) 100-500(2) >500(0)
unspecified(5)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (100%), Not (0%), Unspecified (0%)

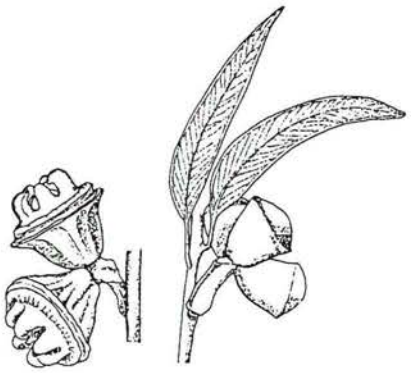
Height: 3-7 m

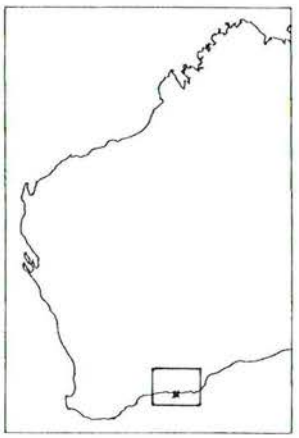
Flowering period: April - June

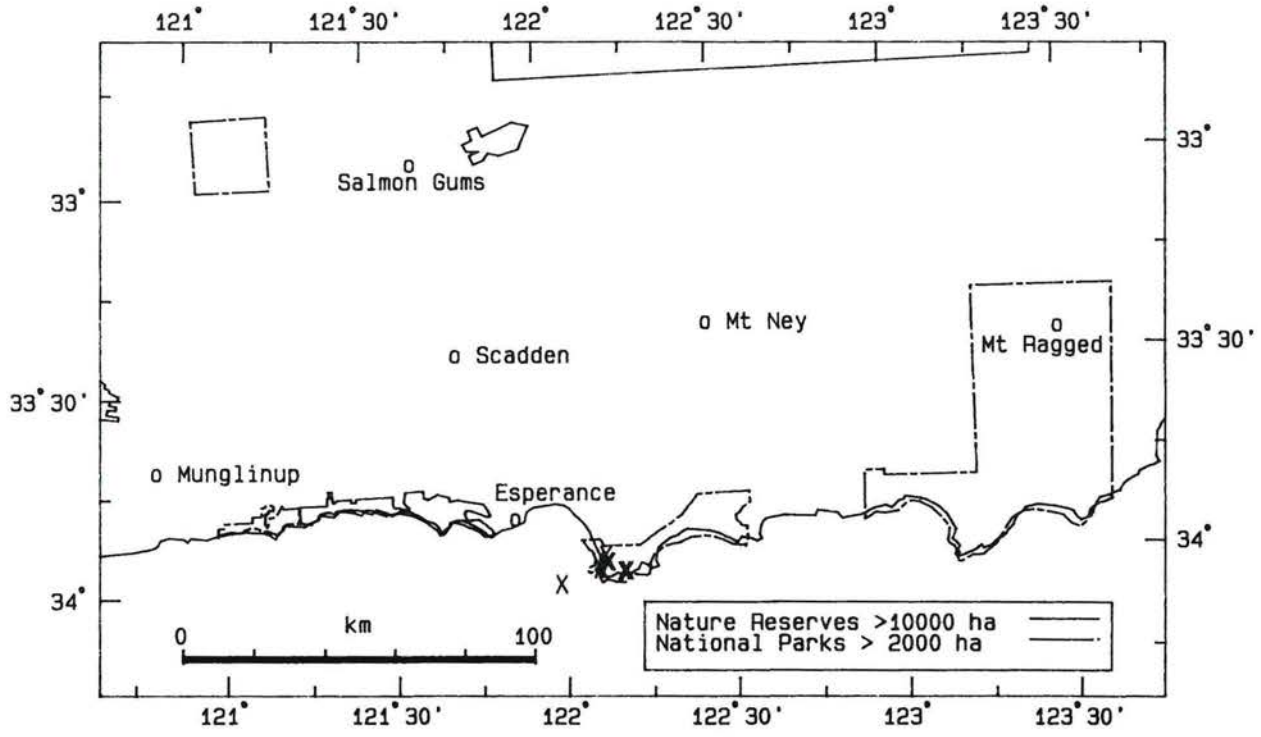
A restricted but locally abundant species in the south-western portion of Cape Le Grand National Park and on an island of the Recherche Archipelago (A Class Nature Reserve) south-east of Esperance. It grows on slopes and along creeklines in shallow sandy or loamy soils among granite rocks. It forms dense thickets in mallee scrub and heath with *Eucalyptus ligulata, E. lehmannii, E. doratoxylon, E. semiglobosa* and *E. goniantha* ssp. *notactites*. Careful management of fire regimes will be required for recruitment. The impact of dieback disease on this species needs investigation.

*E. aquilina* is a thin-stemmed mallee similar to *E. coronata* but with larger, smooth, unbeaked buds and smooth or only faintly ribbed fruits. The disc of *E. aquilina* has hooked lobes covering the valves whereas those of *E. coronata* are rounded.

Specific References: Brooker (1974), Brooker and Hall (1975a), Pryor (1981), Rye and Hopper (1981), Elliot and Jones (1986).







**EUCALYPTUS 'ARBORELLA'** Brooker & Hopper ined.

Number of records: 4

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(4)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0)
In conservation reserve (100%), Not (0%), Unspecified (0%)

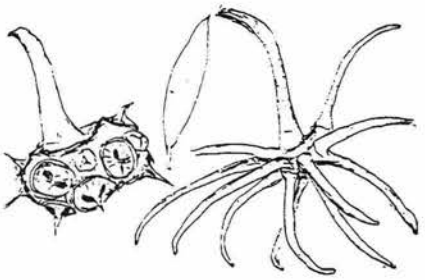
Height: 2.5-5 m

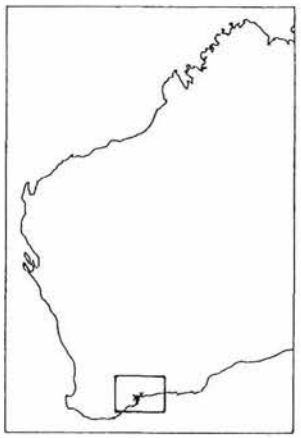
Flowering period: March

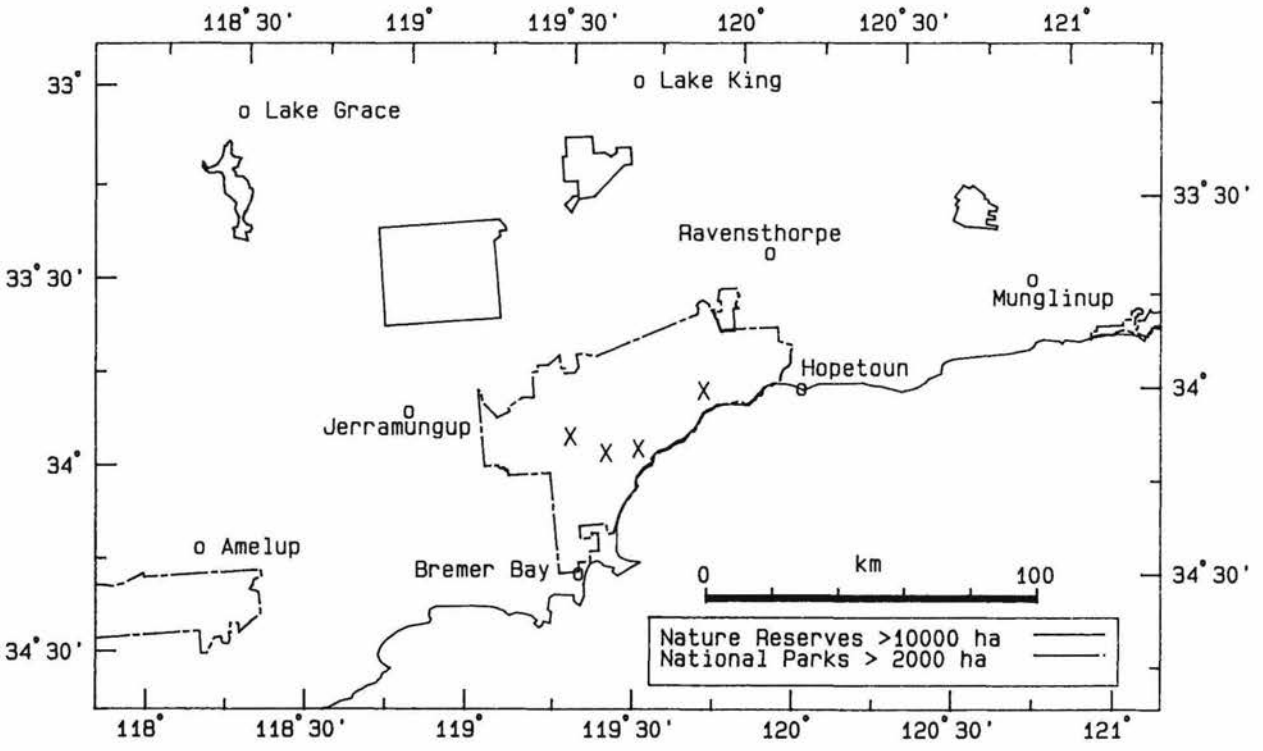
*Eucalyptus 'arborella'* is a recently recognized taxon recorded only from the Fitzgerald River National Park where it grows on hilltops, breakaways and creekline slopes in spongolite stone and gravel. Associated species in the shrub-mallee and low woodlands include *E. tetragona, E. uncinata, E. astringens, E. falcata* and *Banksia laevigata* ssp. *laevigata*. It was included as a species of interest toward the end of the survey and further searching is required. It has considerable horticultural merit.

*E. 'arborella'* is a mallet with a short, thick basal trunk up to 1 m then widely branching above. The bark is smooth, grey-brown over pale pinkish copper. It is closely related to the more widespread *E. lehmannii*, differing in its mallet habit and longer, more tapering buds.

Illustration by S.D. Hopper.







**EUCALYPTUS ARENARIA** Blakely

**Rough-barked Bloodwood**

Number of records: 10

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0)
unspecified(10)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (50%), Not (50%), Unspecified (0%)

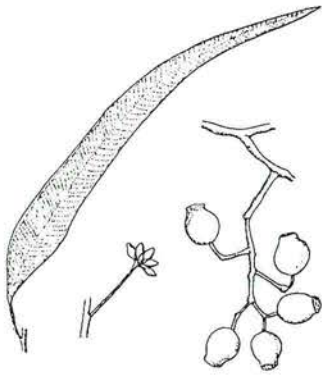
Height: 4-18 m

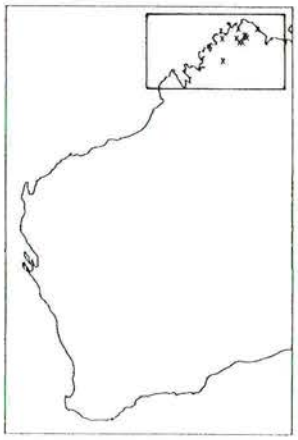
Flowering period: June

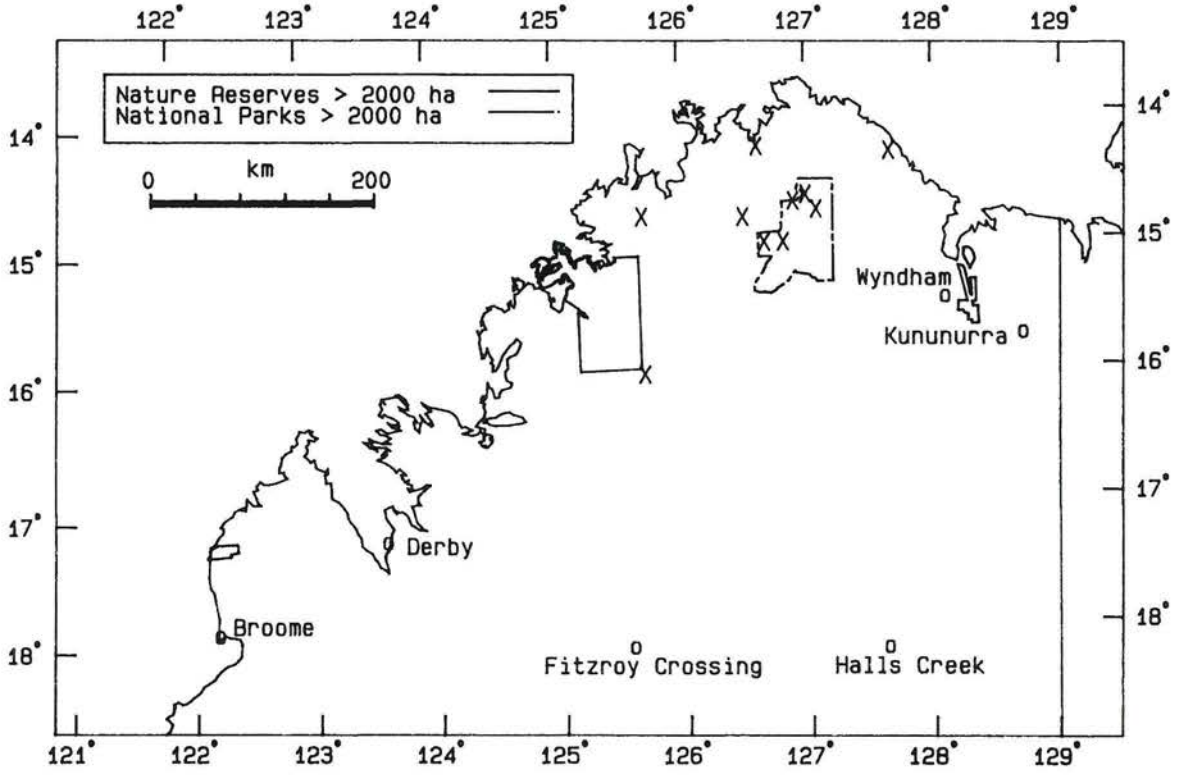
A bloodwood species of the northern Kimberley with a scattered distribution over 300 km from Mt Jameson north-east to Mt Casuarina. It grows in open woodlands on rocky sandstone ridges and plateaus, often along watercourses. Of the total records, 50 per cent are within Drysdale River National Park, with others occurring on pastoral lands and Aboriginal reserves. Population size was not specified. It is well protected given its occurrence in the National Park and its geographic remoteness.

*Eucalyptus arenaria* is a tree with rough, fibrous bark on the trunk and lower branches. The buds are ovoid or pear-shaped and the fruits globular to urn-shaped. It is distinguished from *E. dichromophloia*, a species of central Northern Territory, by its narrower leaves and rough bark.

Specific References: Blakely (1934), Carr and Carr (1985), Elliot and Jones (1986).







**EUCALYPTUS ARGUTIFOLIA** Grayling & Brooker

**Yanchep Mallee, Wabling Hill Mallee**

Number of records: 8

Population Size
<10(4) 10-20(0) 20-50(4) 50-100(0) 100-500(0) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

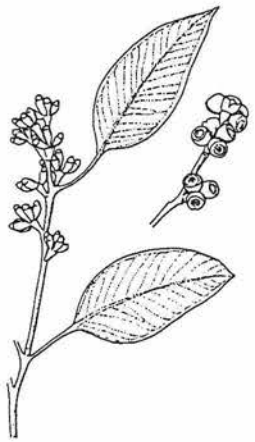
Height: 2-3 m

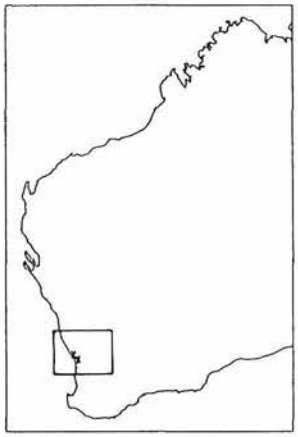
Flowering period: February - May

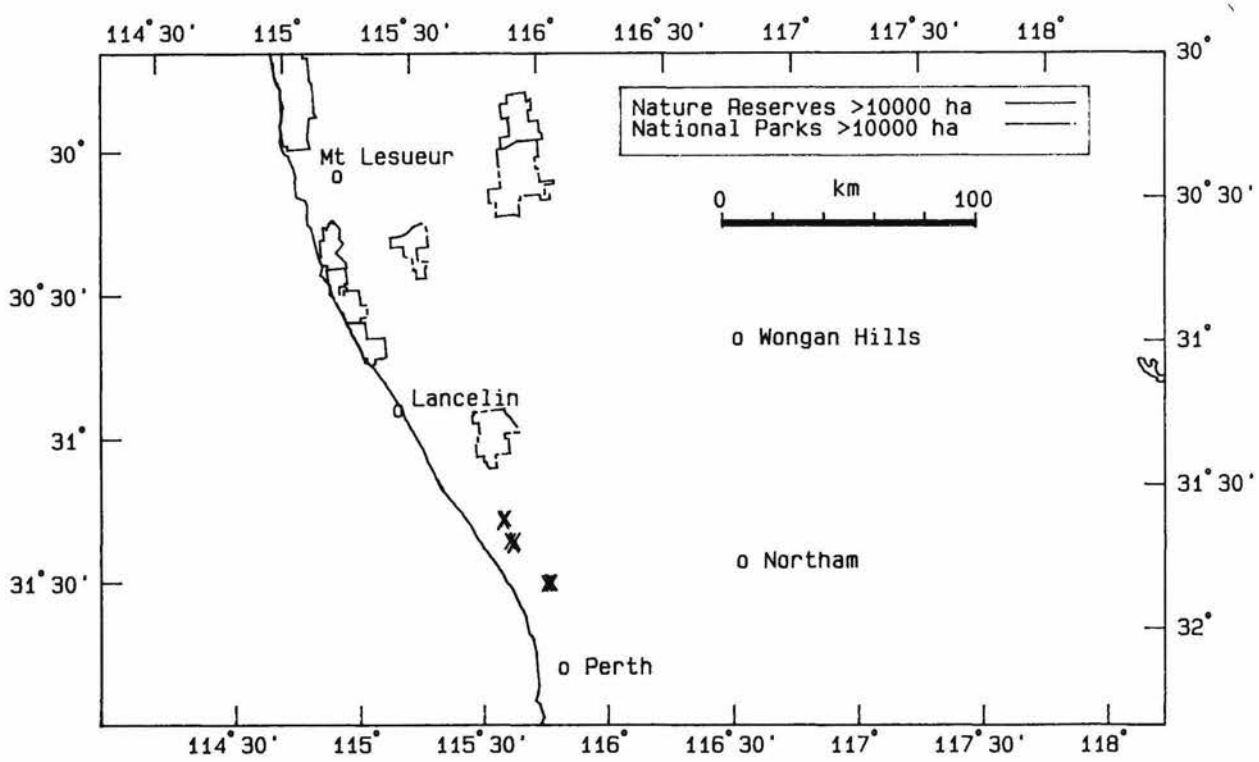
*Eucalyptus argutifolia* was previously known from only two populations north of Yanchep, but owing to recent surveys by regional staff it is now recorded from populations at eight sites between Wanneroo and Guilderton. It grows in shallow sand on limestone slopes and ridges where it is emergent from heath and thicket dominated by *Dryandra sessilis* and *Melaleuca huegelii*. Other coastal species *E. foecunda, E. decipiens* and *E. petrensis* are associated. The populations total less than two hundred plants and occur in State forest and a quarry reserve. Limestone mining operations are proposed in some areas. Two collections from near Seabird and the Hill River, although resembling *E. argutifolia* in some characteristics, are probably more closely related to *E. obtusiflora*. Appropriate fire management and protection from accidental destruction is essential. It is gazetted as Declared Rare Flora [Appendix 2].

*E. argutifolia* is a smooth-barked mallee with thick, glossy leaves and sessile or shortly pedicellate buds and fruits on a stout peduncle. It is closely related to *E. obtusiflora* which has narrower, dull leaves and distinctly pedicellate buds and fruits.

Specific References: Grayling (1989), Grayling and Brooker (1992).







**EUCALYPTUS ARTICULATA** Brooker & Hopper

**Ponton Creek Mallee**

Number of records: 6

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(3) 100-500(0) >500(0) unspecified(3)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

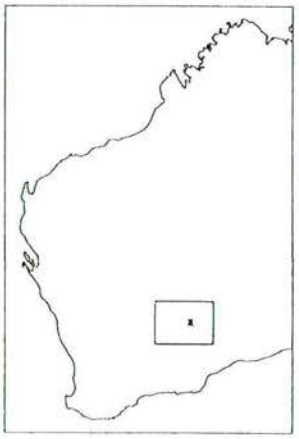
Height: 2.5-3 m

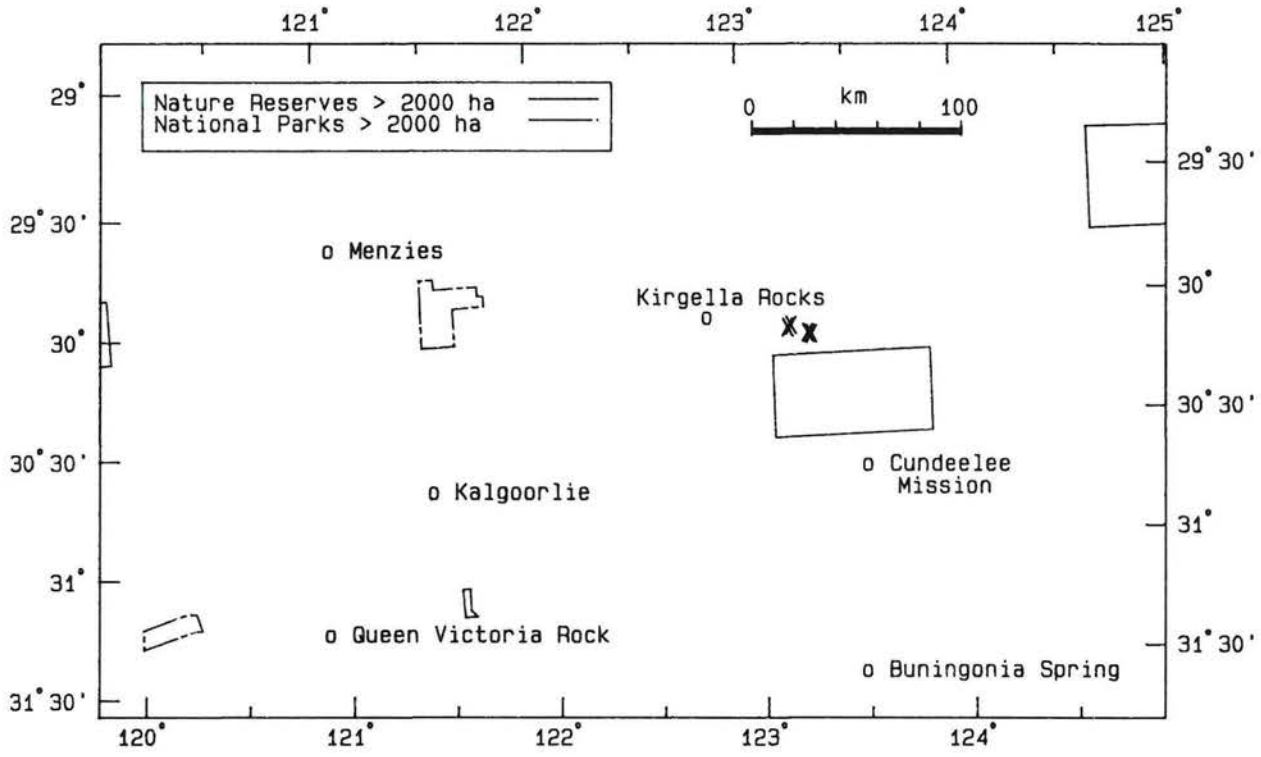
Flowering period: June

A rare species known from several populations south of Lake Minigwal in the Great Victoria Desert, growing on gradual slopes and ridge-tops in red sand or loam with quartz and gravel. It forms an open shrub-mallee community with *Eucalyptus concinna*, over scattered *Melaleuca uncinata*, *Acacia* sp. and spinifex (*Triodia* sp.). All of the populations are from vacant Crown land and require protection from mineral exploration activities. The region is largely unsurveyed owing to poor access. It is gazetted as Declared Rare Flora [Appendix 2].

*E. articulata* is an effuse, spreading mallee with thick, shiny copper trunks and a glossy, dark green canopy. It is related to the smooth-barked form of *E. loxophleba*, differing in its non-glaucous branchlets and broadly lanceolate, blue-green juvenile leaves.

Specific Reference: Brooker and Hopper (1993).





**EUCALYPTUS ASPERSA** Brooker & Hopper

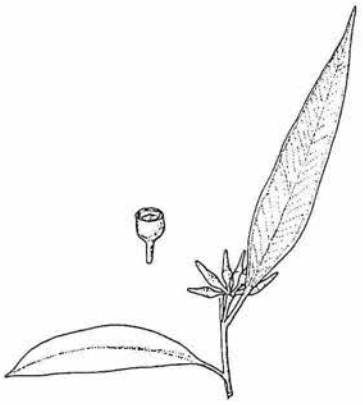
Number of records: 36

Population Size
<10(6) 10-20(3) 20-50(8) 50-100(4) 100-500(3) >500(0) unspecified(12)

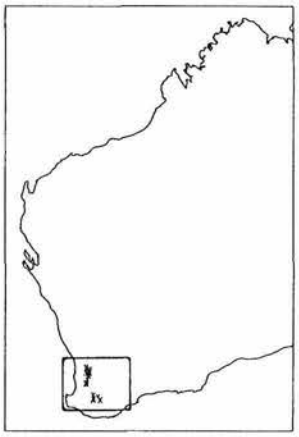
Conservation Status
Restricted to road verge (3%), Not (86%), Unspecified (11%)
In conservation reserve (3%), Not (97%), Unspecified (0%)

Height: 2.5 m

Flowering period: April

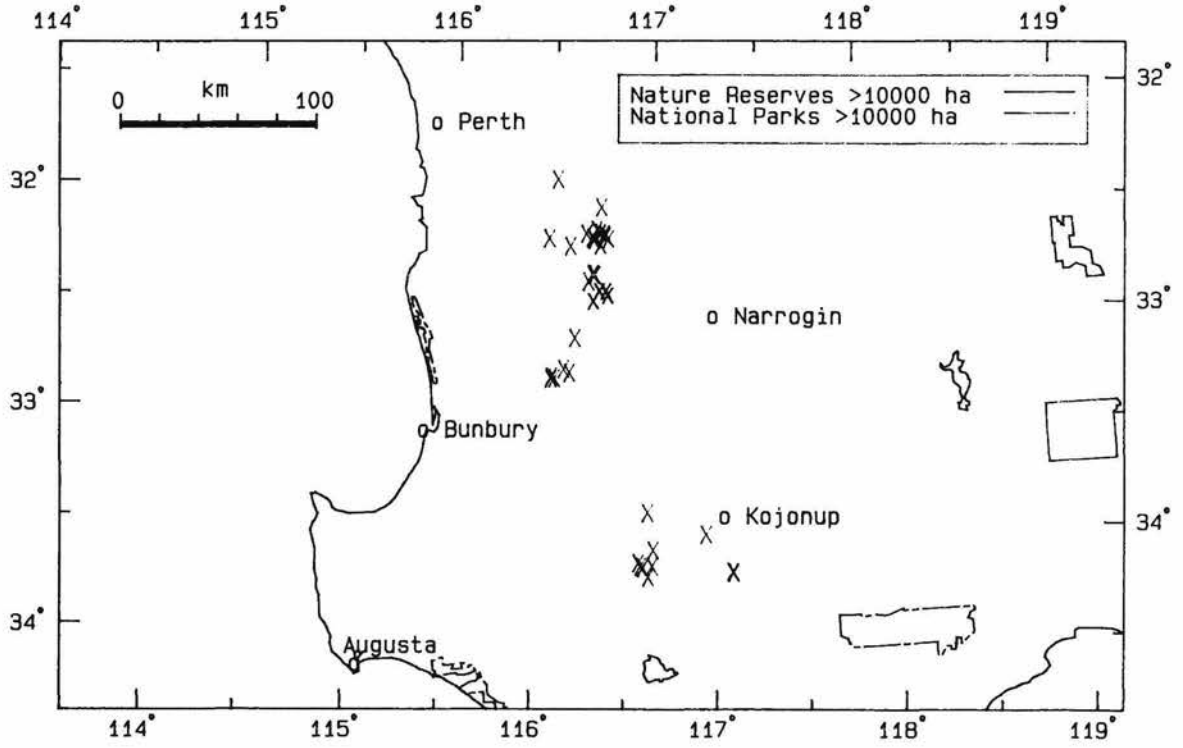


*Eucalyptus aspersa* occurs over a range of more than 200 km, from east of Abyssinia Rock near the Brookton Highway to south of Kojonup. It is usualy found in small pure stands in woodland or patches of heath surrounded by *E. marginata* and *E. wandoo* forest. The northern populations are mostly from sandy gravel soils while those to the south are from gravelly loam. Landform is gradual slopes, flats and occasionally hilltops. It is relatively well protected with 64 per cent of the total records from State forest. One record (3 per cent of total) is from a nature reserve and three records (8 per cent of total) are from the Lane Poole Reserve [5(g) CALM Act Reserve]. Recent work by regional staff has found *E. aspersa* to be more common in the northern jarrah forest than previously thought. Development of specific fire regimes and maintenance of dieback hygiene conditions are required in its area of occurrence. Reservation of more populations in conservation areas would be desirable.



*E. aspersa* is a small mallee with slightly glossy leaves and rough, flaking bark on the lower stems. The buds are spindle-shaped with a beaked operculum and the fruits have apparently exserted valves owing to the persistent style remnants. It is related to *E. oleosa* of the goldfields and eastward.

Specific Reference: Brooker and Hopper (1993).



**EUCALYPTUS BALANITES** Grayling & Brooker

**Cadda Road Mallee**

Number of records: 1

Population Size
<10(0) 10-20(0) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (100%), Not (0%), Unspecified (0%)

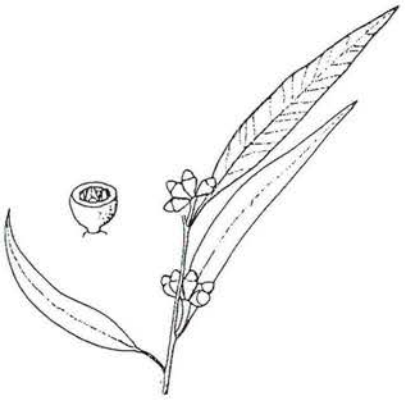
Height: 5 m

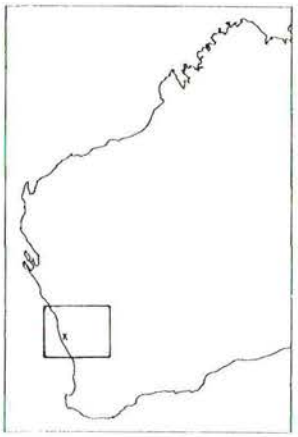
Flowering period: October - January

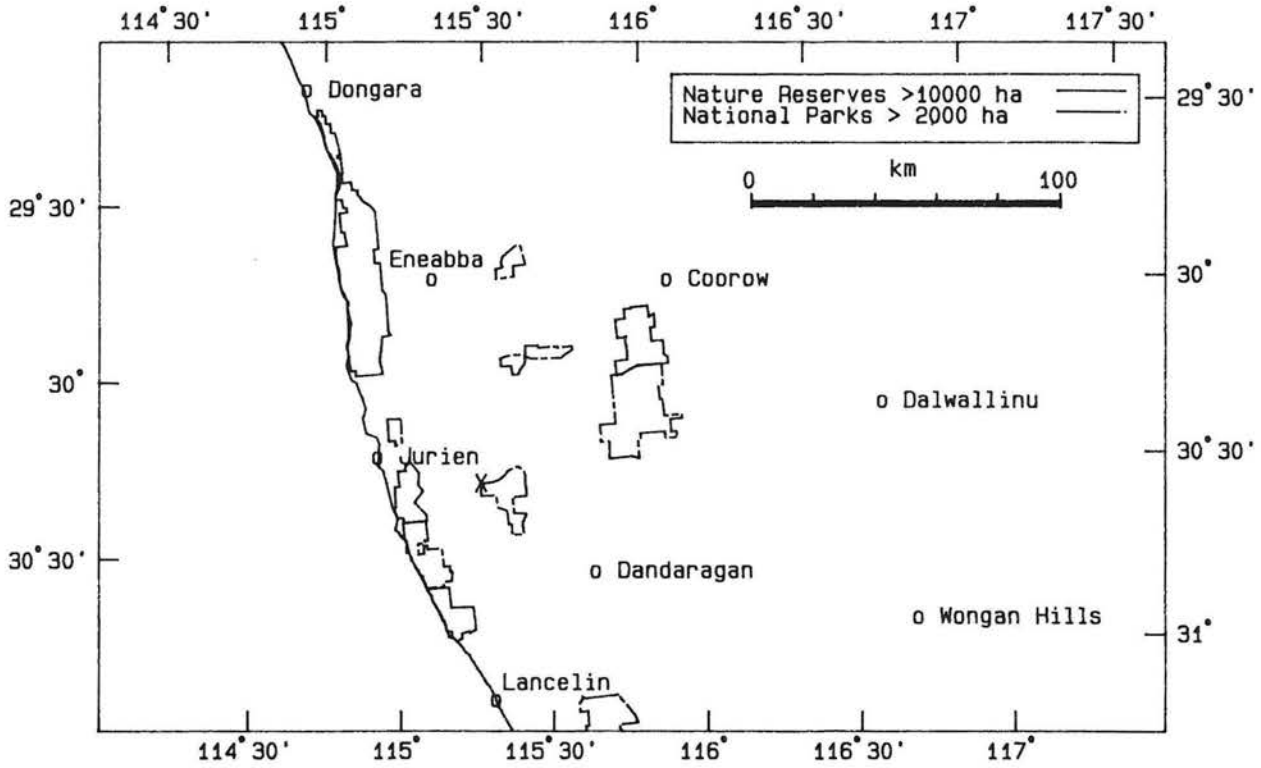
*Eucalyptus balanites* is a rare mallee known from a single population on the northern boundary of Badgingarra National Park. It grows emergent from dense heath on a gentle, sandy laterite slope in association with *E. lanepoolei, E. todtiana, Nuytsia floribunda* and *Banksia candolleana*. Recent studies (Grayling 1989) suggest that it may be of hybrid origin with parents *E. decipiens* and *E. lanepoolei*. The stand has been shown to consist of at least two genetically distinct individuals. Few mature fruit and little fertile seed are produced. Careful management of the site and further research are required. It is gazetted as Declared Rare Flora [Appendix 2].

*E. balanites* is an erect-stemmed mallee with rough, corky basal bark and dull or slightly glossy leaves. Its buds are acorn-like with a hemispherical operculum that is narrower than the hypanthium at the join. The fruits are cup-shaped and sessile.

Specific References: Grayling (1989), Grayling and Brooker (1992).







**EUCALYPTUS BEARDIANA** Brooker & Blaxell

**Beard's Mallee**

Number of records: 10

Population Size
<10(1) 10-20(1) 20-50(2) 50-100(0) 100-500(0) >500(0) unspecified(6)

Conservation Status
Restricted to road verge (20%), Not (60%), Unspecified (20%)
In conservation reserve (10%), Not (90%), Unspecified (0%)

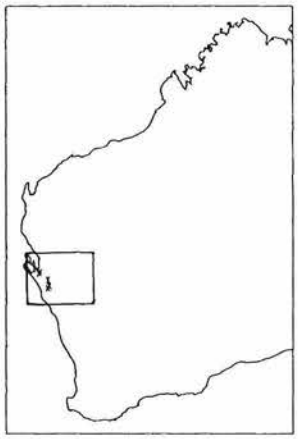
Height: 1.5-5 m

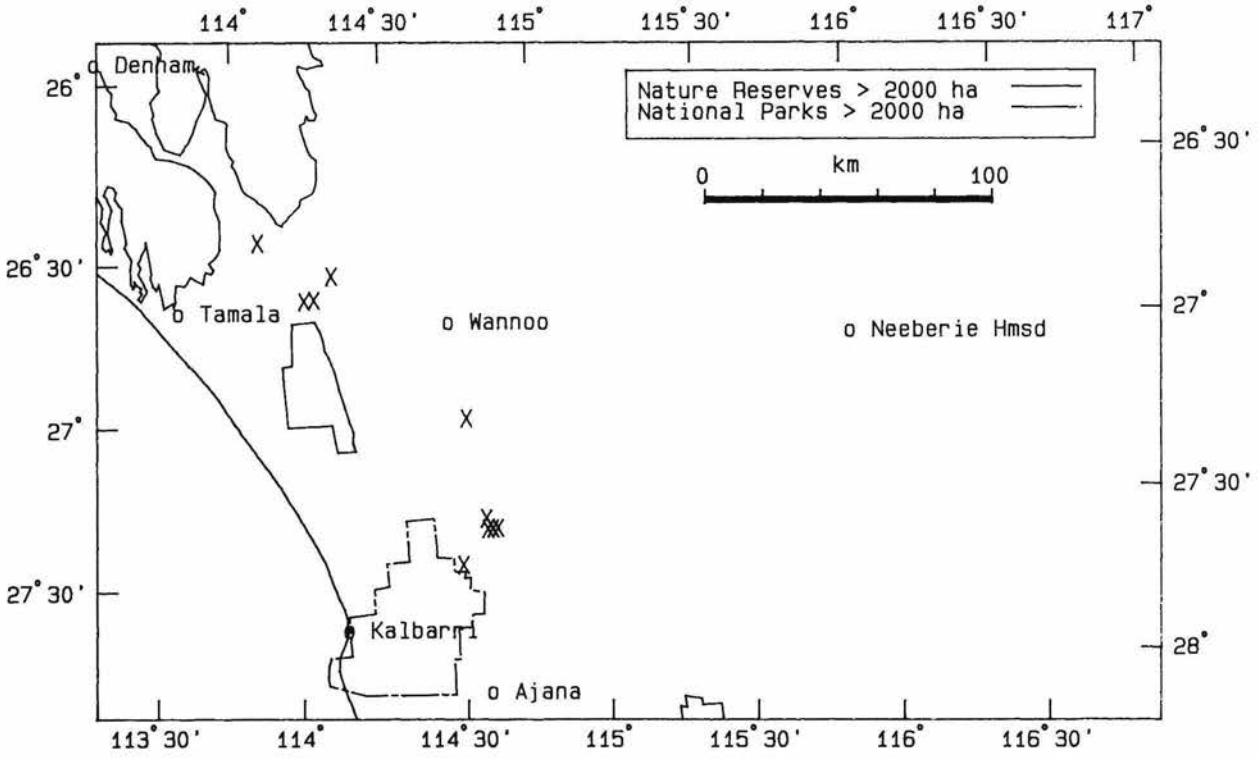
Flowering period: August - September

*Eucalyptus beardiana* is a rare species with a scattered distribution from the Murchison River north toward Shark Bay. It grows on flat or undulating sandplain in mallee-heath or woodland with *E. jucunda, E. eudesmioides, E. gittinsii* and *Banksia sceptrum*. Only one population is known to occur on a conservation reserve, with the other populations on pastoral land and road verge. Some of the old collections have vague location details and have not been relocated during subsequent surveys. Close liaison with land managers to protect this species from grazing, road works and accidental destruction is required. It is gazetted as Declared Rare Flora [Appendix 2].

*E. beardiana* is a spreading, often straggly mallee with smooth bark, slightly glossy leaves and pendulous inflorescences. Like *E. synandra* its stamens are united in the lower half to form a tube. It can be distinguished by its urn-shaped fruits, longer peduncles, larger buds and inflorescences of up to eleven flowers.

Specific References: Brooker and Blaxell (1978), Keighery (1983), Elliot and Jones (1986).





**EUCALYPTUS BENNETTIAE** D.J. Carr & S.G.M. Carr

**Bennett's Mallee**

Number of records: 3

Population Size
<10(1) 10-20(1) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(1)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (67%), Not (33%), Unspecified (0%)

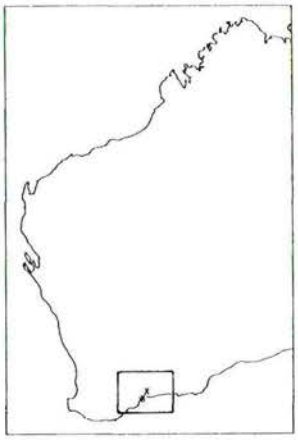
Height: 2 m

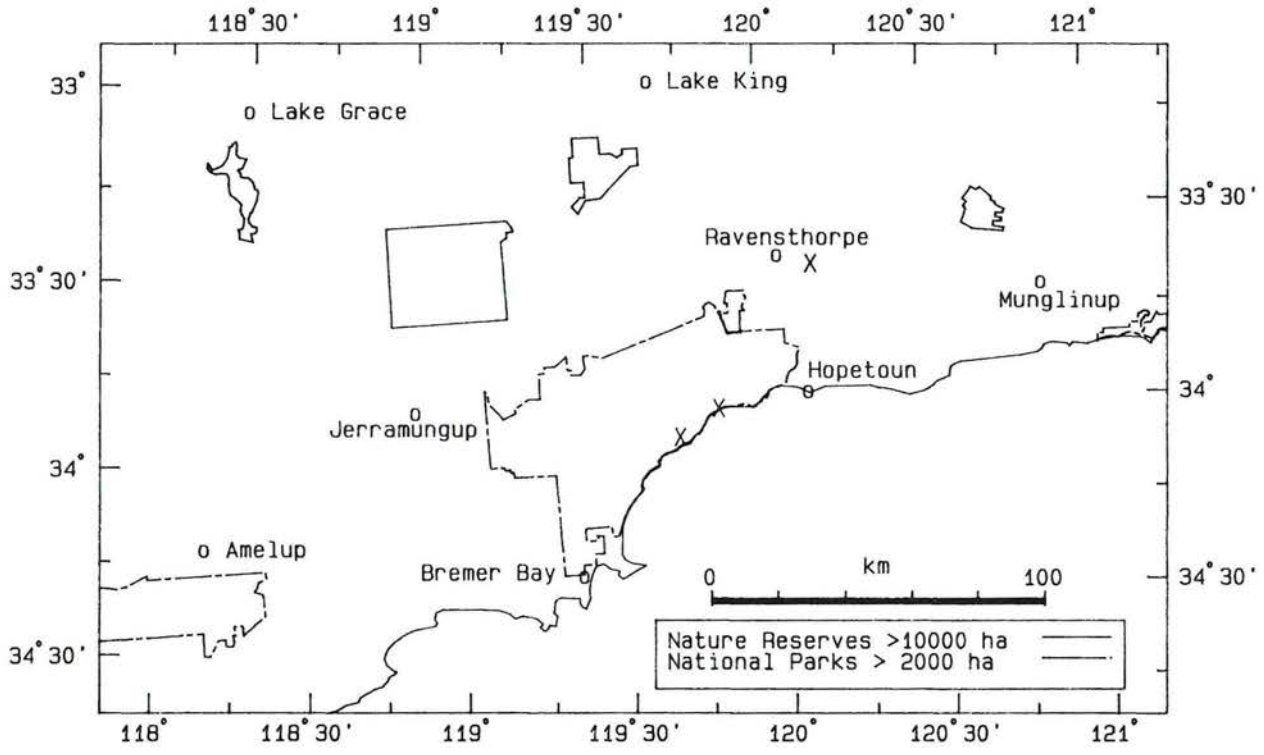
Flowering period: June - September, December

A rare and restricted mallee previously known from a single population in the Ravensthorpe Range near Mt Desmond. Survey work in the Fitzgerald River National Park has extended its range about 65 km south-west to near Mid Mt Barren. It is found on loamy quartzite or lateritic slopes and ridges above creeklines. Surrounding vegetation is mallee or mallee-heath with *Eucalyptus lehmannii, E. megacornuta, E. redunca* and mallee *E.* aff. *occidentalis*. The total number of recorded individuals is low and the species is therefore under considerable threat. The population near Mt Desmond is on 'common' land and may be endangered by further mining activities in the area.

*E. bennettiae* is a small mallee with smooth, pale grey to brown stems and inflorescences borne on long, flattened peduncles. It is believed to have originated as a hybrid between *E. lehmannii* and mallee *E.* aff. *occidentalis*. One of the new populations has slightly broader leaves than the type collection but is otherwise similar (McQuoid, personal communication).

Specific References: Carr and Carr (1980a), Bennett (1982), Patrick and Hopper (1982).





**EUCALYPTUS BLAXELLII** L. Johnson & K. Hill

**Howatharra Mallee**

Number of records: 9

Population Size
<10(7) 10-20(1) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(1)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (22%), Not (78%), Unspecified (0%)

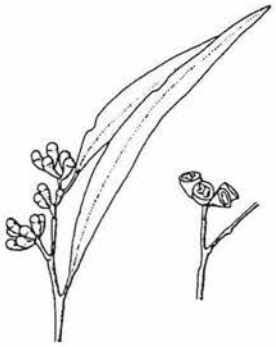
Height: 1-3 m

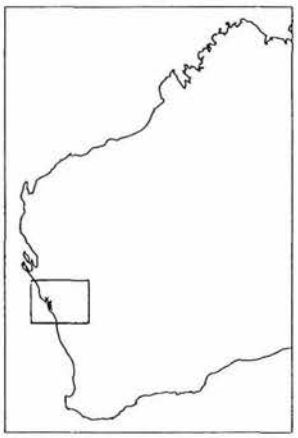
Flowering period: May - November

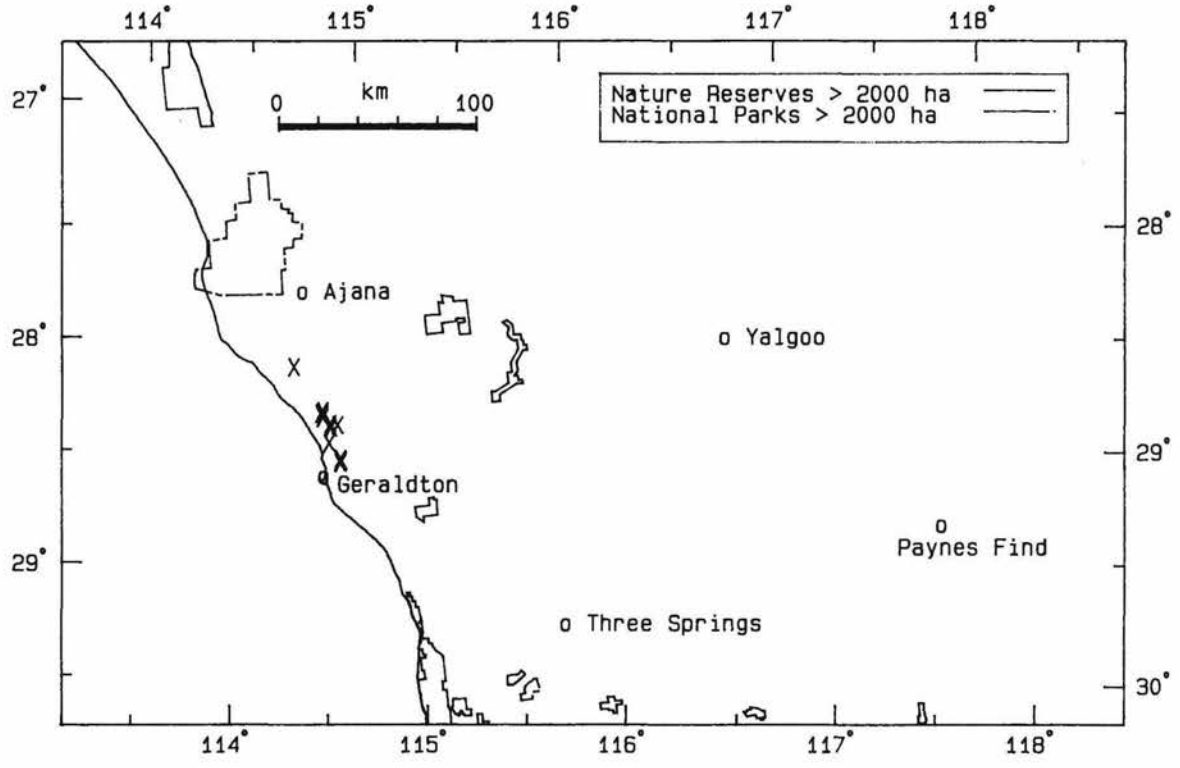
A rare species endemic to the Moresby Range north-east of Geraldton where it is known from nine small populations over a range of less than 60 km. It grows emergent over heath in clayey soils on stony breakaways and slopes. The northernmost population is from a clay creekline. *Eucalyptus 'diminuta'* and *E. ebbanoensis* ssp. *photina* have been recorded in association. Two populations (nine clumps) are from a nature reserve south of Northampton while all other populations are from private land. The continued goodwill of landowners is essential for its survival. Seed collection and cultivation should be undertaken. It is gazetted as Declared Rare Flora [Appendix 2].

*E. blaxellii* is a low, straggly mallee with smooth grey and coppery stems and glossy leaves. It is similar to the smooth-barked form of *E. loxophleba*, differing in its narrower leaves without prominent venation and its generally smaller buds and fruits.

Specific Reference: Hill and Johnson (1992).







**EUCALYPTUS BLEESERI** Blakely

**Smooth-stemmed Bloodwood**

Number of records: 14

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0)
unspecified(14)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (7%), Not (93%), Unspecified (0%)

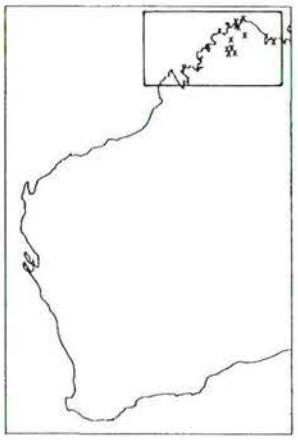
Height: 6-16 m

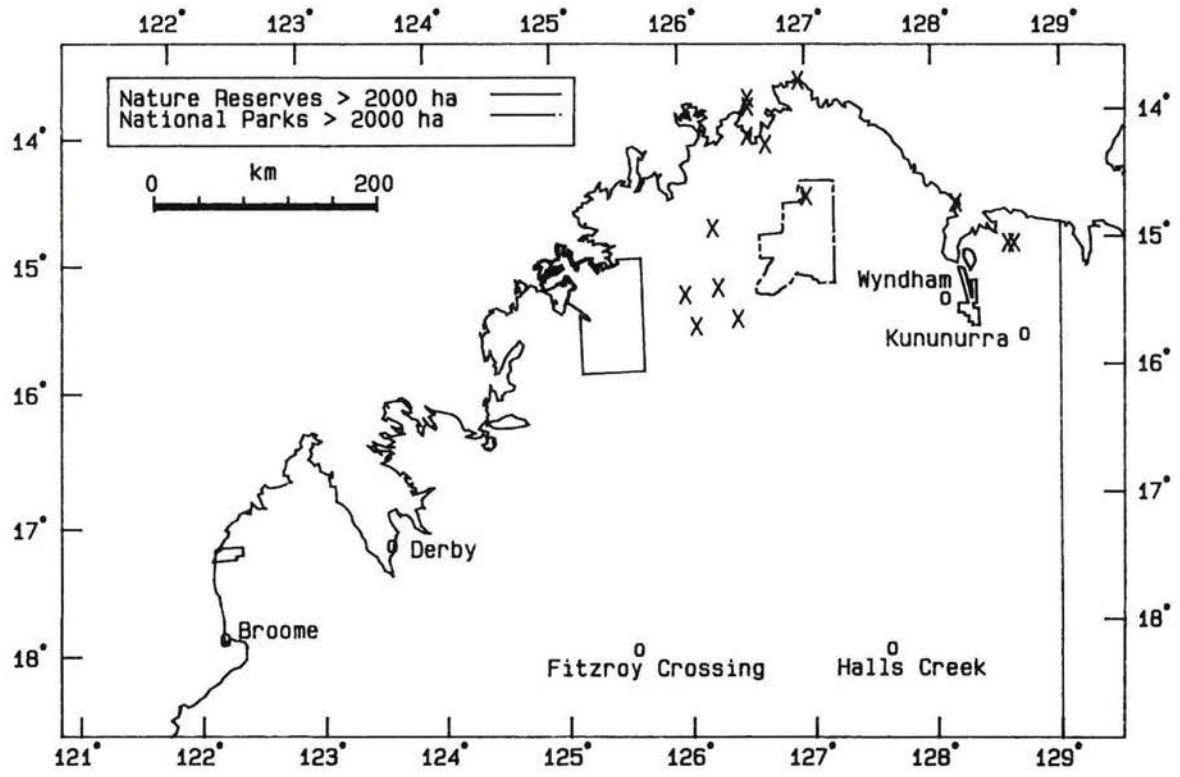
Flowering period: May - July

*Eucalyptus bleeseri* has a scattered distribution from south-west of Drysdale River National Park, north to Cape Londonderry and east to the Ningbing Range, and including one of the coastal islands. It extends into the Northern Territory where it is apparently common. It grows on rocky sandstone and laterite flats, hills and plateaus, forming woodland associations with *E. polycarpa, E. tetrodonta and E. miniata*. It is poorly reserved in Western Australia with only one record from Drysdale River National Park. Other populations are from pastoral leases, vacant Crown land and aboriginal reserves. It is relatively well protected given its remote distribution.

*E. bleeseri* is a bloodwood tree with smooth, whitish bark which may remain as persistent red-brown flakes on the stems. It is characterized by its thick, glossy leaves and buds and fruits on long, terete pedicels and peduncles.

Specific References: Blakely (1926), Blake (1953), Hall and Brooker (1973a), Elliot and Jones (1986).





**EUCALYPTUS BRACHYANDRA** F. Muell.

**Tropical Red Box**

Number of records: 26

Population Size
<10(0) 10-20(0) 20-50(1) 50-100(1) 100-500(0) >500(0) unspecified(24)

Conservation Status
Restricted to road verge (0%), Not (96%), Unspecified (4%)
In conservation reserve (19%), Not (81%), Unspecified (0%)

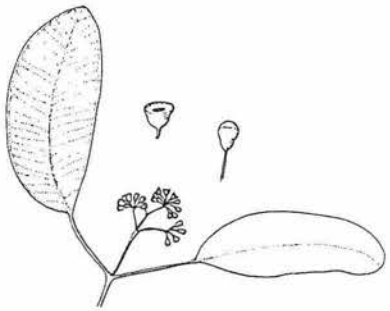
Height: 1-8 m

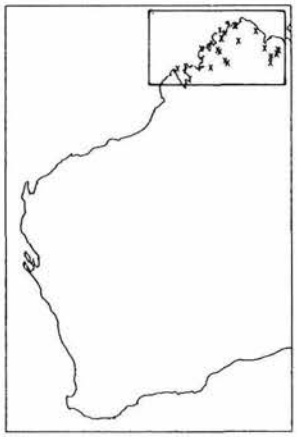
Flowering period: September - November

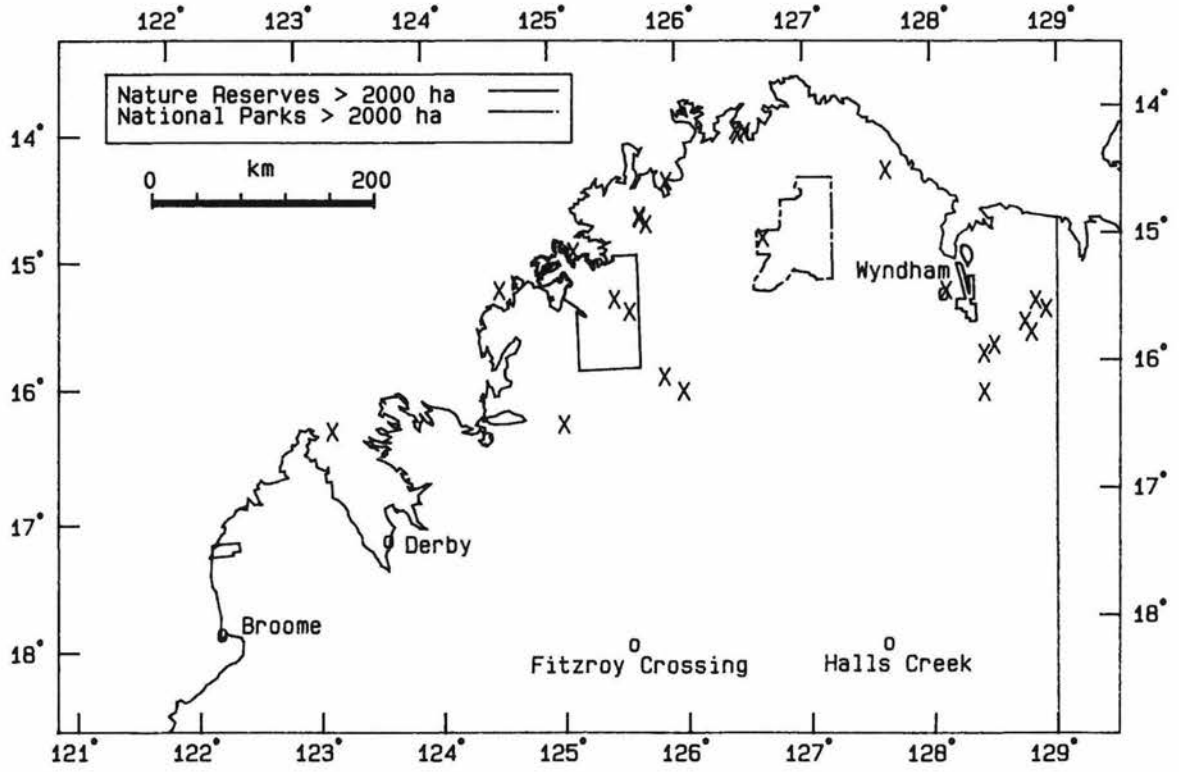
A species of widespread distribution in the Kimberley region from the Buccaneer Archipelago in the west, north to Napier Broome Bay and east into the Northern Territory. It grows on rocky, sandstone outcrops and escarpments with other tree species including *Eucalyptus* aff. *papuana, E. aspera* and *E. fitzgeraldii*. In the Prince Regent Nature Reserve habitat was recorded as quartzite outcrop. It is adequately protected on the coastal islands, and in nature reserves, national parks and aboriginal reserves of the area.

*E. brachyandra* is a small, straggly tree or sometimes a shrub with fibrous, grey bark on the trunk and lower branches. Its minute buds and fruits that measure up to 3 mm in length are characteristic.

Specific References: Mueller (1859), Blake (1953), Hall and Brooker (1975), Elliot and Jones (1986).







**EUCALYPTUS** aff. **BRACHYCALYX** Blakely

Number of records: 4

Population Size
<10(1) 10-20(0) 20-50(0) 50-100(0) 100-500(1) >500(0) unspecified(2)

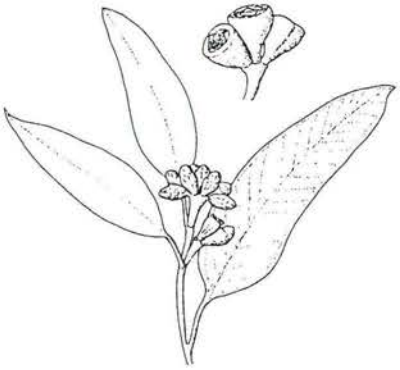
Conservation Status
Restricted to road verge (25%), Not (50%), Unspecified (25%)
In conservation reserve (25%), Not (75%), Unspecified (0%)

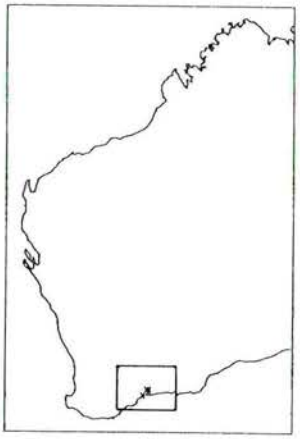
Height: 7 m

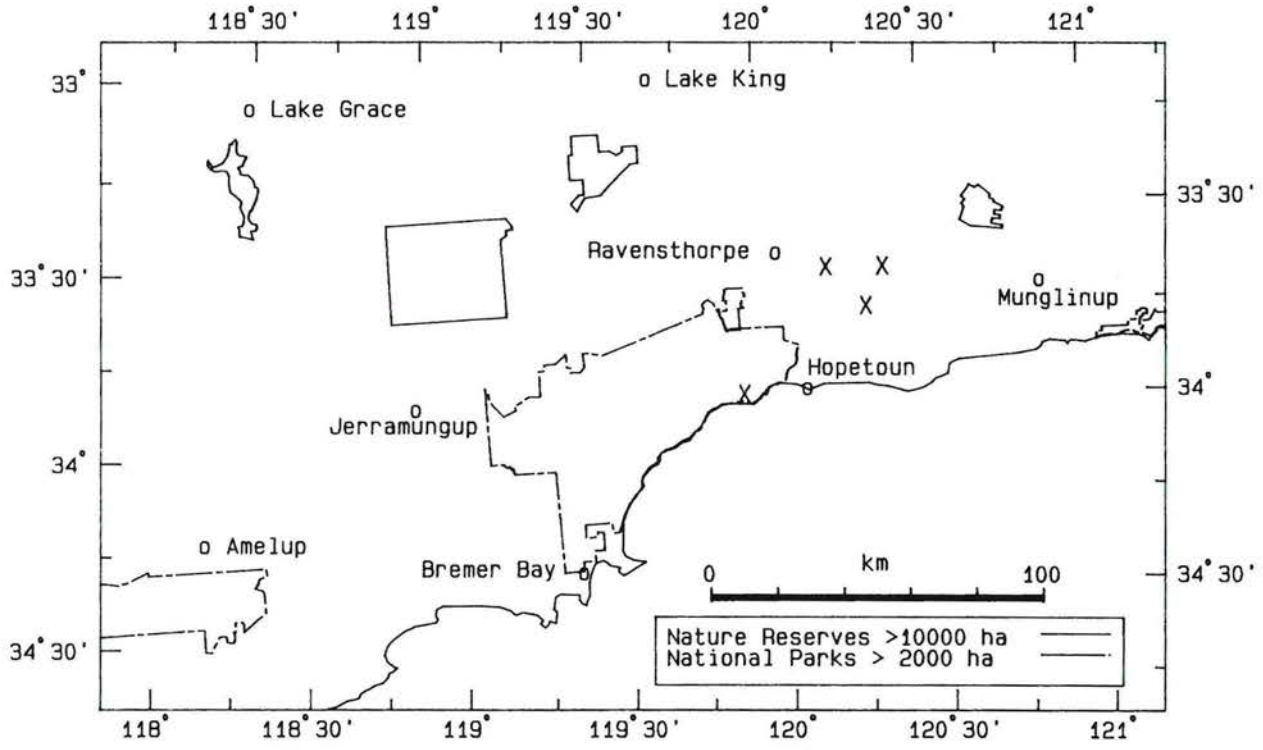
Flowering period: unknown

A restricted taxon recorded from four sites between Hamersley Inlet, Ravensthorpe and Bandalup Hill, growing on loam or gravelly loam slopes in mallee or mallee-woodland. Species found in association include *Eucalyptus platypus, E. kessellii, E. gracilis* and *Acacia glaucoptera*. It is related to *E. brachycalyx* of eastern coastal Western Australia and South Australia, possibly belonging to this species and exhibiting the extreme of recorded characteristics. Protection of the population in Fitzgerald River National Park is a priority. Three of the records are the result of recent surveys. Further survey and taxonomic research is required.

*E.* aff. *brachycalyx* is a mallee with smooth cream and silver bark that is occasionally dark grey and rough at the base. It has ovoid buds and cup-shaped fruits that are angular or slightly ribbed. It differs from *E. brachycalyx* in its wider leaves and occurrence on heavier, non-calcareous soils.







**EUCALYPTUS BRACHYPHYLLA** Gardner

**Binyarinyinna Mallee**

Number of records: 11

Population Size
<10(6) 10-20(2) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(2)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (18%), Not (82%), Unspecified (0%)

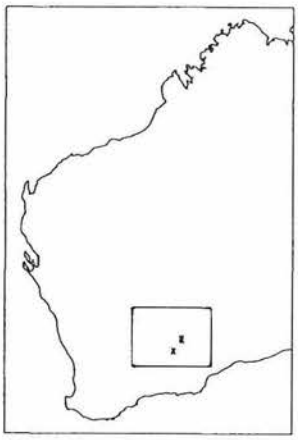
Height: 3-5 m

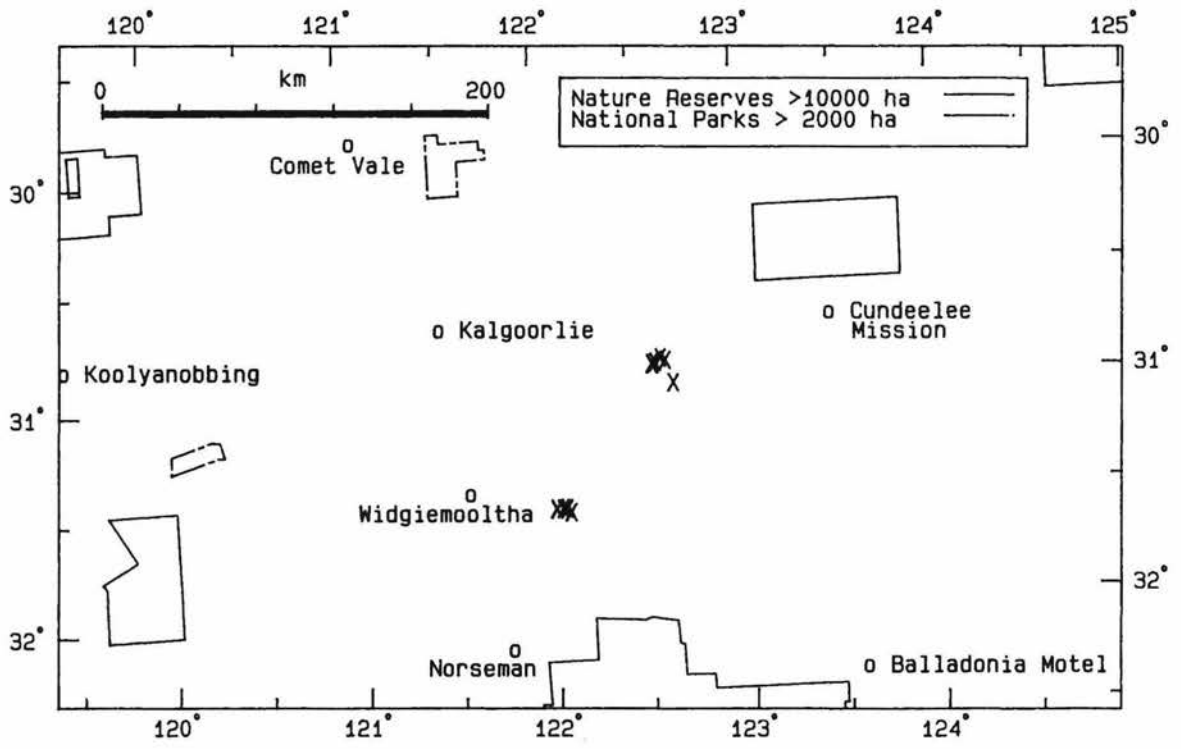
Flowering period: February, June - August

*Eucalyptus brachyphylla* occurs in two disjunct areas, near Binyarinyinna Rock north of Lake Cowan and near Karonie. It grows on loamy soils usually associated with granite outcrops and hills. Surrounding vegetation is scrub and thicket of *Acacia* and *Eremophila* species. Only two populations (18 per cent of total records), with a total of <20 individuals, are from a nature reserve. *E. brachyphylla* is believed to be a hybrid between *E. kruseana* and *E. loxophleba* (Brooker and Kleinig 1990). It occupies a similar range to that of *E. kruseana* but is much less abundant. It is not expected to be more widely distributed.

*E. brachyphylla* is a straggly mallee with grey-green leaves and smooth bark that sheds in short flakes. It differs from *E. kruseana* in its larger, distinctly petiolate leaves that are alternate or occasionally opposite. *E. loxophleba* is easily distinguished by its large, glossy leaves.

Specific References: Gardner (1942), Holliday and Watton (1980), Patrick and Hopper (1982).





**EUCALYPTUS BREVIPES** Brooker

**Mukinbudin Mallee**

Number of records: 2

Population Size
<10(0) 10-20(1) 20-50(0) 50-100(0) 100-500(1) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (50%), Not (50%), Unspecified (0%)

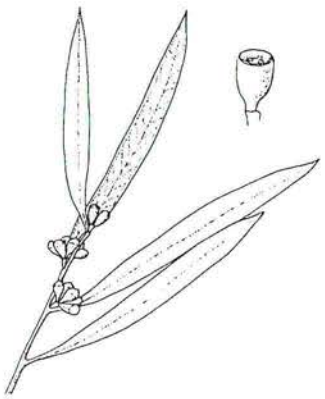
Height: 3-5 m

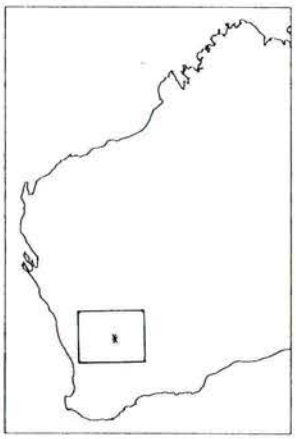
Flowering period: July

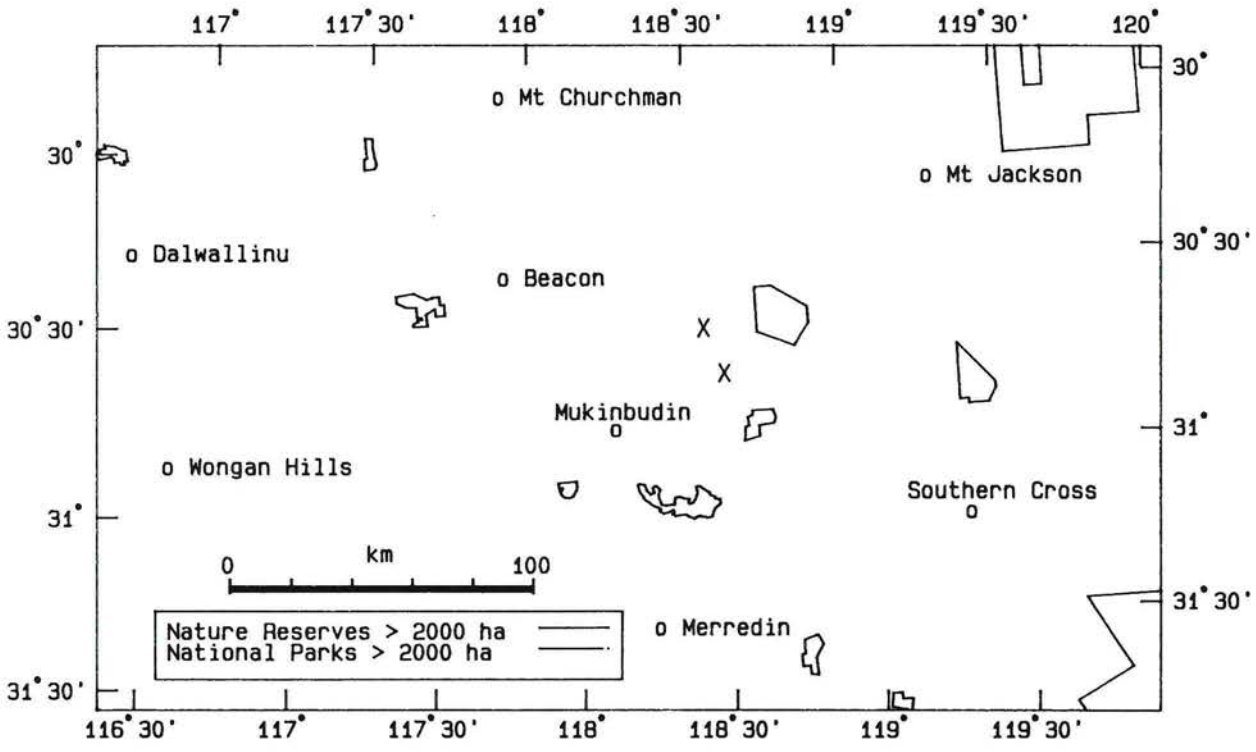
A Declared Rare species confined to two populations over a 17 km range in the wheatbelt north-east of Mukinbudin. It is found on loamy flats in *Acacia* scrub, mallee or low woodland with *Eucalyptus loxophleba* and *E. kochii* ssp. *plenissima*. The larger of the two populations, of some 200+ individuals, occurs on road verge and extends into an adjoining nature reserve. The other population is on road verge and vacant Crown land. Careful management of these sites is required.

*E. brevipes* is a mallee with a stocking of rough grey-brown bark on the lower trunk. The leaves are narrow, erect and maturing to glossy green. It is related to the widespread *E. gracilis*, differing in its shorter peduncle, erect leaves and buds without a constriction at the join of the hypanthium and operculum.

Specific Reference: Brooker (1986).







**EUCALYPTUS BREVISTYLIS** Brooker

**Rate's Tingle**

Number of records: 19

Population Size
<10(1) 10-20(1) 20-50(1) 50-100(0) 100-500(2) >500(0) unspecified(14)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (16%), Not (84%), Unspecified (0%)

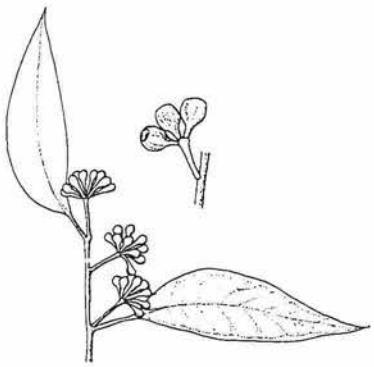
Height: 25-40 m

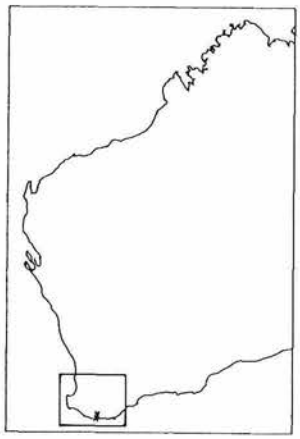
Flowering period: throughout year

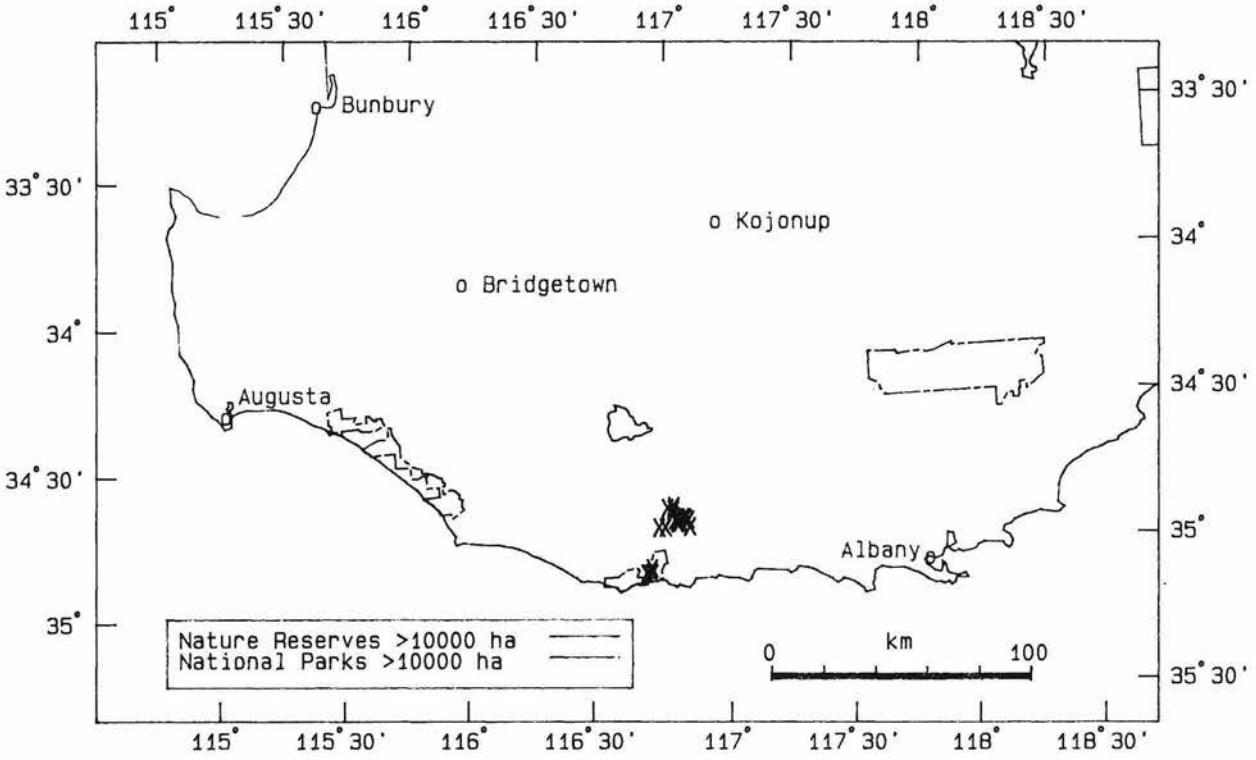
A species of restricted distribution east of Walpole and north-east near Mt Frankland, growing near granite outcrops, along creeklines and at the ecotone between sand plains and granitic hills. It may occur in pure forest stands or in association with *Eucalyptus calophylla, E. marginata, E. diversicolor, E. megacarpa* and *E. patens*. The largest populations are found high in the landscape (Wardell-Johnson, personal communication). Three of the records (16 per cent of total) are from the Walpole-Nornalup National Park while the remaining 84 per cent are from State forest to the north. It has been well surveyed and is included in current research on the biogeography and ecology of endemic forest eucalypts of the Walpole region.

*E. brevistylis* is a large tree with rough bark, slightly glossy, discolorous leaves and usually glaucous branchlets. It has up to thirteen buds and fruits per inflorescence, on a terete or slightly flattened peduncle.

Specific References: Brooker (1974), Hall and Brooker (1974a), Elliot and Jones (1986).







**EUCALYPTUS BROCKWAYI** Gardner

**Dundas Mahogany**

Number of records: 41

Population Size
<10(0) 10-20(0) 20-50(8) 50-100(12) 100-500(9) >500(1) unspecified(11)

Conservation Status
Restricted to road verge (2%), Not (90%), Unspecified (8%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

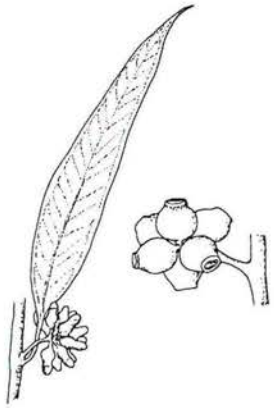
Height: 12-17 m

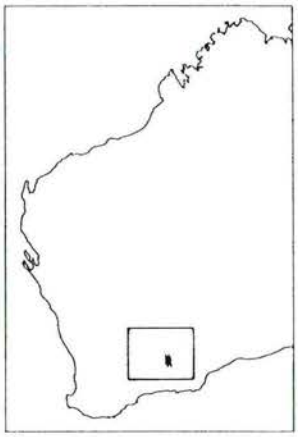
Flowering period: April - June

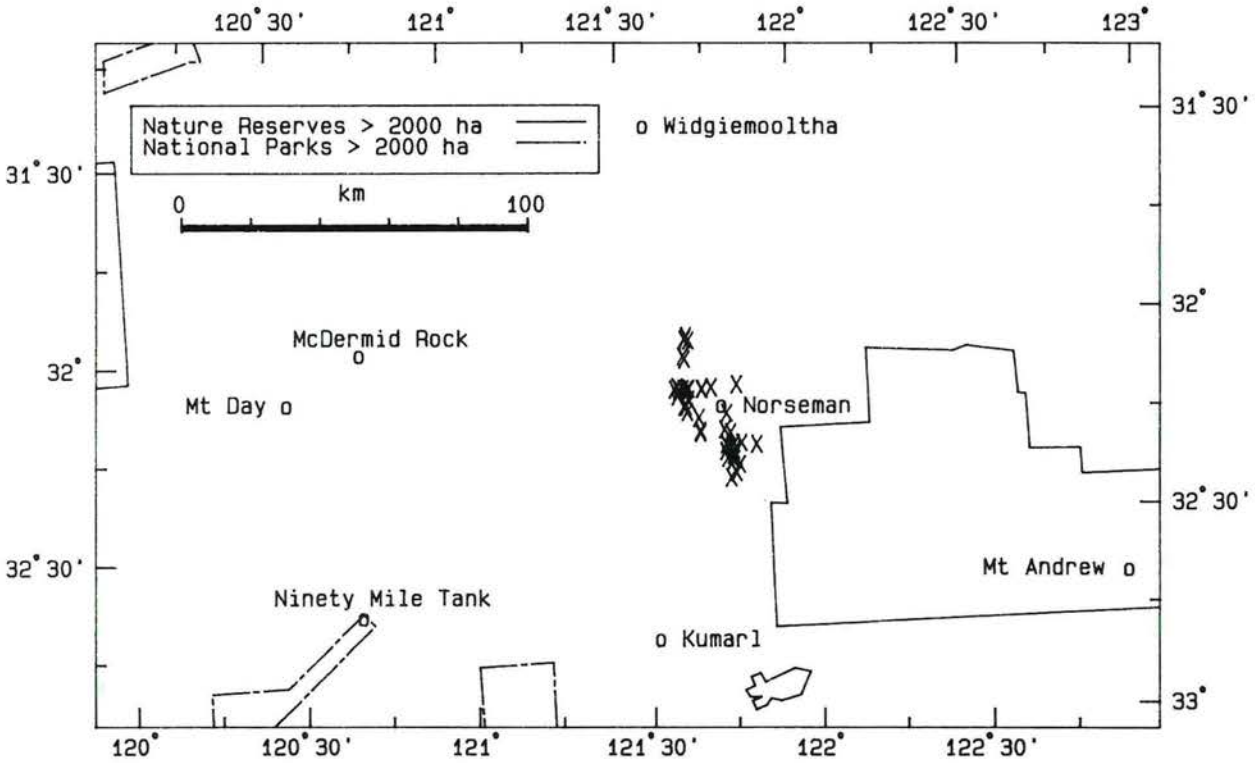
*Eucalyptus brockwayi* is confined to within a 30 km radius of Norseman where it grows in woodlands on flat or gently sloping terrain. Soils are loamy, sometimes with gravel and greenstone. Eucalypt species most commonly found in association include *E. dundasii, E. lesouefii, E. flocktoniae, E. torquata* and *E. polita*. Of the total records, 22 per cent occur on a timber reserve which affords this species considerable protection. The remaining populations are on vacant Crown land, other reserves and road verge. Where population size was specified, each record was >20 individuals. The populations require monitoring with regard to mining activities in the area. More secure vesting of the timber reserve would be desirable.

*E. brockwayi* is an erect tree with smooth, peeling grey and salmon bark and a broad crown of glossy leaves. It has distinctive globular, urn-shaped fruits in clusters of up to fifteen. It is a unique species with no known close relatives and is widely cultivated throughout Australia.

Specific References: Gardner (1942), Holliday and Watton (1980), Pryor (1981), Elliot and Jones (1986).







**EUCALYPTUS BURDETTIANA** Blakely & Steedman

**Burdett's Mallee**

Number of records: 2

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(1) >500(0) unspecified(1)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (100%), Not (0%), Unspecified (0%)

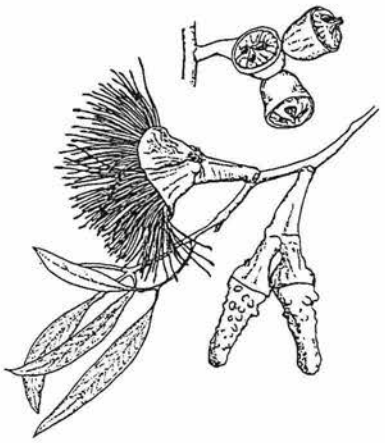
Height: 1 m

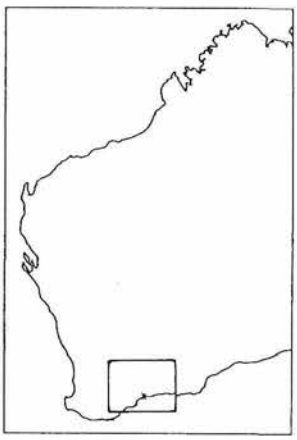
Flowering period: irregular throughout year, often January to March and July to August

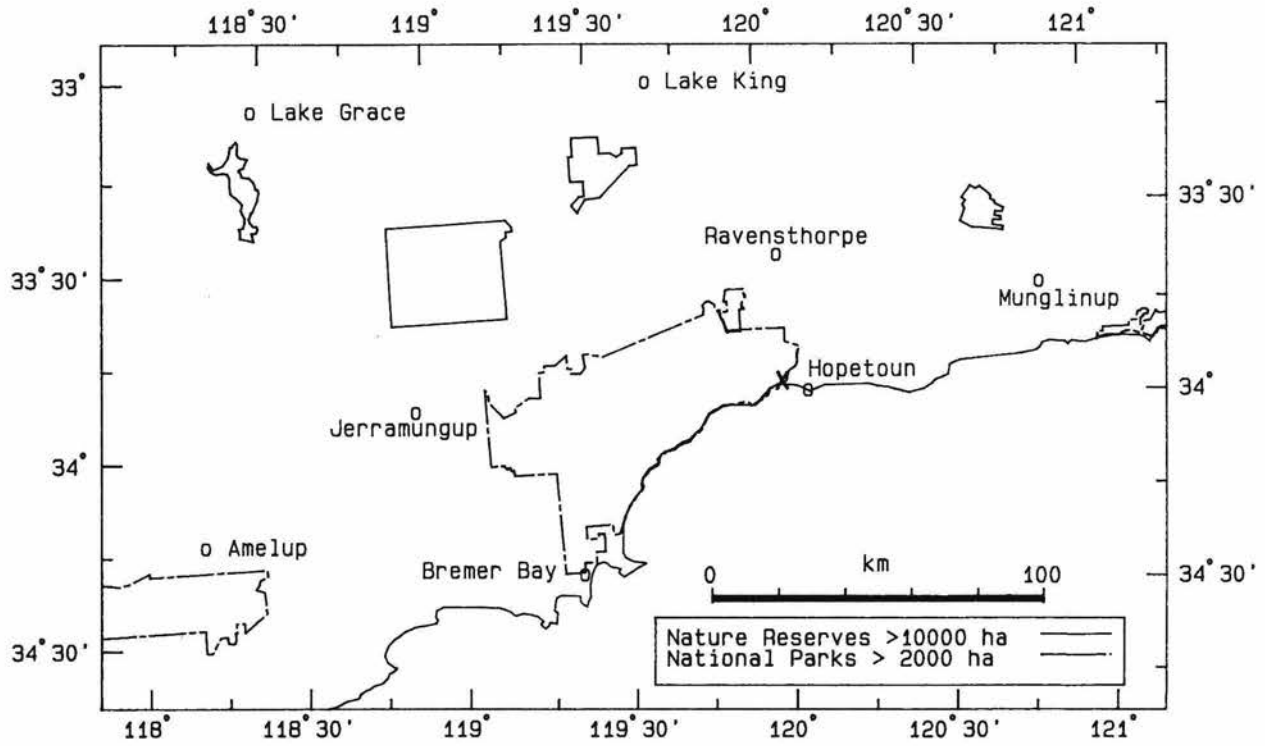
*Eucalyptus burdettiana* is confined to rocky slopes of the Barren Range in the Fitzgerald River National Park. It grows on white sand over quartzite in mallee-heath with scattered *E. coronata* and *E. tetragona*. A few thousand plants were recorded in 1990 following a wildfire the previous year. *E. burdettiana* is a vulnerable species despite its occurrence in a National Park and requires special consideration when formulating management practices in the area. Susceptibility to dieback infection and fire sensitivity are major concerns. It is a widely planted and popular species in cultivation.

*E. burdettiana* is a mallee or shrub usually growing to heights of about 2 m but up to 4 m in sheltered sites. It is allied to *E. megacornuta* and *E. newbeyi*, differing from the former in its lower stature, smaller buds and fruits and less warty operculum. *E. newbeyi* can be distinguished by its smooth operculum.

Specific References: Blakely and Steedman (1939), Holliday and Watton (1980), Pryor (1981), Rye and Hopper (1981), Elliot and Jones (1986).







**EUCALYPTUS CAESIA** Benth. ssp. **CAESIA**

**Caesia**

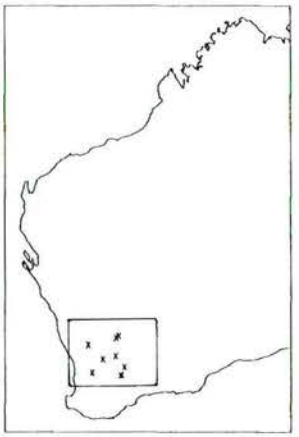
Number of records: 11

Population Size
<10(4) 10-20(0) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(6)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (55%), Not (45%), Unspecified (0%)

Height: 2.5-12 m

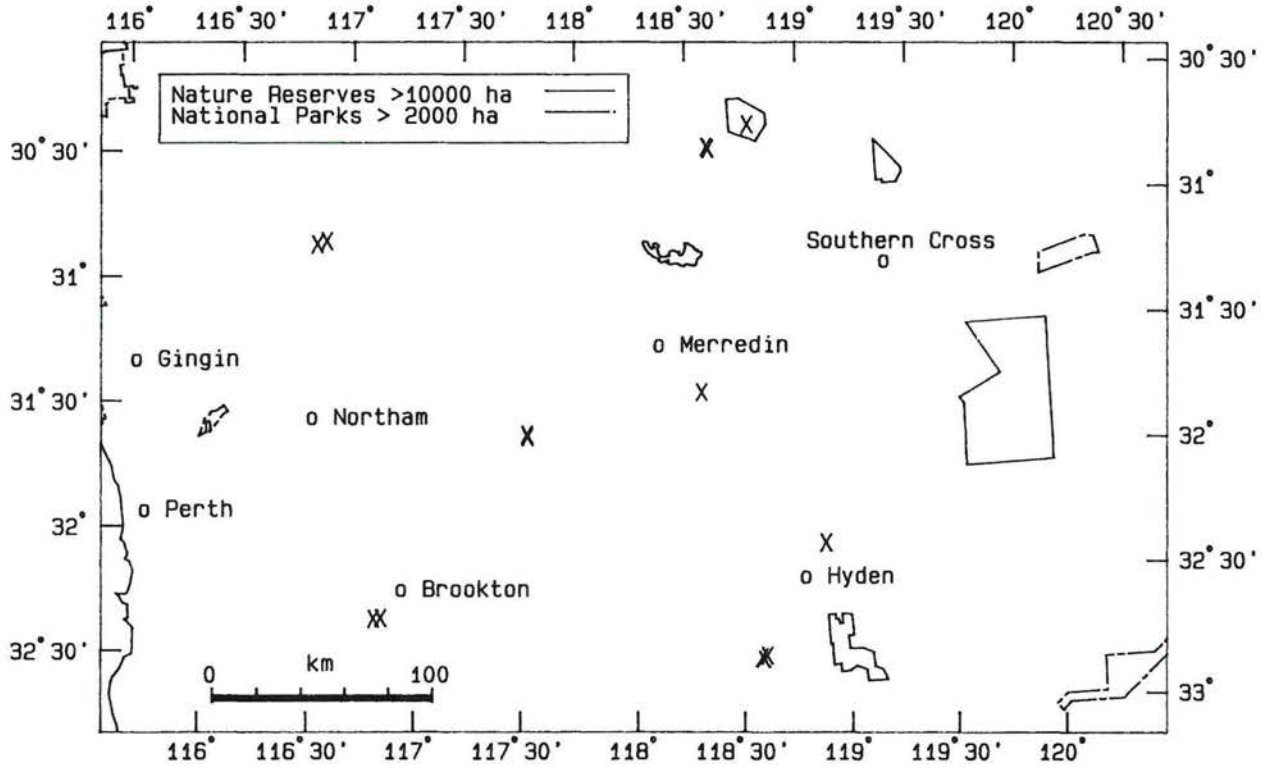
Flowering period: May - August



*Eucalyptus caesia* ssp. *caesia* has a widespread and scattered distribution in the wheatbelt from near Wongan Hills and Brookton east to Pingaring and Bonnie Rock. It is restricted to shallow loam and sandy loam on or at the base of large granite outcrops, usually emergent above scrub and thicket of *Hakea petiolaris, Kunzea pulchella, Leptospermum erubescens and Acacia* species. It grows together with ssp. *magna* on an outcrop south-east of Bonnie Rock. It occurs in usually small populations and is represented in five nature reserves throughout its range. Other populations are from water reserves and private property. There is little threat of land development on sites outside conservation areas owing to their rocky nature. The granite outcrops in the wheatbelt have been extensively surveyed and few further populations are likely. The genetic implications and long-term survival of such a species existing in small isolated populations is of concern (Moran and Hopper 1983). It is a popular species in cultivation.

*E. caesia* ssp. *caesia* is a straggly mallee or occasionally a tree characterized by its glaucous buds and fruits and large, pink flowers in pendulous inflorescences. It has minniritchi bark, glaucous branchlets and dull, blue-green leaves. Related species such as *E. orbifolia, E. crucis* and *E. ewartiana* have smaller leaves and hemispherical fruits.

Specific References: Bentham (1867), Holliday and Watton (1980), Pryor (1981), Rye and Hopper (1981), Brooker and Hopper (1982), Hopper and Burgman (1983), Moran and Hopper (1983), Elliot and Jones (1986).



**EUCALYPTUS CAESIA** Benth. ssp. **MAGNA** Brooker & Hopper

**Silver Princess**

Number of records: 8

Population Size
<10(3) 10-20(1) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(3)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (62.5%), Not (25%), Unspecified (12.5%)

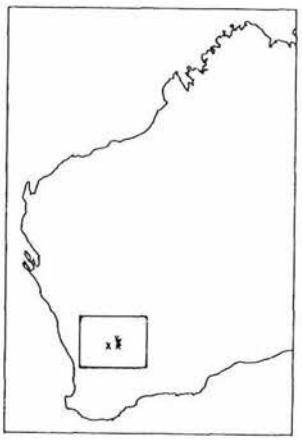
Height: 2.5-7 m

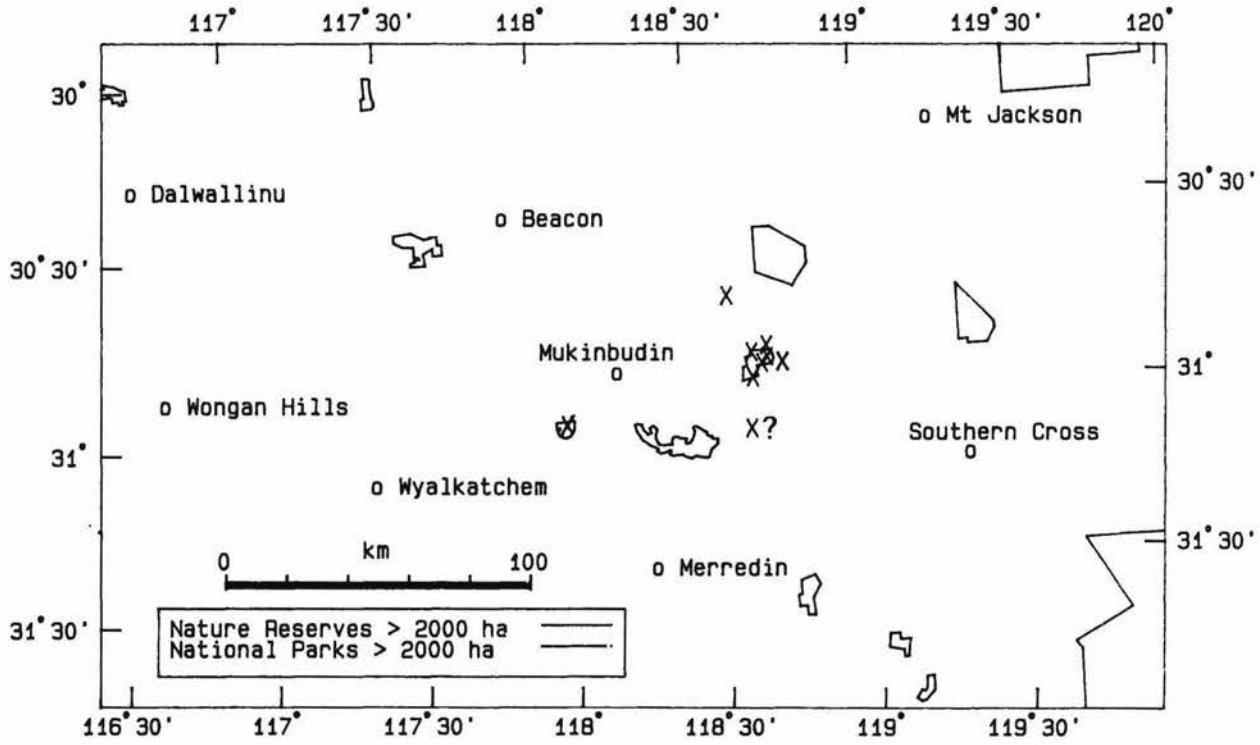
Flowering period: May - September

This weeping, coarser subspecies of *Eucalyptus caesia* occurs from Kununoppin east to near Bullfinch and Bonnie Rock. It is confined to granite rock outcrops, growing at the base or in gullies on shallow, loamy soils. It frequently occurs in pure stands but is sometimes associated with *E. crucis* ssp. *lanceolata*. A mixture of ssp. *magna* and ssp. *caesia* are found on an outcrop south-east of Bonnie Rock. Like ssp. *caesia* it generally occurs as small populations. 62.5 per cent of the total records are from three nature reserves. An old, vague herbarium record from south of Warralakin requires verification in the field. Extensive surveys for this and other granite eucalypts have been undertaken and additional populations are unlikely. It is under no immediate threat but monitoring of populations is required. It is widely cultivated.

A slender, weeping mallee differing from ssp. *caesia* in its pendulous habit, larger leaves, buds and fruits and deep pink to bright red flowers. The long branchlets are usually hanging to the ground.

Specific References: Brooker and Hopper (1982), Elliot and Jones (1986).





**EUCALYPTUS CALCICOLA** Brooker

**Hamelin Bay Mallee, Boranup Mallee**

Number of records: 8

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(1) 100-500(3) >500(1) unspecified(3)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (100%), Not (0%), Unspecified (0%)

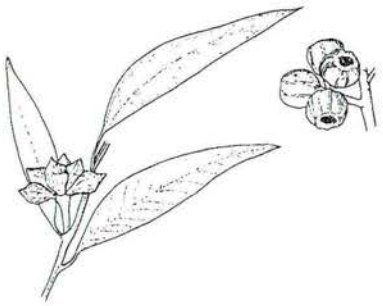
Height: 2.5-3.5 m

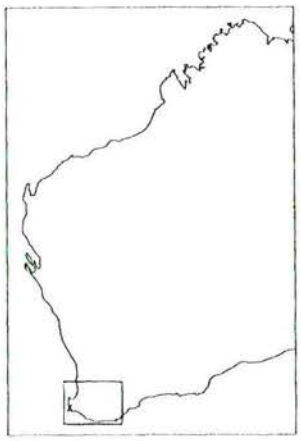
Flowering period: May - June

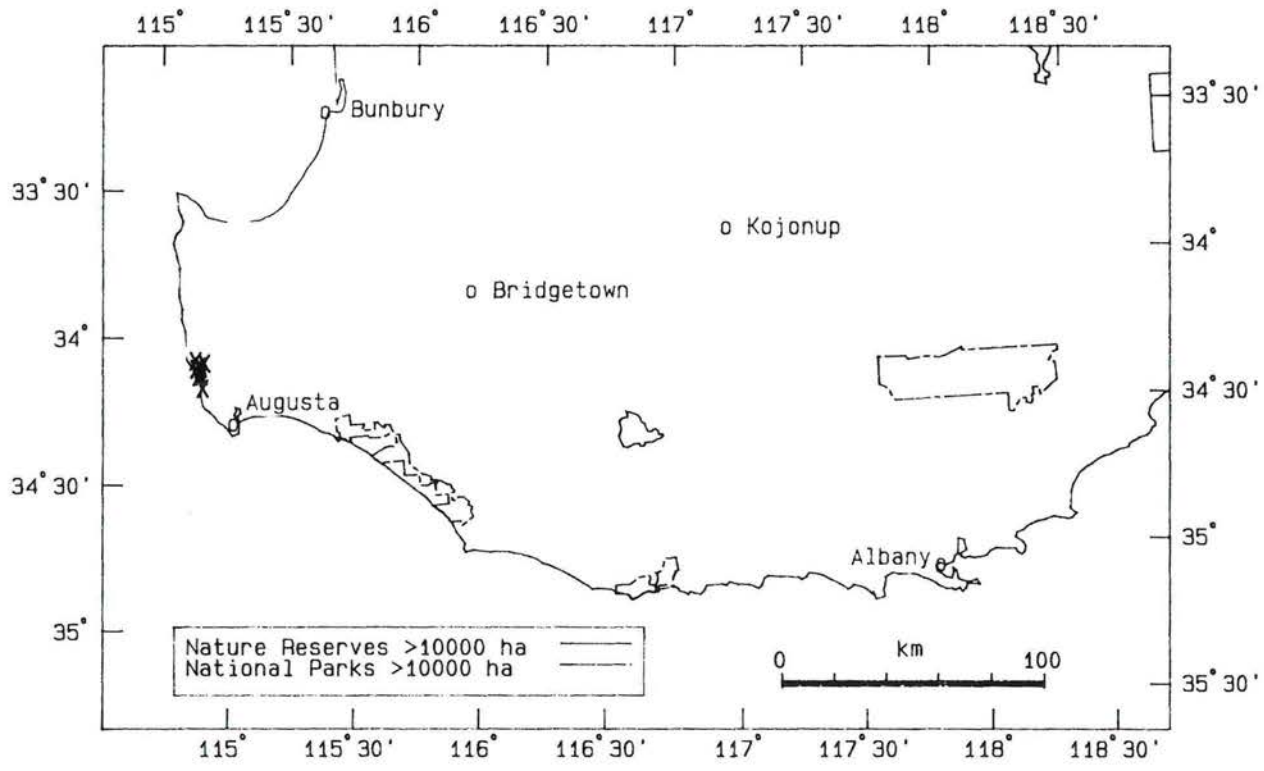
*Eucalyptus calcicola* has a very restricted distribution between Cape Freycinet and Cape Hamelin where it grows exposed above coastal heath on limestone dunes. *E. calophylla* and *E. megacarpa* are associated at the east of its range. It is locally abundant and well protected with all populations in the Leeuwin-Naturaliste National Park. A variant, possibly a new subspecies, has been recorded along the south coast near West Cape Howe. Consideration needs to be given to *E. calcicola* in management of the National Park.

*E. calcicola* is a smooth-barked mallee with slightly glossy leaves and up to seven-flowered inflorescences on a flattened peduncle. It is allied to *E. ligulata* and differs in its glossy, bright green juvenile leaves and broader, more prominently ribbed buds and fruits.

Specific References: Brooker (1974), Hall and Brooker (1974b), Pryor (1981), Rye and Hopper (1981), Elliot and Jones (1986).







**EUCALYPTUS CARNABYI** Blakely & Steedman ex Blakely

**Carnaby's Mallee**

Number of records: 4

Population Size
<10(3) 10-20(1) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (25%), Not (75%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

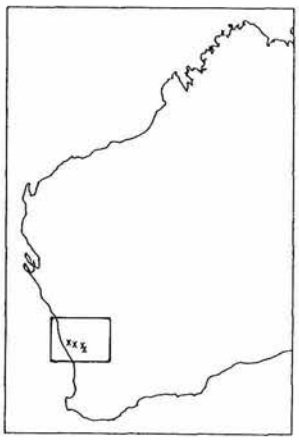
Height: 2-5 m

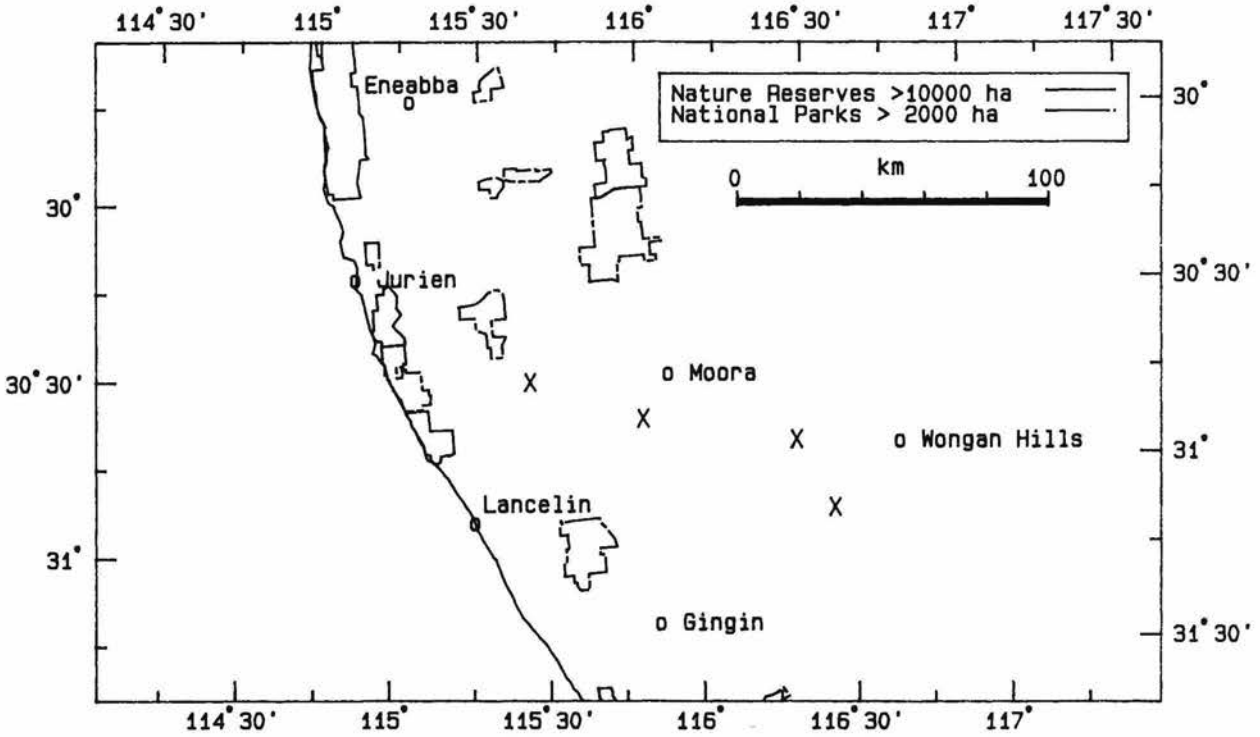
Flowering period: April - June, October - November

*Eucalyptus carnabyi* is a rare hybrid known from only four populations, totalling <40 plants, in the northern wheatbelt between Calingiri and Walyering Hill. No populations occur on conservation reserves, with three confined to cleared farmlands and road verge. It grows on gradual slopes in sandy loam or sandy gravel. Remnant heath vegetation at some sites includes *E. macrocarpa, E. drummondii, E. falcata, Allocasuarina campestris* and species of *Gastrolobium* and *Dryandra*. Flowering in this taxon is poor and irregular with low fruit set. Buds are heavily predated by parrots and many are aborted, apparently owing to insect attack. There is some doubt over the identity of the population south-west of Moora which may by a hybrid between *E. macrocarpa* and *E. pyriformis*.

*E. carnabyi* is a spreading mallee believed to be a hybrid between *E. macrocarpa* and *E. drummondii*. It has smooth bark, grey-green leaves and usually glaucous branchlets, buds and fruits. Its flowers are mid-pink to creamy white.

Specific References: Blakely (1941), Lucas and Synge (1978), Rye and Hopper (1981).





**EUCALYPTUS CERACEA** Brooker & Done

Number of records: 1

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(1)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

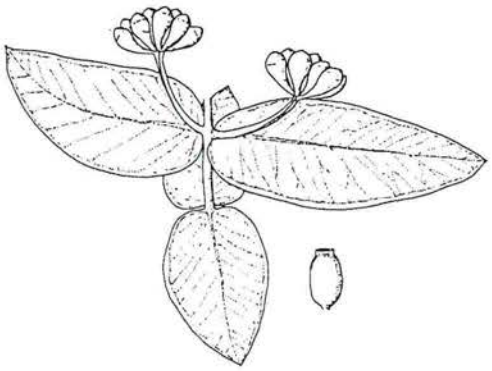
Height: not specified

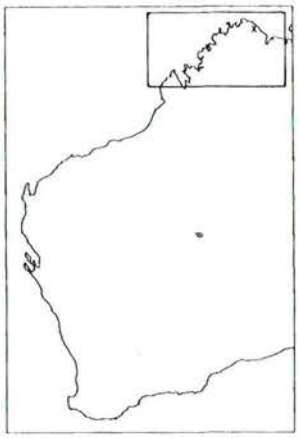
Flowering period: July

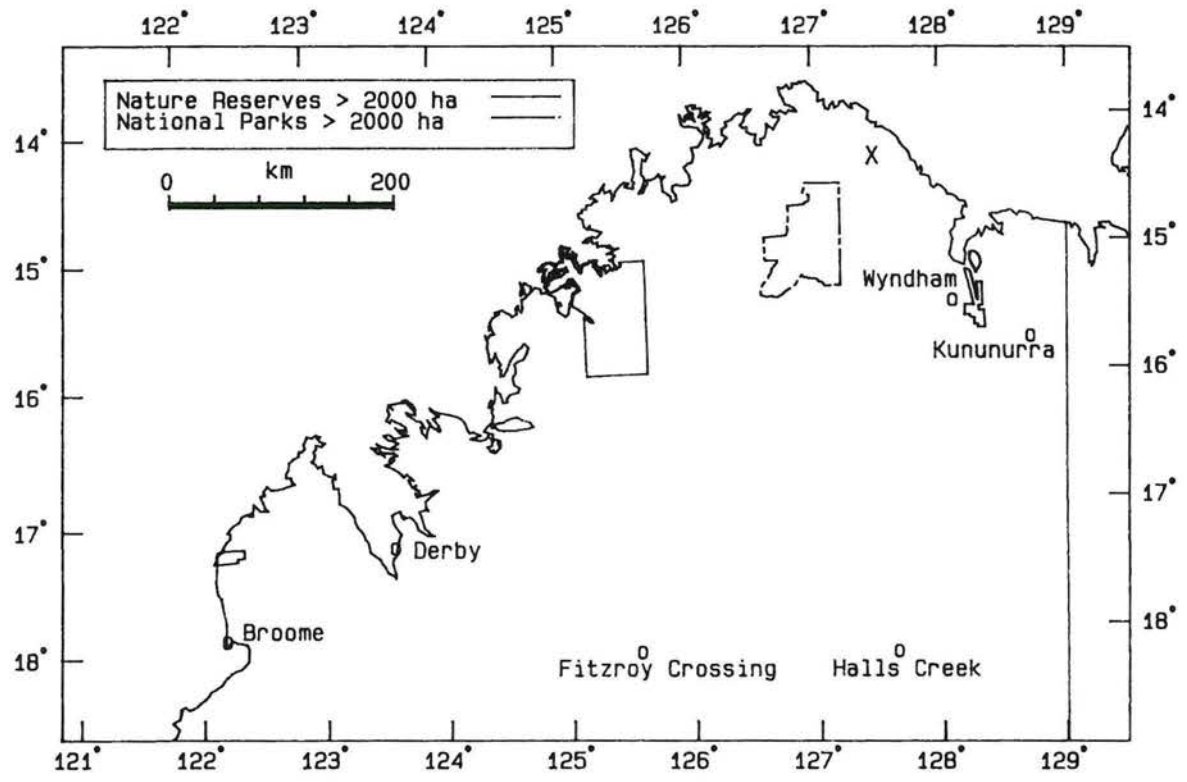
A Declared Rare species known only from the type locality in the Seppelt Range of the northern Kimberley. It occurs as a small pure stand over approxiamately 2 ha, growing among quartz and sandstone boulders. *Eucalyptus tectifica* and *Erythrophleum chlorostachys* are associated tree species. The land is vested as aboriginal reserve. Surveys by regional staff on tracks that traverse suitable habitat have not located further populations. Access is poor, however, and it may occur in more isolated areas that have not been adequately surveyed. The population is under no immediate threat.

*E. ceracea* is an attractive tree related to *E. phoenicea* and *E. miniata*. It differs in its smaller habit, persistent crown of juvenile leaves and glaucous buds, fruits and leaves. It has yellow, flaky bark and bright orange flowers.

Specific Reference: Brooker and Done (1986).







**EUCALYPTUS CERASIFORMIS** Brooker & Blaxell

**Cherry-fruited Mallee**

Number of records: 13

Population Size
<10(1) 10-20(2) 20-50(1) 50-100(2) 100-500(2) >500(2) unspecified(3)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

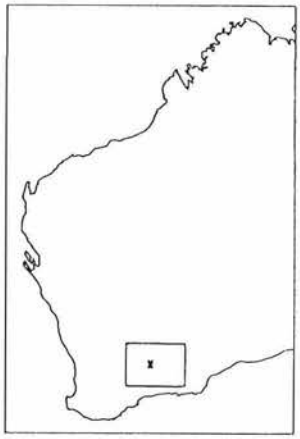
Height: 2.5-4 m

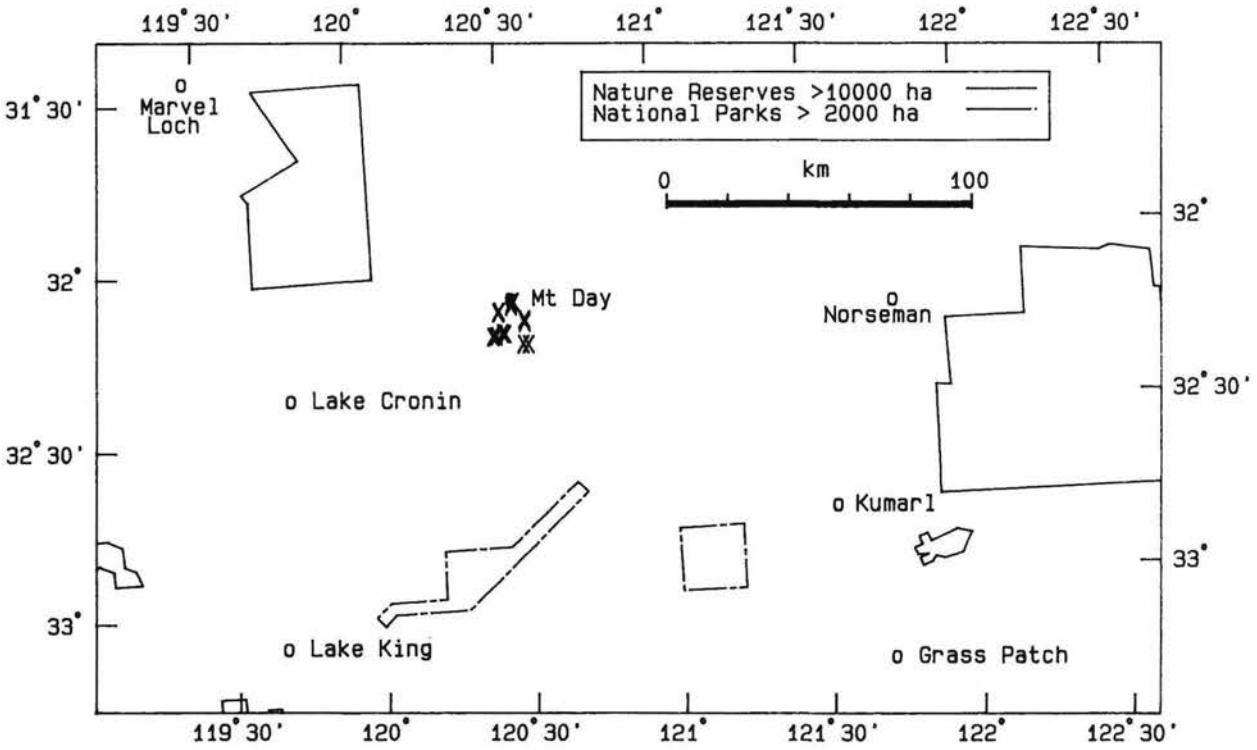
Flowering period: throughout year

*Eucalyptus cerasiformis* has a restricted distribution in the Mt Day-Lake Hope area between Hyden and Norseman. It grows on flat or gently sloping country, and is sometimes found in moist depressions. Soils are loam and clay over ironstone and greenstone. It most commonly forms an open shrub-mallee over heath of *Allocasuarina, Acacia* and *Melaleuca* species. Associated eucalypts include *E. flocktoniae, E. salubris, E. loxophleba* ssp. *lissophloia* and *E. cylindriflora*. It is locally abundant in the area with some populations covering several hectares and containing 1000+ individuals. All populations occur on shire road verge and vacant Crown land under active mineral exploration. Because of its very restricted distribution and the current operations in the area, acquisition of land as a nature reserve would be desirable. The number of new recordings for this species are the result of recent survey work by research staff. It is gazetted as Declared Rare Flora [Appendix 2].

*E. cerasiformis* is an erect mallee with glossy, yellow-green leaves and smooth, mottled bark that sheds in long ribbons. The urn-shaped fruits, resembling bunches of cherries, are on long pedicels and slender down-curved peduncles. It is closely related to *E. dielsii*.

Specific References: Brooker and Blaxell (1978), Elliot and Jones (1986).





**EUCALYPTUS CHLOROPHYLLA** Brooker & Done

**Green-leaf Box**

Number of records: 12

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(1) 100-500(0) >500(0) unspecified(11)

Conservation Status
Restricted to road verge (0%), Not (91%), Unspecified (9%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

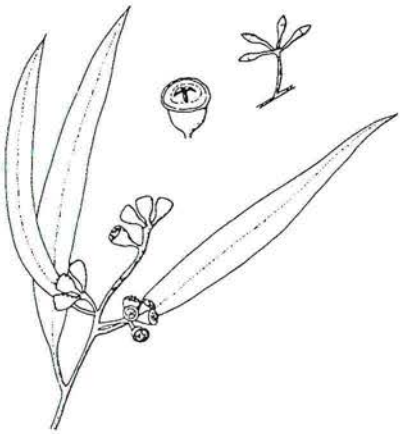
Height: 4-11 m

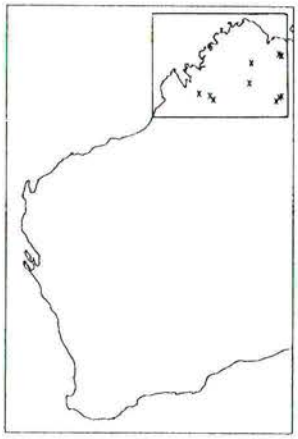
Flowering period: December

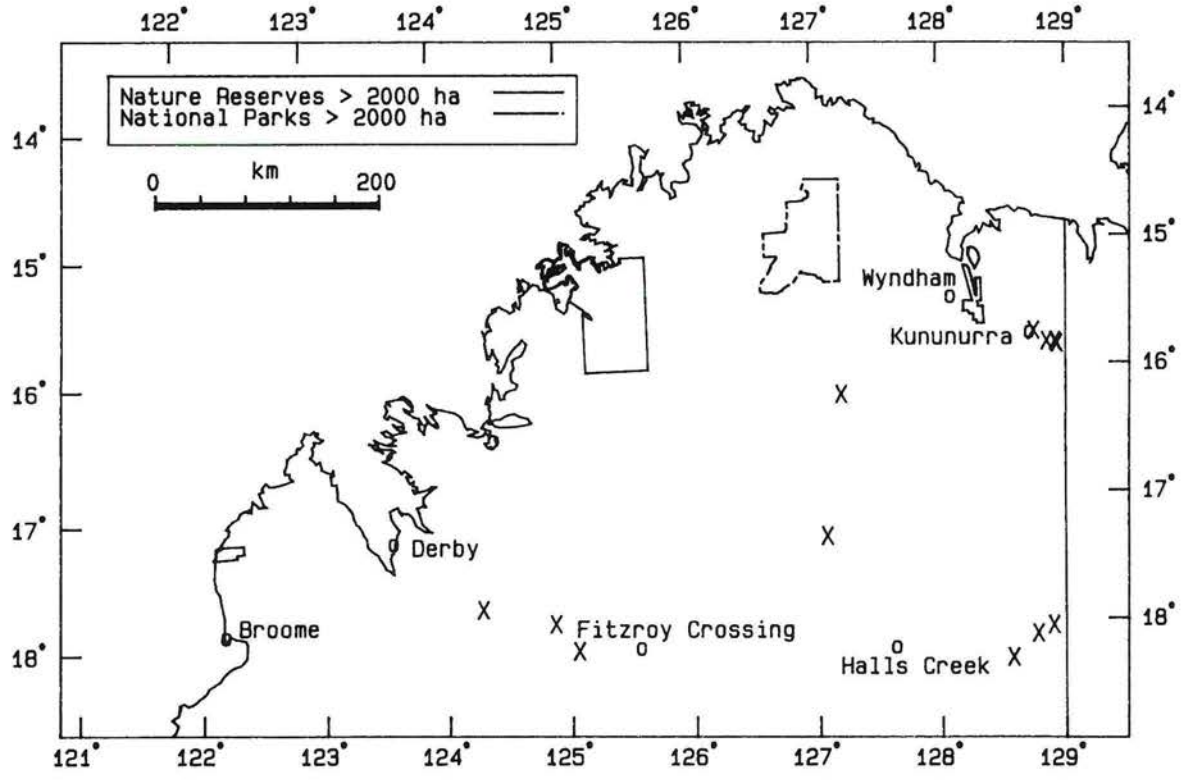
A widespread species occurring over several hundred kilometres from south-east of Derby, east into the Northern Territory and Queensland. It grows in woodlands or among small shrubs on sandy or loamy flats, often with laterite. A few collections are from river banks and rock outcrops. Associated species are *Eucalyptus tetrodonta, E. ferruginea, Erythrophleum chlorostachys, Acacia* sp. and *Triodia* sp. The area is generally poorly surveyed with many of the collections from along transport routes. Further populations are expected to occur in more remote areas. Collections in the far west of its range may belong to a separate subspecies (Brooker, personal communication). Its isolated distribution affords this species considerable protection.

*E. chlorophylla* is a tree recorded to 11 m in height but more commonly growing to 4-6 m. It has grey, 'box-type' bark and is distinguished from other 'box' species of the region by its narrow, bright green, glossy leaves.

Specific Reference: Brooker and Done (1986).







**EUCALYPTUS CHRYSANTHA** Blakely & Steedman

**Golden Mallee**

Number of records: 3

Population Size
<10(1) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(2)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (100%), Not (0%), Unspecified (0%)

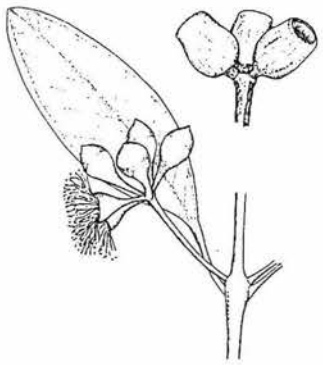
Height: 3 m

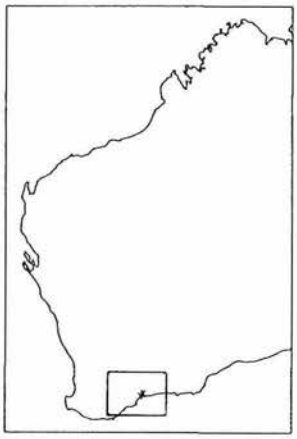
Flowering period: August - December

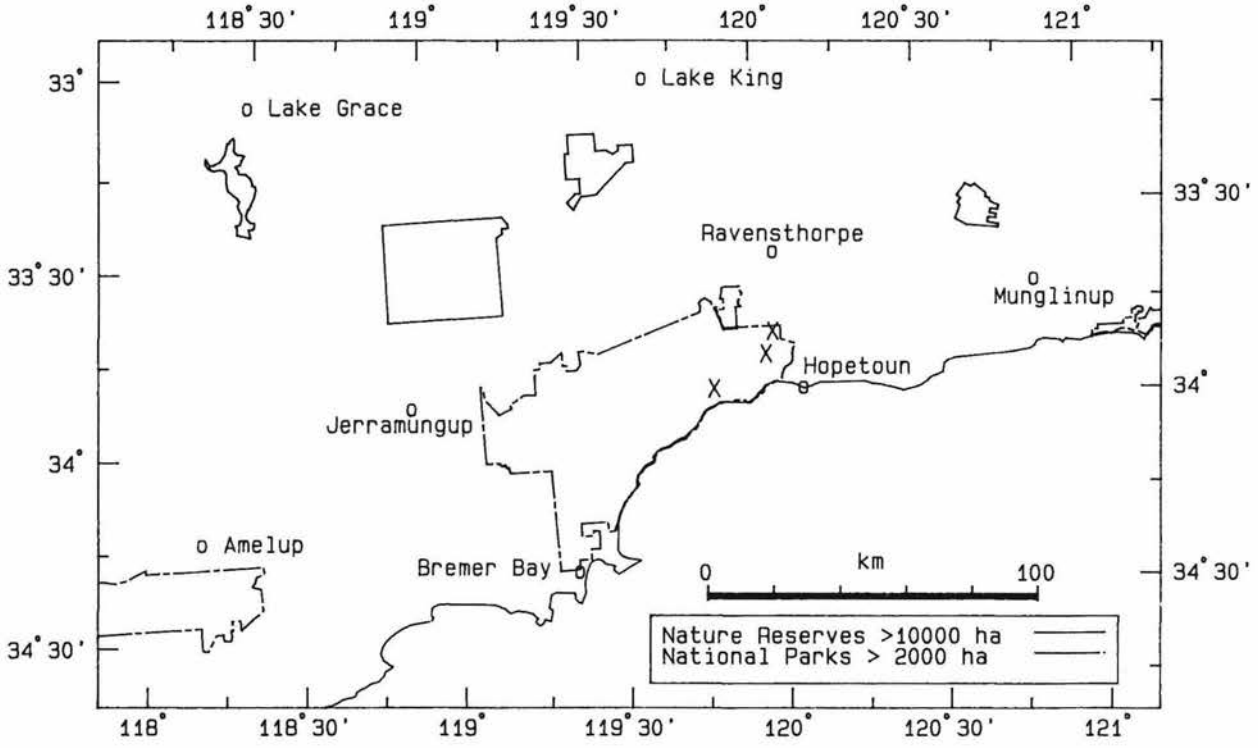
A rare hybrid known from three localities in the eastern part of Fitzgerald River National Park. It grows in sand around rocky outcrops as scattered individuals in mixed stands of *Eucalyptus sepulcralis* and *E. preissiana*. Access to the areas of occurrence is difficult and thorough surveys of the sites have not been made. Being a hybrid with an uncommon parent species few, if any, further populations are expected. Requirements of this taxon need to be considered in management of the area.

*E. chrysantha* is a hybrid of *E. sepulcralis* and *E. preissiana* and is intermediate between the two in leaf, bud and fruit characteristics. It has erect, slender stems and branches, and up to six-flowered inflorescences on long rigid peduncles.

Specific Reference: Blakely, McKie and Steedman (1938), Hopper *et al.* (1978).







**EUCALYPTUS CLAVIGERA** Cunn. ex Schauer

**Apple Gum**

Number of records: 4

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(4)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

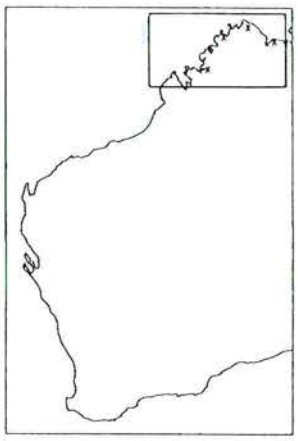
Height: not specified

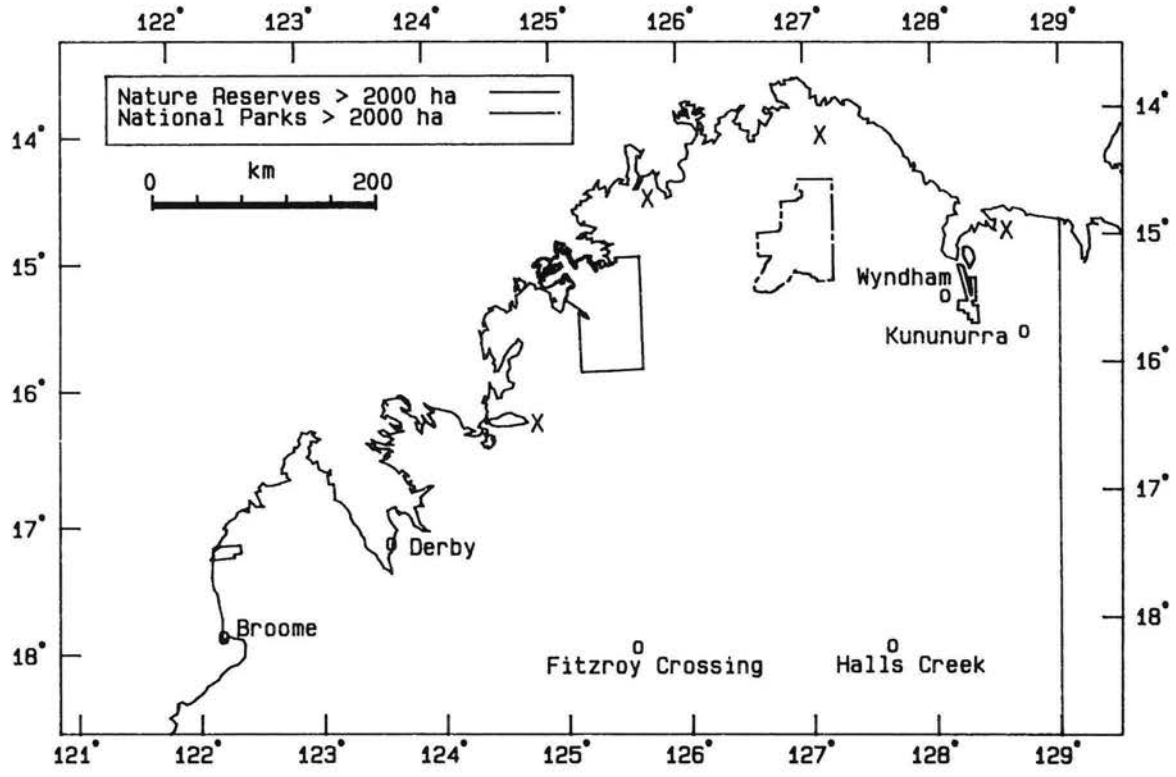
Flowering period: September

*Eucalyptus clavigera* has been collected in Western Australia from four scattered localities between Walcott Inlet and Cambridge Gulf, a range of some 460 km. It extends east and is widespread in the Northern Territory and Arnhem Land. Herbarium records of the Western Australian specimens provide little habitat detail but Chippendale (1988) describes the habitat as 'in open forest, on coastal plains, river terraces and low rocky hills; in shallow lateritic and sandy soils'. Associated species were not recorded. All collections are from aboriginal reserves or pastoral land. It is probably more common in the Kimberley than distribution records indicate, but poorly collected owing to limited botanical surveys and inaccessibility.

*E. clavigera* is an often straggly tree with a stocking of grey, tessellated bark. The club-shaped buds and ovoid fruits are in compound inflorescences on long pedicels and peduncles. The leaves are lanceolate and grey-green.

Specific References: Blake (1953), Hall and Brooker (1973b), Elliot and Jones (1986).





**EUCALYPTUS COLLINA** W. Fitzg.

**Silver-leaved Bloodwood**

Number of records: 12

Population Size
<10(1) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(11)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (33%), Not (67%), Unspecified (0%)

Height: 8-17 m

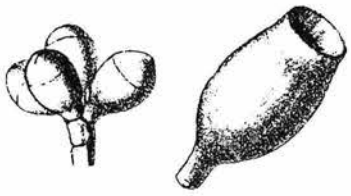
Flowering period: May - April

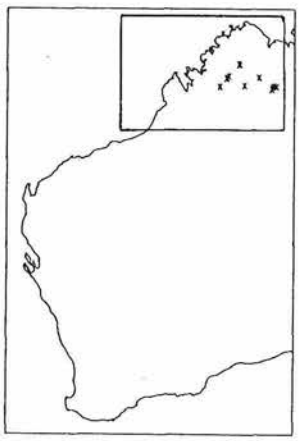
A widespread species of northern Western Australia occurring from the King Leopold Range east to the Bungle Bungle Range. It grows in open woodlands in usually sandy soils on rocky quartzite or sandstone hills. *Eucalyptus miniata, E. phoenicea* and *E. camaldulensis* have been recorded in association. It is well protected in the east of its range with 33 per cent of the total collections from the Purnululu (Bungle Bungle) National Park (park boundary not delineated on the map). The other populations are from pastoral leases and vacant Crown land.

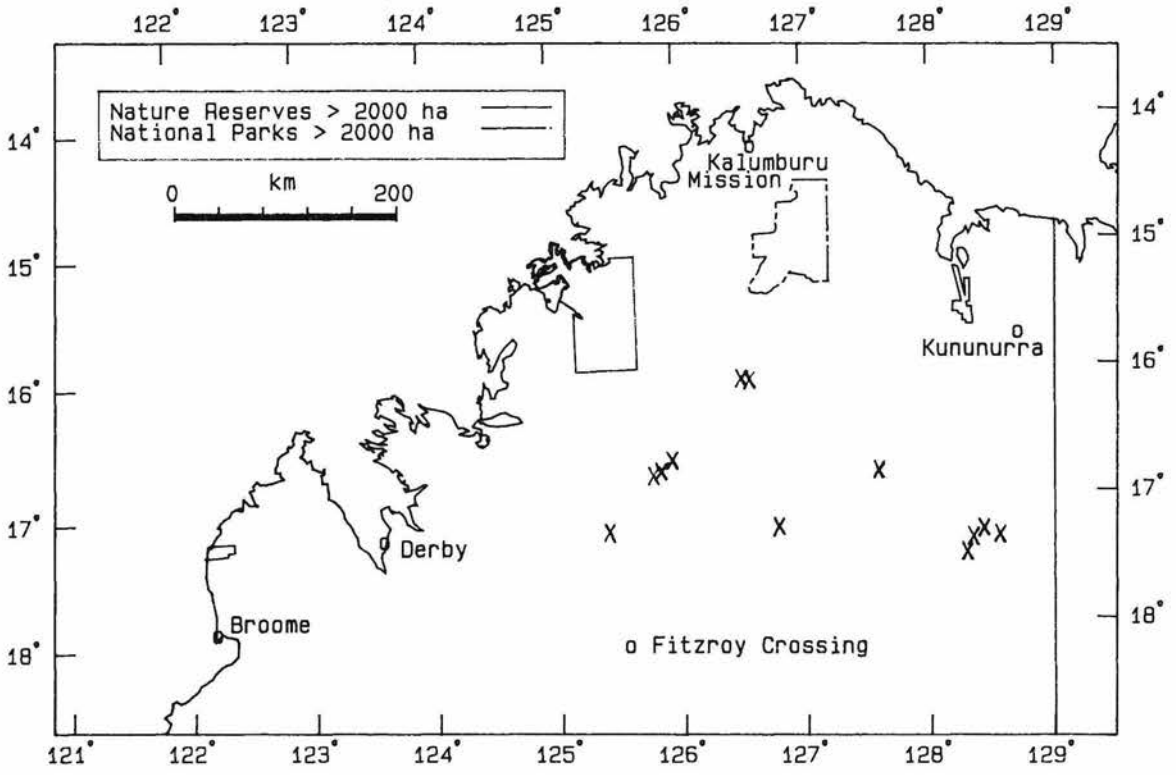
*E. collina* is an attractive tree characterized by its silvery white young growth and large, ovoid to urn-shaped buds on long pedicels. The mature leaves are narrow and slightly glossy. It has mostly smooth bark with brown flaking bark at the base.

Specific References: Maiden (1903-1933), Hall and Brooker (1974c), Elliot and Jones (1986).

Illustration by M. Flockton (in Chippendale 1981).







**EUCALYPTUS CONFLUENS** W. Fitzg. ex Maiden

**Kimberley Gum**

Number of records: 20

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(1) 100-500(1) >500(0) unspecified(18)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (5%), Not (95%), Unspecified (0%)

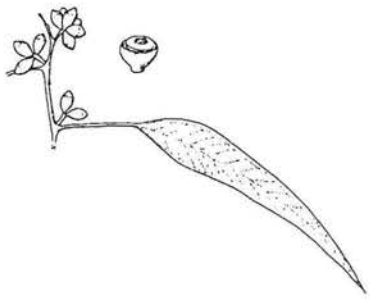
Height: 3-10 m

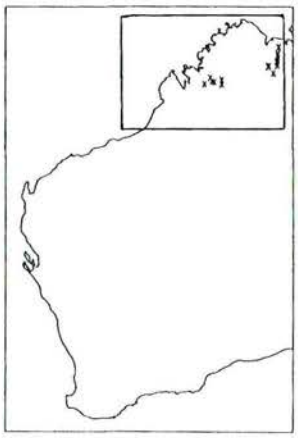
Flowering period: March - July

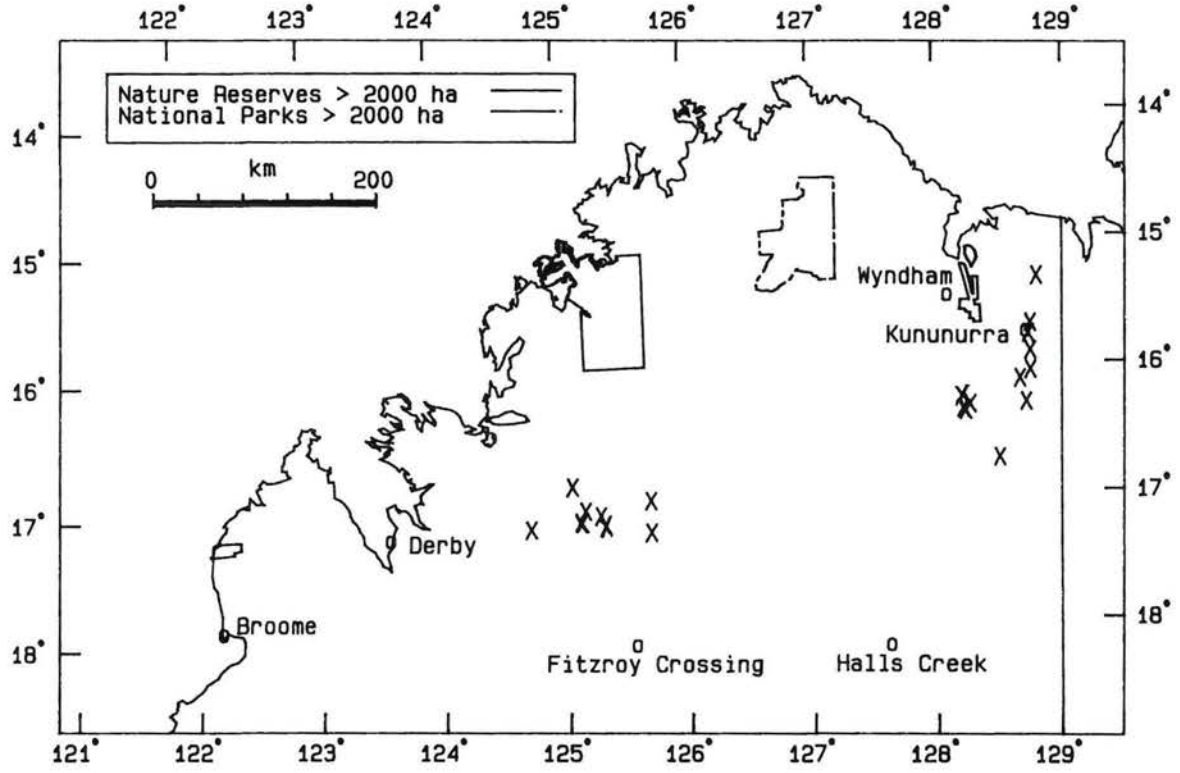
A species occurring in two disjunct areas of the Kimberley region - near the King Leopold and Napier Ranges, and in the far north-east of the State near Lake Argyle and the Northern Territory border. It grows mainly on rocky sandstone or quartzite slopes and ridges, but has also been recorded from granite hills and loamy sand over laterite. *Plectrachne pungens* and *P. bynoei* are often associated. It appears to be locally abundant in its area of occurrence but is poorly represented in conservation reserves.

*Eucalyptus confluens* is a smooth 'gum-barked' tree with small, ovoid to club-shaped buds and hemispherical to top-shaped fruits. It is distinguished from the closely related *E. brevifolia* by its glossy green leaves.

Specific References: Maiden (1916), Turnbull and Hall (1973a), Elliot and Jones (1986).







**EUCALYPTUS 'CONTINENS'** Brooker & Hopper ined.

Number of records: 3

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(1) 100-500(1) >500(1) unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

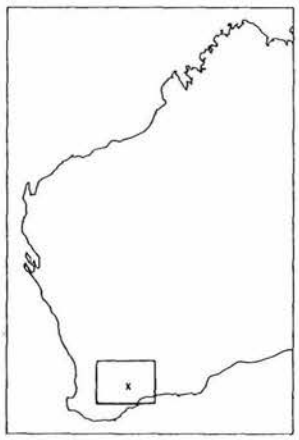
Height: 5 m

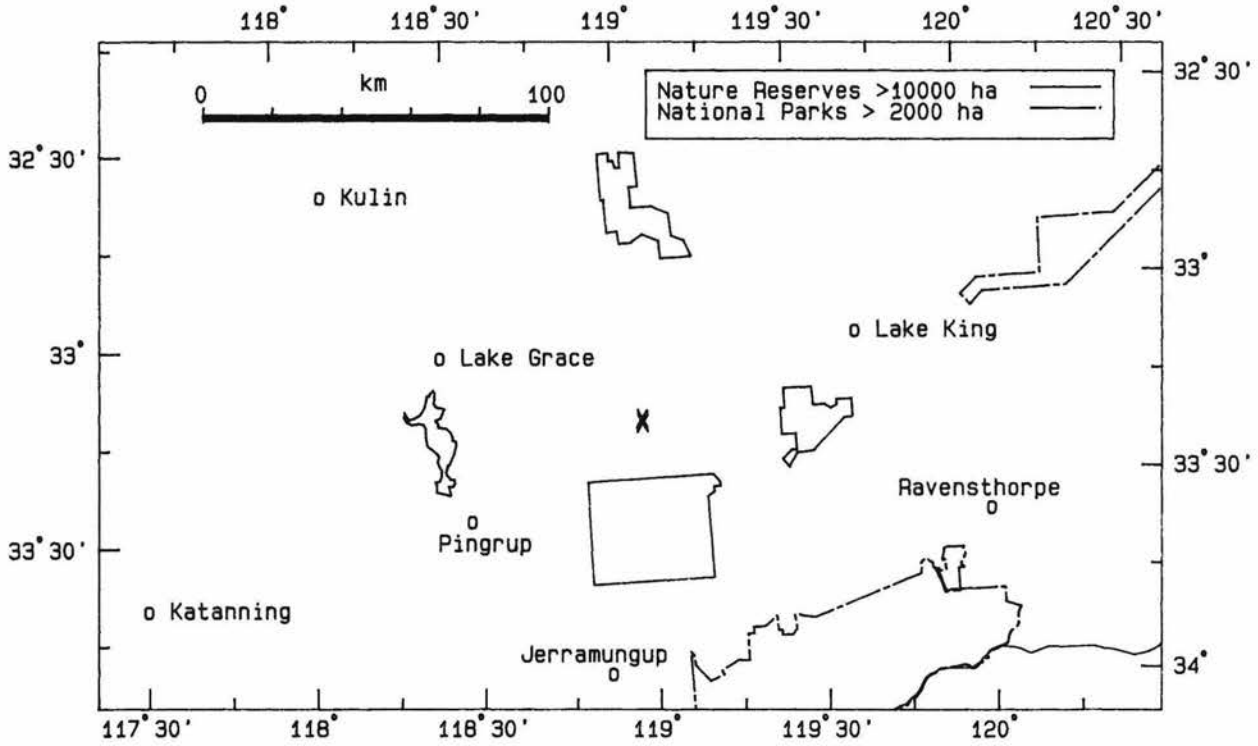
Flowering period: unknown

An undescribed taxon known from a few pure stands over a 1.5 km range south of Newdegate. An estimated 1000+ individuals grow as dense low forest on low lying white sand near a salt flat. *Melaleuca* sp. dominates the shrub understorey. All records are from privately owned land. Surveys of the Lake Grace-Newdegate-Lake Magenta area failed to locate any further populations.

*Eucalyptus 'continens'* is a mallet, or occasionally a mallee, with smooth, coppery stems and curled flakes of bark at the base. It resembles *E. steedmanii* but has smaller buds and fruits, erect inflorescences and retains its outer operculum until flowering. *E. 'mimica'* is closely related but sheds its outer operculum before flowering.

NOTE: New populations of *E. 'continens'* were recorded west of Mt Holland in early 1992, extending its range northward by more than 100 km.





**EUCALYPTUS CORONATA** Gardner

**Crowned Mallee**

Number of records: 7

Population Size
<10(0) 10-20(0) 20-50(2) 50-100(2) 100-500(0) >500(0) unspecified(3)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (100%), Not (0%), Unspecified (0%)

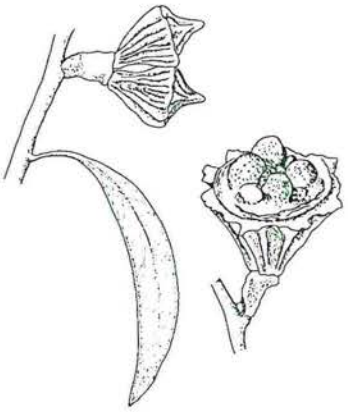
Height: 1.5-2.5 m

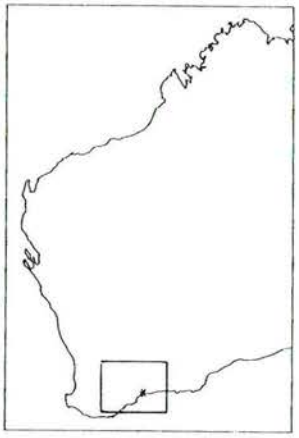
Flowering period: July - August

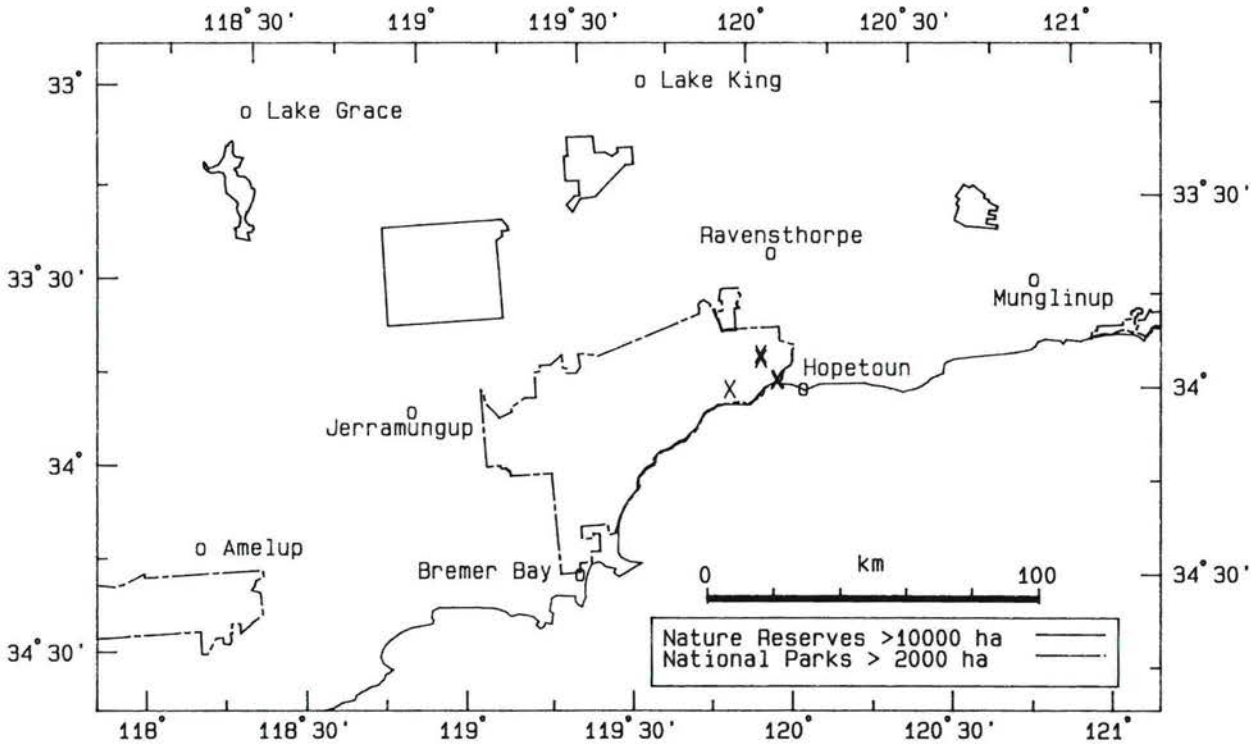
*Eucalyptus coronata* is a rare species restricted to the eastern ranges of the Fitzgerald River National Park. It grows emergent from coastal heath dominated by proteaceous shrubs, in sand on quartzite slopes and hilltops. Associated species include *E. sepulcralis* and *E. preissiana*, with which it hybridizes, and *E. lehmannii* and *E. burdettiana*. It is one of the dominant species at the known sites, with a few thousand plants recorded after a wildfire in 1989. It occurs in rugged country with limited access and further populations may be located in inaccessible areas not yet surveyed. Careful management of its habitat is required. The impact of dieback on local eucalypt species, including *E. coronata* is of concern and requires monitoring. It is gazetted as Declared Rare Flora [Appendix 2].

*E. coronata* is a small mallee charactererized by its conspicuous ribbing on the buds and fruits, and the prominent rounded lobes covering the protruding valves. It has smooth bark and slightly glossy, green to blue-green leaves. It is closely related to *E. aquilina*.

Specific References: Gardner (1934), Pryor (1981), Rye and Hopper (1981), Elliot and Jones (1986).







**EUCALYPTUS CORRUGATA** Luehm.

**Rib-fruited Mallee**

Number of records: 80

Population Size
<10(4) 10-20(10) 20-50(15) 50-100(8) 100-500(16) >500(3) unspecified(24)

Conservation Status
Restricted to road verge (9%), Not (82%), Unspecified (9%)
In conservation reserve (1%), Not (94%), Unspecified (5%)

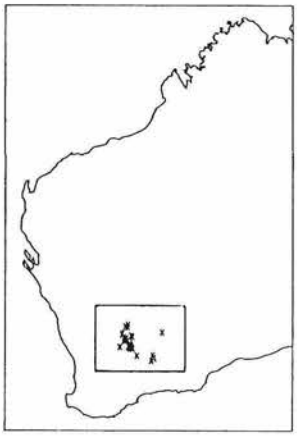
Height: 4-16 m

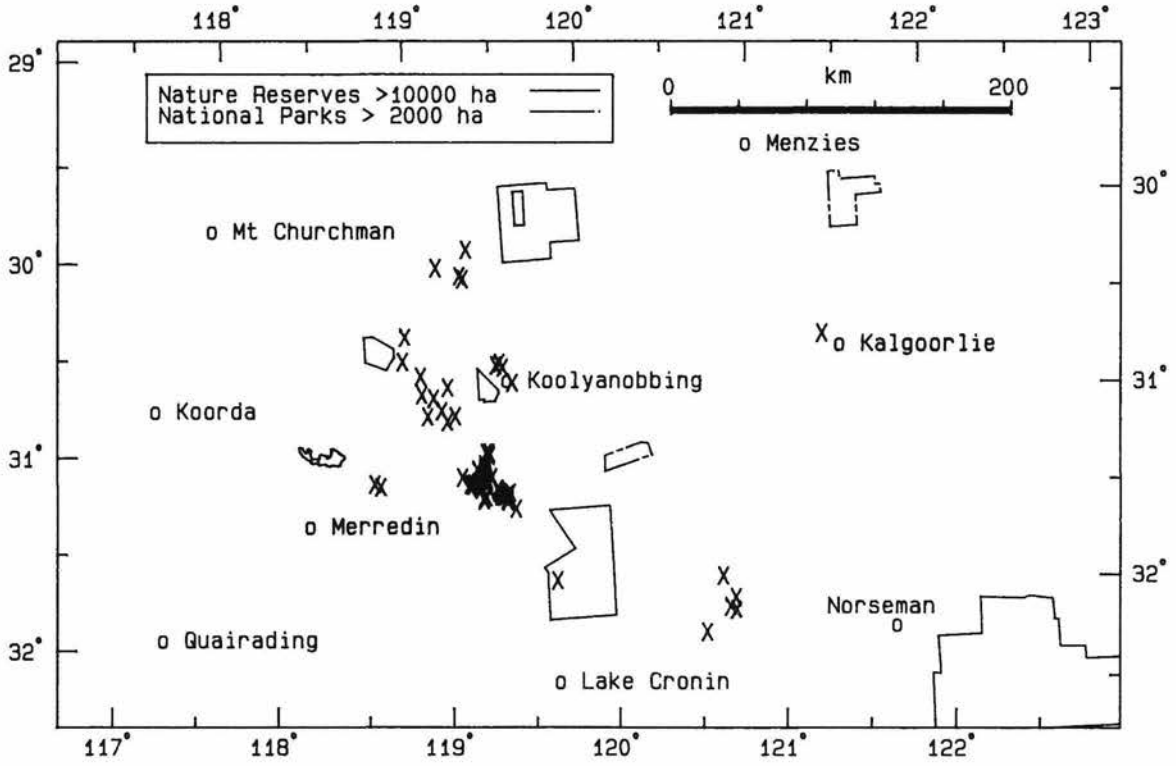
Flowering period: October - April

*Eucalyptus corrugata* occurs over a 280 km range from Westonia, north to the Mt Jackson area, south to Lake Johnston and east to Kalgoorlie. It occurs as localized populations in specific habitats and is most abundant in the Southern Cross - Marvel Loch and Bullfinch areas. It grows on flats, slopes and hilltops in clay and loam soils, often with rocky laterite, quartzite and greenstone. It forms woodland or tree-mallee communities with *E. salubris, E. longicornis, E. salmonophloia, E. transcontinentalis* and *E. oleosa*. It is often the most dominant tree species. There is only one confirmed record from a conservation reserve, with two old collections possibly from a nature reserve north of Southern Cross. There are mining interests throughout its range. A sight-record from north-east of Kalgoorlie, over 150 km beyond its current distribution, requires verification.

*E. corrugata* is a smooth-barked tree or mallee, usually with a short stocking of rough, grey bark at the base. It has very glossy leaves and attractive, prominently ribbed buds and fruits in groups of three. It is closely related to *E. griffithsii* which has less strongly ribbed buds and fruits.

Specific References: Luehmann (1897), Elliot and Jones (1986).





**EUCALYPTUS CRETA** L. Johnson & K. Hill

**Large-fruited Gimlet**

Number of records: 24

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(24)

Conservation Status
Restricted to road verge (0%), Not (96%), Unspecified (4%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

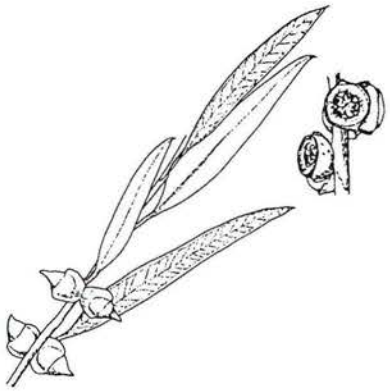
Height: 1.2-9 m

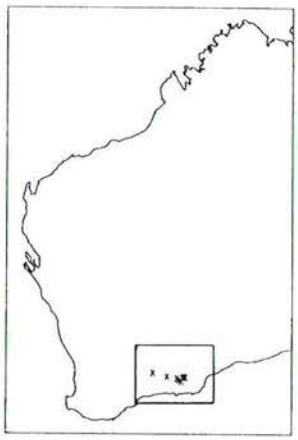
Flowering period: not known

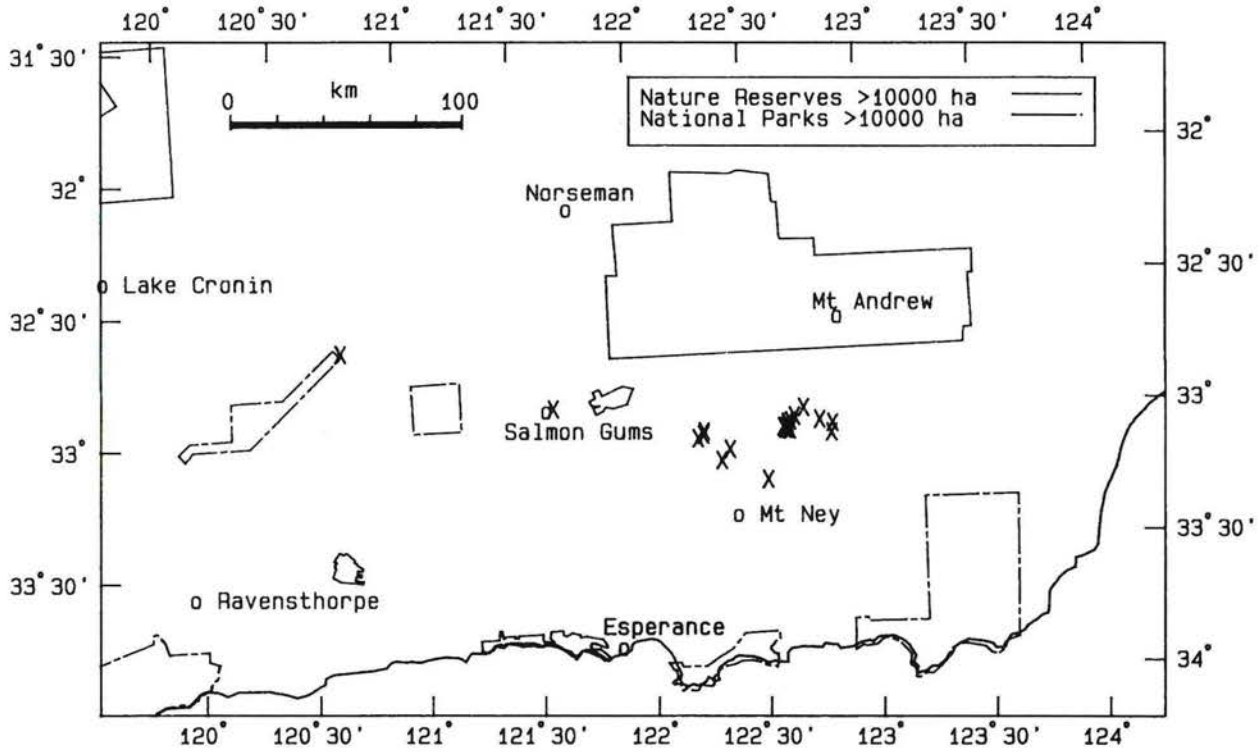
*Eucalyptus creta* is concentrated in the area north-east of Esperance, with outlying populations to the west near Salmon Gums and Ninety Mile Tank. Its recorded habitat includes sandy clay and clay loam flats in mallee-heath or woodlands. A variety of eucalypt species including *E. eremophila, E. flocktoniae, E. gracilis* and *E. conglobata* are associated. It grows together with the closely related *E. terebra* north-east of Wittenoom Hills. None of the records is from conservation reserves but it is not endangered by current land use within its range. Protection of the disjunct western populations is a priority.

*E. creta* is a mallee or small tree related to *E. diptera, E. terebra* and *E. jimberlanica*. It is distinguished by its larger buds and fruits in groups of three, and its relatively long, often hooked operculum.

Specific References: Burgman (1985b), Johnson and Hill (1991).







**EUCALYPTUS CRISPATA** Brooker & Hopper

**Yandanooka Mallee**

Number of records: 7

Population Size
<10(4) 10-20(1) 20-50(2) 50-100(0) 100-500(0) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (14%), Not (86%), Unspecified (0%)

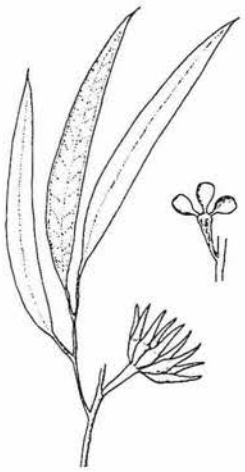
Height: 4-7 m

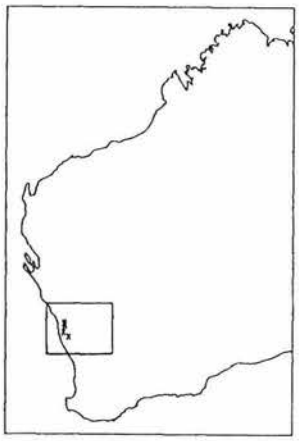
Flowering period: April - June

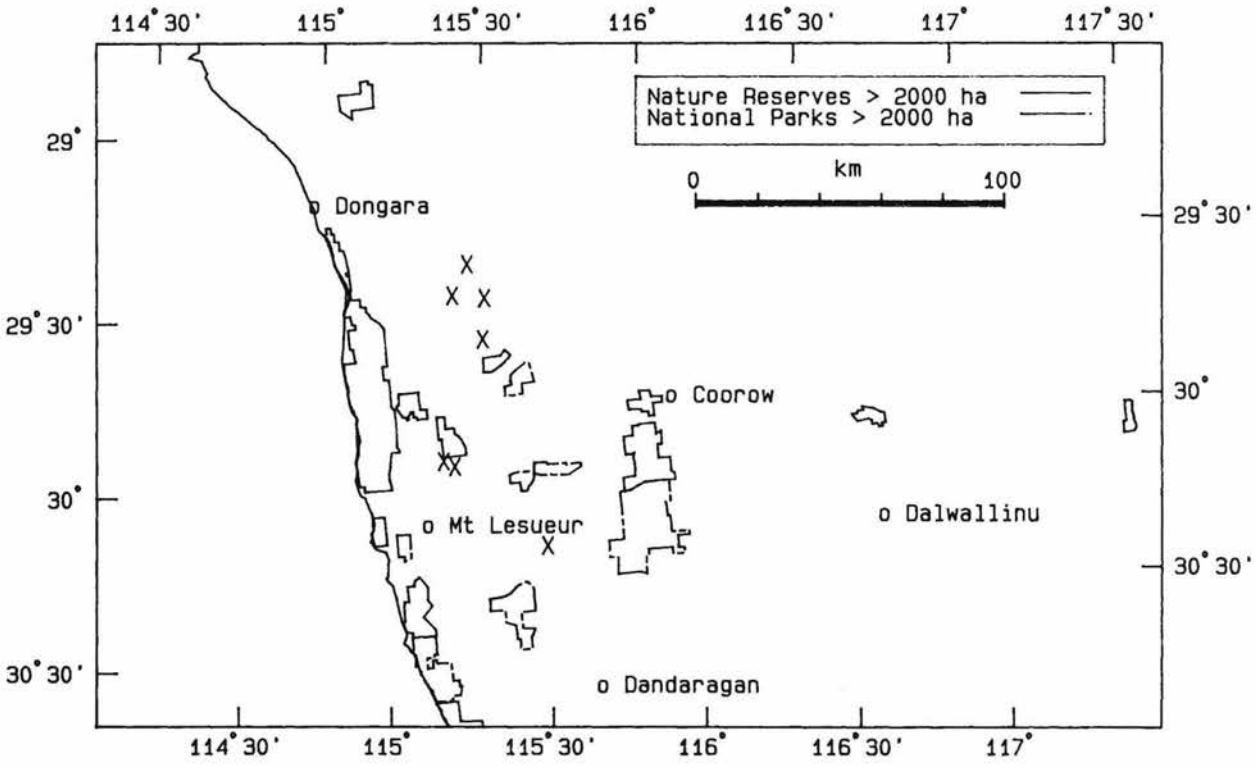
Originally known from a single site near Mingenew but with recent surveys recording it from several populations south to Boothendarra Hill. It grows on clayey soils of shallow gulleys and on lateritic, and occasionally granitic, breakaways and slopes. It occurs as usually small stands in low woodland and mallee. At all but one site, which was mostly cleared farmland, the presumed parent species *Eucalyptus accedens* and *E. arachnaea* were associated. A total of <150 plants is estimated and only one population (14 per cent of total records), of about 30 plants, is from a conservation reserve. Protection of the populations from accidental destruction is essential. It is gazetted as Declared Rare Flora [Appendix 2].

*E. crispata* is a mallee or tree-mallee of probable hybrid origin. It has dull or glossy leaves and curling flakes of grey bark at the base. There is some variation in the bud and fruit form and overall appearance, which are intermediate between the presumed parent species *E. accedens* and *E. arachnaea*.

Specific Reference: Brooker and Hopper (1991).







**EUCALYPTUS CRUCIS** Maiden ssp. **CRUCIS**

**Southern Cross Silver Mallee**

Number of records: 7

Population Size
<10(3) 10-20(1) 20-50(0) 50-100(1) 100-500(2) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (14%), Not (86%), Unspecified (0%)

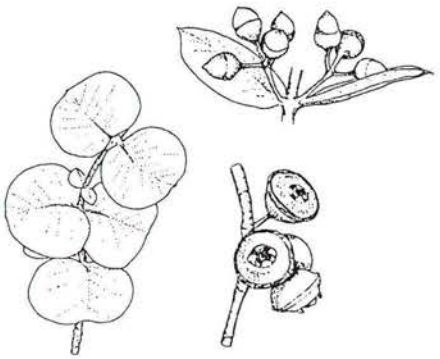
Height: 3-5 m

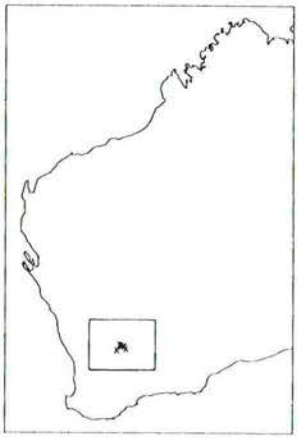
Flowering period: December - March

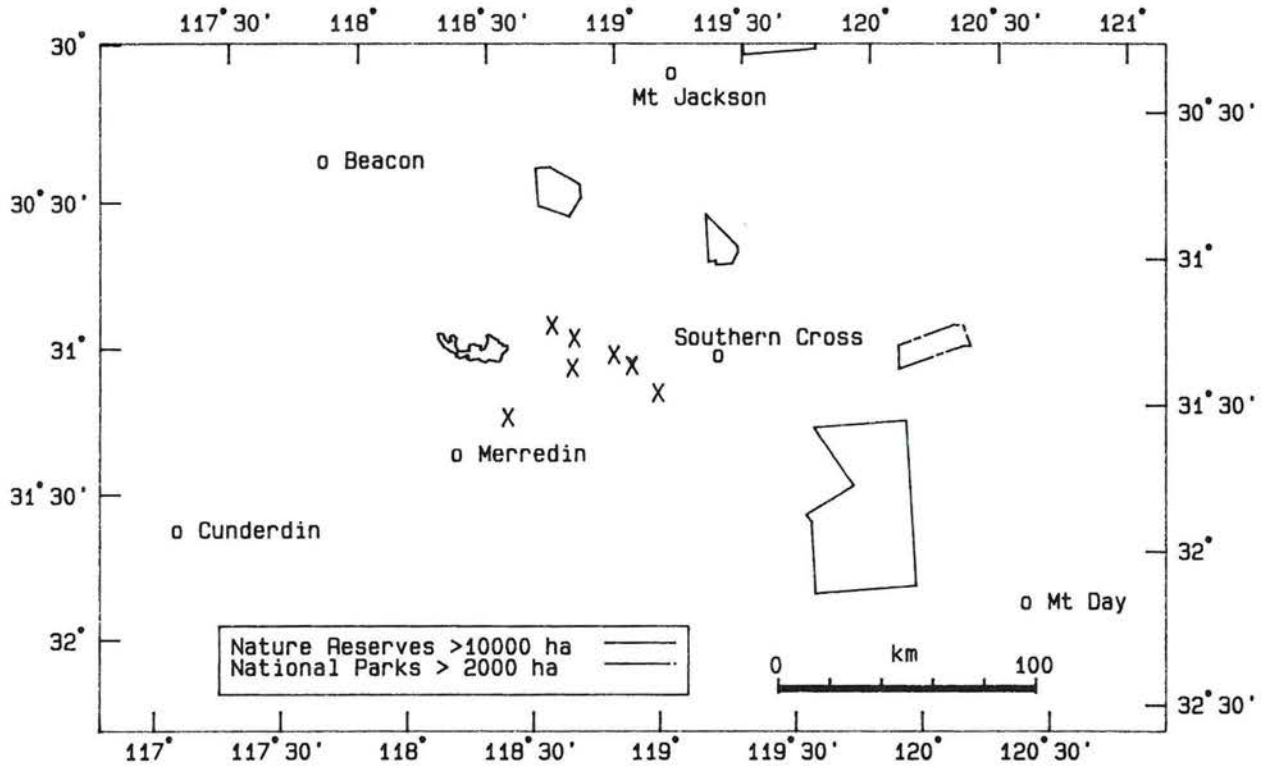
*Eucalyptus crucis* ssp. *crucis* is a granite rock endemic known from seven isolated populations over a 60 km range in the Westonia area. It grows emergent from scrub and thicket in loamy or sandy soils at the base and in gullies of granite outcrops. Surrounding vegetation inlcudes *Allocasuarina, Calothamnus, Acacia* and *Kunzea* species. The total number of individuals is <600, with only one population of approximately 200 plants on a nature reserve. Other populations are from private land and water and townsite reserves. Fortunately these areas are not suitable for agriculture and are valuable water catchments. Granite rocks in the wheatbelt and goldfields have been extensively surveyed. Continued close liaison with land managers is essential for the survival of this subspecies. It is an ornamental plant that is popular in cultivation. It is gazetted as Declared Rare Flora [Appendix 2].

*E. crucis* ssp. *crucis* is a sprawling, or occasionally erect, mallee or small tree with rough, dark grey bark at the base and minniritchi bark above. It has a mature crown of silvery grey, usually sessile and opposite leaves. The branchlets, buds and fruits are glaucous.

Specific References: Maiden (1903-1933), Holliday and Watton (1980), Brooker and Hopper (1982), Elliot and Jones (1986), Sampson *et al.* (1988).







**EUCALYPTUS CRUCIS** Maiden ssp. **LANCEOLATA** Brooker & Hopper

Number of records: 36

Population Size
<10(6) 10-20(1) 20-50(1) 50-100(1) 100-500(0) >500(0) unspecified(27)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (58%), Not (42%), Unspecified (0%)

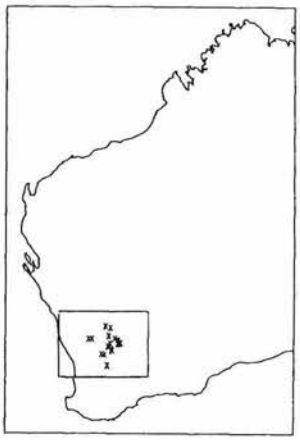
Height: 3-18 m

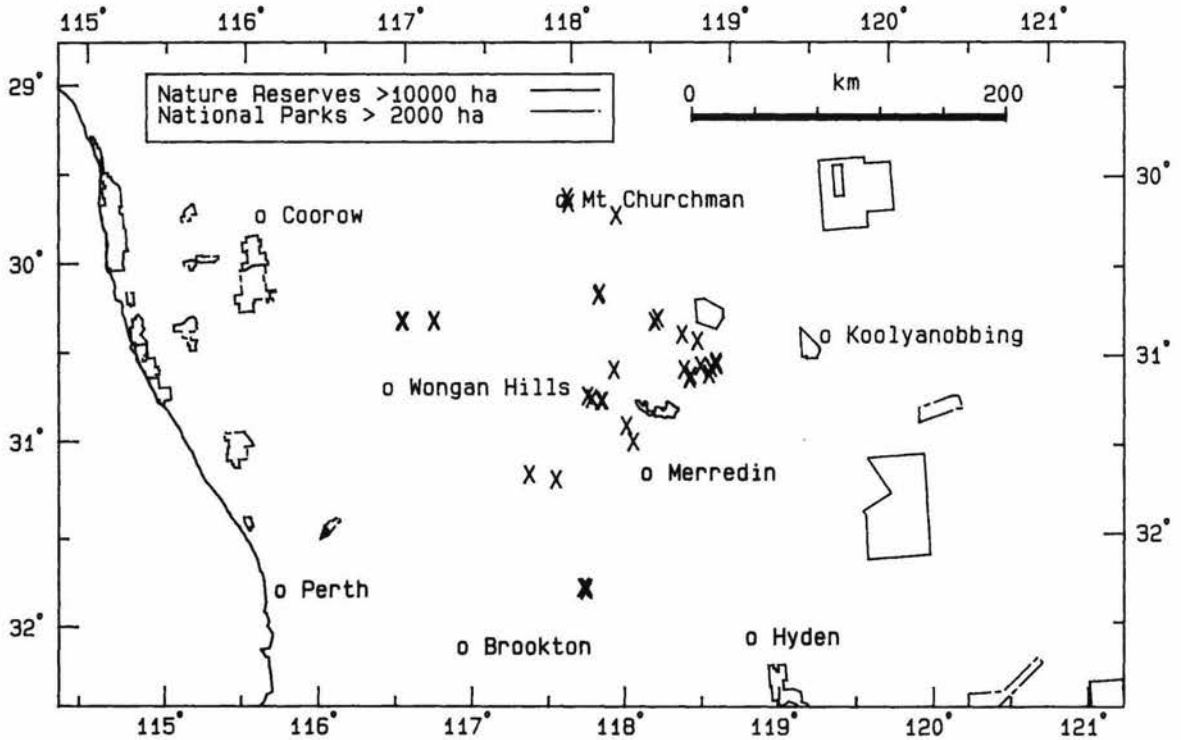
Flowering period: January - March

*Eucalyptus crucis* ssp. *lanceolata* has a widespread distribution from the Mt Churchman area, south through the northern and central wheatbelt to near Pikaring Hill. It is restricted to shallow, granitic loams on and at the base of granite outcrops, growing emergent above *Acacia-Allocasuarina* scrub and thicket. *E. orbifolia* and *E. petraea* are sometimes associated. It is well represented (58 per cent of total records) in 15 nature reserves throughout its range. Recent discoveries included five small populations east of Damboring, a westerly range extension, and two populations in the north of its range near Mt Churchman. The new populations near Mt Churchman may represent intergrades with ssp. *praecipua*. Monitoring and research on regeneration after fire is being conducted.

*E. crucis* ssp. *lanceolata* is an erect-stemmed mallee or small tree with flaky, brown-black bark at the base, minnniritchi bark above and glaucous branchlets. It differs from the typical subspecies in its larger, more erect habit and lanceolate adult leaves with distinct petioles.

Specific References: Brooker and Hopper (1982), Sampson *et al.* (1988).





**EUCALYPTUS CRUCIS** Maiden ssp. **PRAECIPUA** Brooker & Hopper

**Paynes Find Mallee**

Number of records: 1

Population Size
<10(0) 10-20(0) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(0)

Conservation Status
Resricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

Height: 15 m

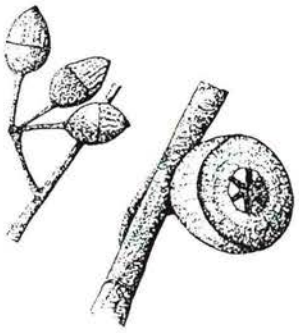
Flowering period: December - March

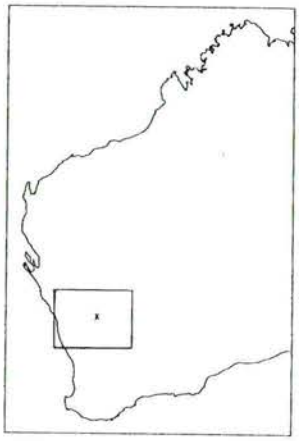
*Eucalytpus crucis* spp. *praecipua* is known from a population of 50+ individuals on a pastoral lease near Paynes Find where it grows in red-brown granitic loam at the base of a large granite outcrop. It forms a dense tree-mallee community in associations with *E.orbifolia* and *E. petraea*. Heavy grazing by sheep and feral goats has been observed at the locality. Exclusion of grazing and careful management of the area is required. Granite outcrops of the wheatbelt and goldfields have been extrensively surveyed. It is gazetted as Declared Rare Flora [Appendix 2].

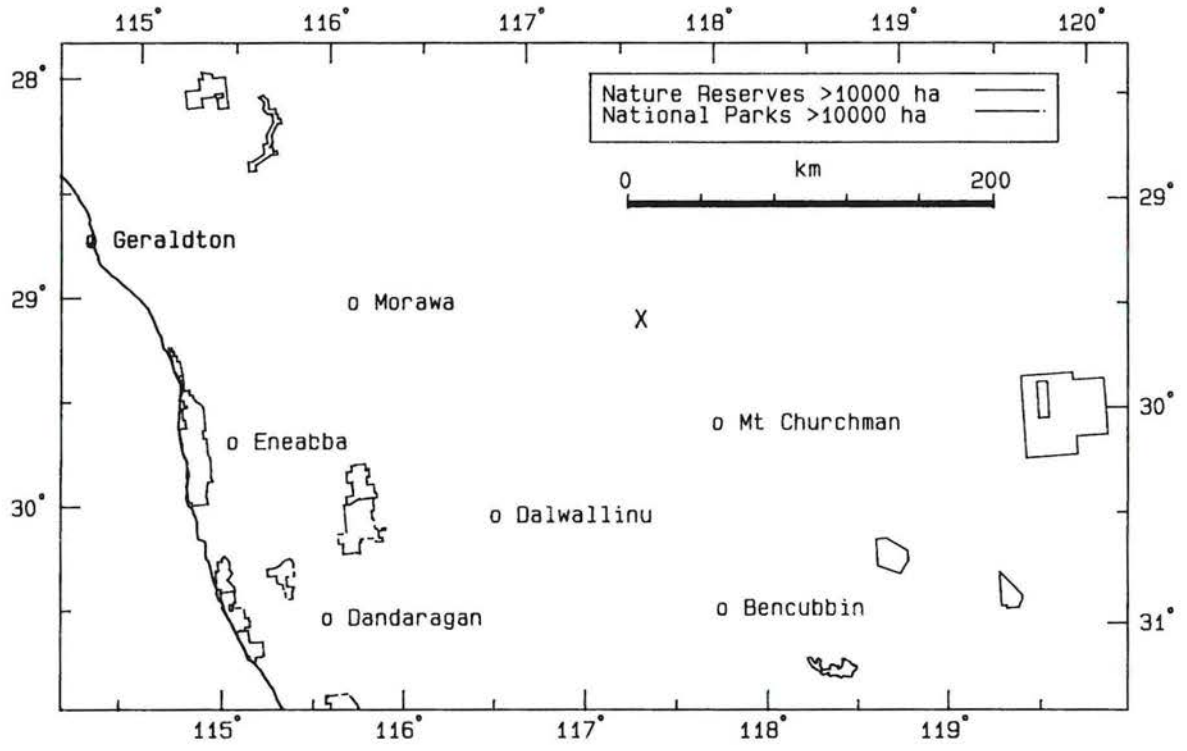
*E. crucis* ssp. *praecipua* is a robust tree-mallee or small tree differing from ssp. *crucis* and ssp. *lanceolata* in its larger leaves, buds and fruits. It has been shown to be allozymically distinct from these subspecies (Sampson et al. 1988).

Specific References: Sampson *et al.* (1988), Brooker and Hopper (1993).

Illustration by E. cooper (in Brooker and Hopper 1993).







**EUCALYPTUS CUPREA** Brooker & Hopper

**Mallee Box**

Number of records: 4

Population Size
<10(3) 10-20(0) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (25%), Not (75%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

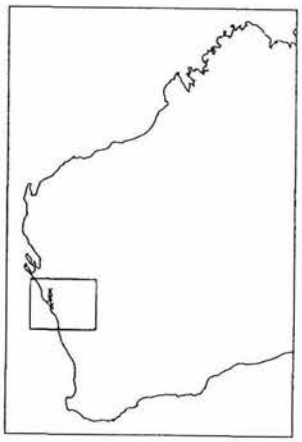
Height: 3-5 m

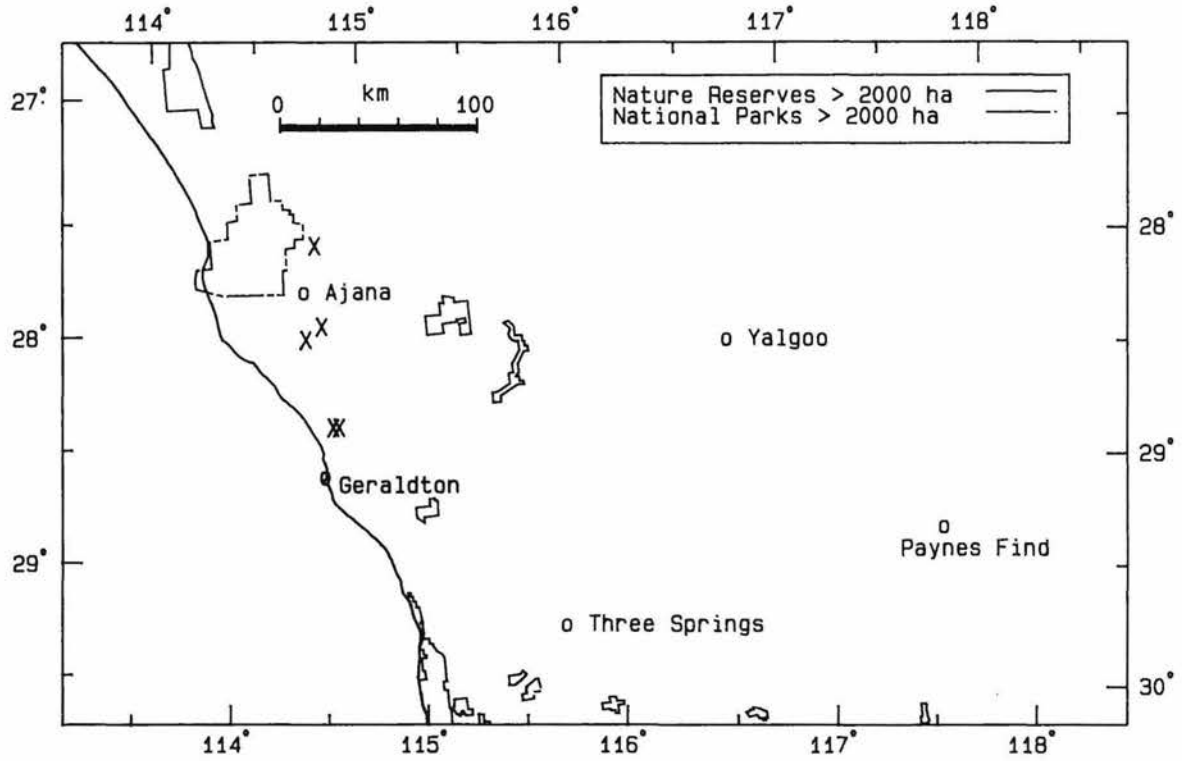
Flowering period: August - November

*Eucalyptus cuprea* is restricted to a few localities in the Moresby Range north-east of Geraldton, and north of the Murchison River. It grows in sandy and loamy soils on slopes and subdued lateritic or granitic breakaways. It is known from only a few hundred plants in four populations, none of which occur in conservation reserves. One population, consisting of a single individual, was last sighted in 1983 and may have been cleared. Two populations are from cleared and grazed farmland that has been recently fenced. The northernmost population comprises >200 individuals and occurs partly on the road reserve of the North-West Coastal Highway. Further populations may be found in unsurveyed bushland that remains on private property in the Moresby Range.

*E. cuprea* is a mallee or small tree with a stocking of rough 'box' bark, or occasionally smooth bark throughout. Its club-shaped buds and cupular to conical fruits are in branched, terminal inflorescences. The leaves are glossy with obvious venation.

Specific Reference: Brooker and Hopper (1993).





**EUCALYPTUS CUPULARIS** Gardner

**Halls Creek White Gum**

Number of records: 9

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(9)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (11%), Not (89%), Unspecified (0%)

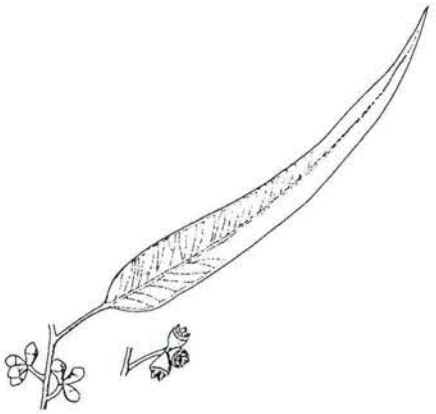
Height: 5-12 m

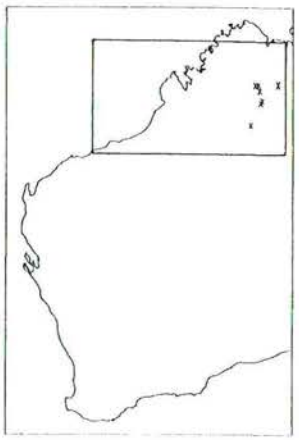
Flowering period: October - November

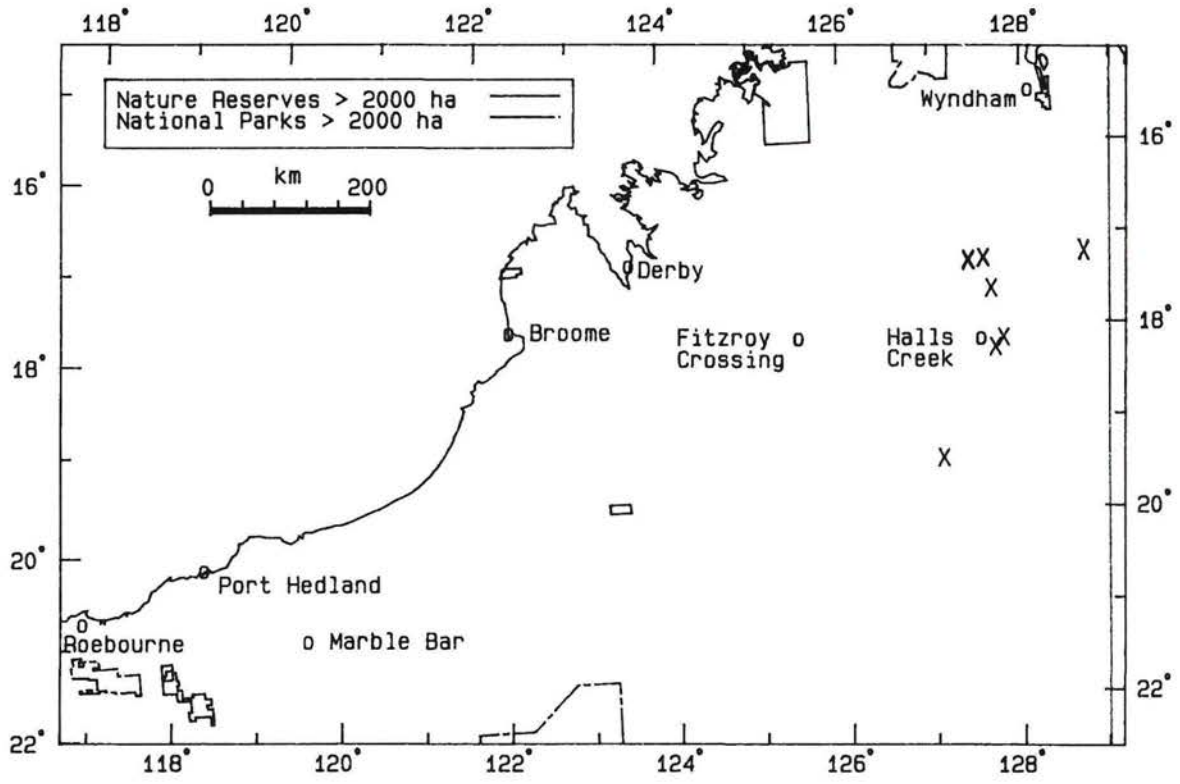
*Eucalyptus cupularis* occurs in the south-eastern Kimberley from near Mt Bannerman to the Osmond Ranges, and has also been recorded from the Tanami Desert in the Northern Territory. It grows in open woodlands and rangelands with *E.* aff. *papuana, E. brevifolia* and *E. argillacea*. Habitat is sandy soils adjacent to creek floodplains and below rocky slopes. One record (11 per cent of total) occurs in the Purnululu (Bungle Bungle) Conservation Reserve (not delineated on map) while all other records are from pastoral lands. A number of collections were from along transport routes, suggesting that it may be more abundant in less travelled areas.

*E. cupularis* is a tree with powdery-white bark, drooping branchlets and green to grey-green leaves. It has faintly ribbed buds and fruits on a thick, angular peduncle. The valves of the fruit are prominently exserted. It is closely related to *E. herbertiana* which has a smaller tree or mallee habit, cream-yellow bark and smaller buds and fruits.

Specific References: Gardner (1964), Turnbull and Hall (1973b), Jessop (1985), Elliot and Jones (1986).







**EUCALYPTUS DEFLEXA** Brooker

Number of records: 16

Population Size
<10(0) 10-20(1) 20-50(0) 50-100(0) 100-500(1) >500(0) unspecified(14)

Conservation Status
Restricted to road verge (0%), Not (75%), Unspecified (25%)
In conservation reserve (12.5%), Not (87.5%), Unspecified (0%)

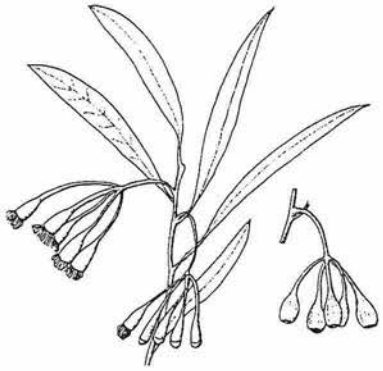
Height: 2-3 m

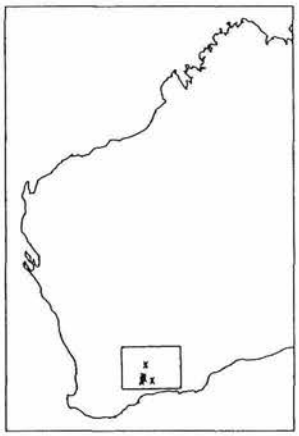
Flowering period: August - October

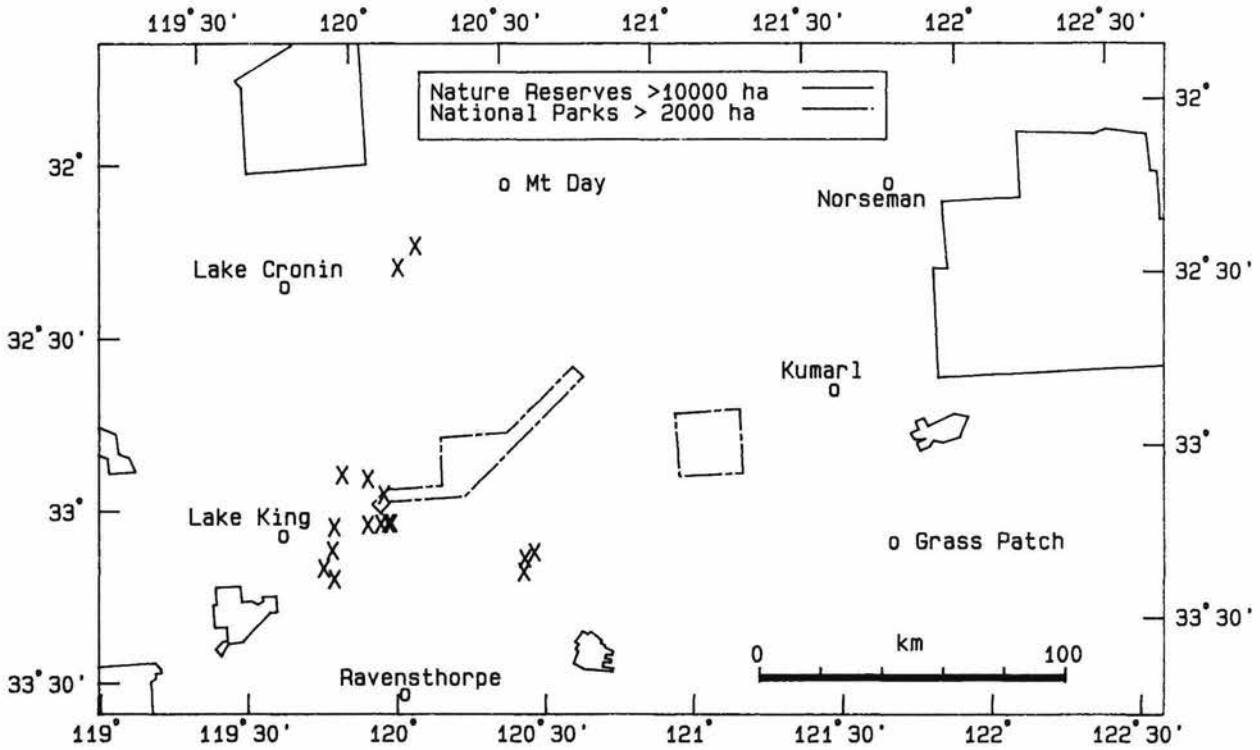
*Eucalyptus deflexa* is concentrated in an area east of Lake King with outlying populations east of Lake Cronin and near Coujinup Hill. Its preferred habitat is sandy soils, often with laterite, on flat or undulating terrain. Surrounding vegetation is mallee or mallee-heath with *E. eremophila, E. flocktoniae, E.* aff. *leptophylla, E. uncinata* and *E. pileata*. About 200 plants occur in Frank Hann National Park and one population, of unrecorded size, is from a nature reserve. It is abundant in the localized populations (Burgman 1985a) but is vulnerable owing to its restricted distribution. Monitoring of populations is required.

*E. deflexa* is a small mallee characterized by its buds and fruits on long, down-curved pedicels and peduncles. It has slender, smooth-barked stems and narrow, slightly glossy leaves. The cream coloured buds are conspicuous against the foliage. Flowers are pink or creamy white.

Specific References: Brooker (1976a), Hall and Brooker (1977b), Elliot and Jones (1986).







**EUCALYPTUS DENSA** Brooker & Hopper ssp. **IMPROCERA** Brooker & Hopper

**Dwarf blue Mallee**

Number of records: 23

Population Size
<10(4) 10-20(0) 20-50(2) 50-100(1) 100-500(0) >500(0) unspecified(16)

Conservation Status
Restricted to road verge (13%), Not (48%), Unspecified (39%)
In conservation reserve (13%), Not (78%), Unspecified (9%)

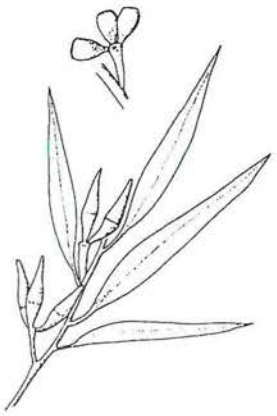
Height: 1-2.5 m

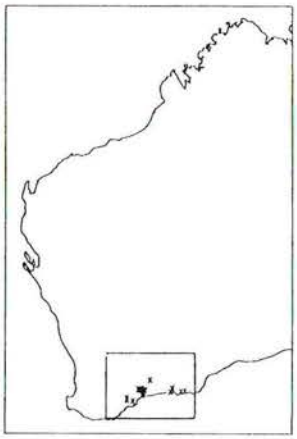
Flowering period: June - December

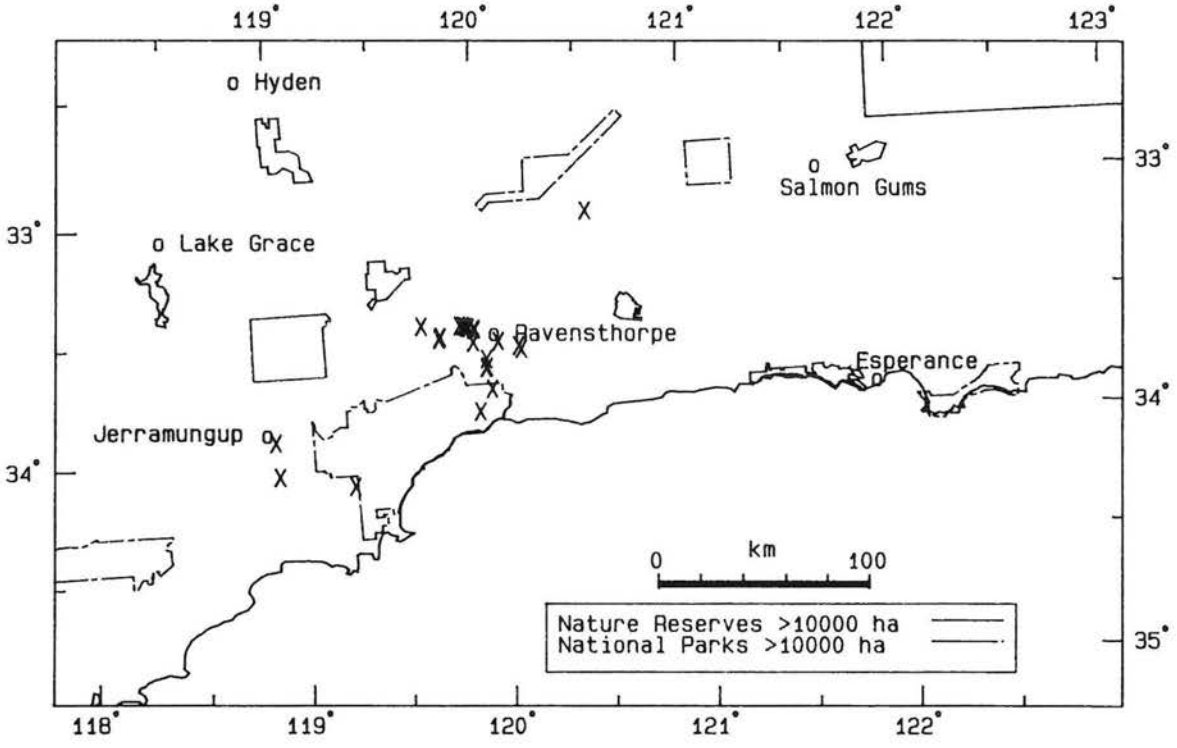
*Eucalyptus densa* ssp. *improcera* occurs from south of Jerramungup to the Ravensthorpe area, with a disjunct population to the north near Lake Tay. It is most commonly found in mallee-heath and shrub-mallee, on low-lying sites and gradual slopes. Associated species include *E. tetragona, E. phaenophylla, E. perangusta* and *E. uncinata*. Soils are varied mixtures of sands, clays and loams. It is abundant at most of the known sites, only three of which are confirmed occurrences from conservation reserves. Other populations are from private property, road verge and Crown land. Monitoring with regard to further land clearing in its range is required.

*E. densa* ssp. *improcera* is a small, straggly mallee with a dense canopy of narrow, blue-green leaves. The bark is smooth, sometimes flaky in older individuals. Its lemon-yellow flowers are an attractive contrast to the blue-green foliage. It differs from ssp. *densa* in its low mallee habit.

Specific Reference: Brooker and Hopper (1991).







**EUCALYPTUS DEPAUPERATA** L. Johnson & K. Hill

Number of records: 7

Population Size
<10(0) 10-20(1) 20-50(0) 50-100(0) 100-500(1) >500(0) unspecified(5)

Conservation Status
Restricted to road verge (0%), Not (71%), Unspecified (29%)
In conservation reserve (43%), Not (57%), Unspecified (0%)

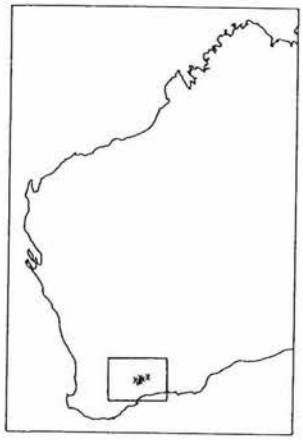
Height: 1.5-2.5 m

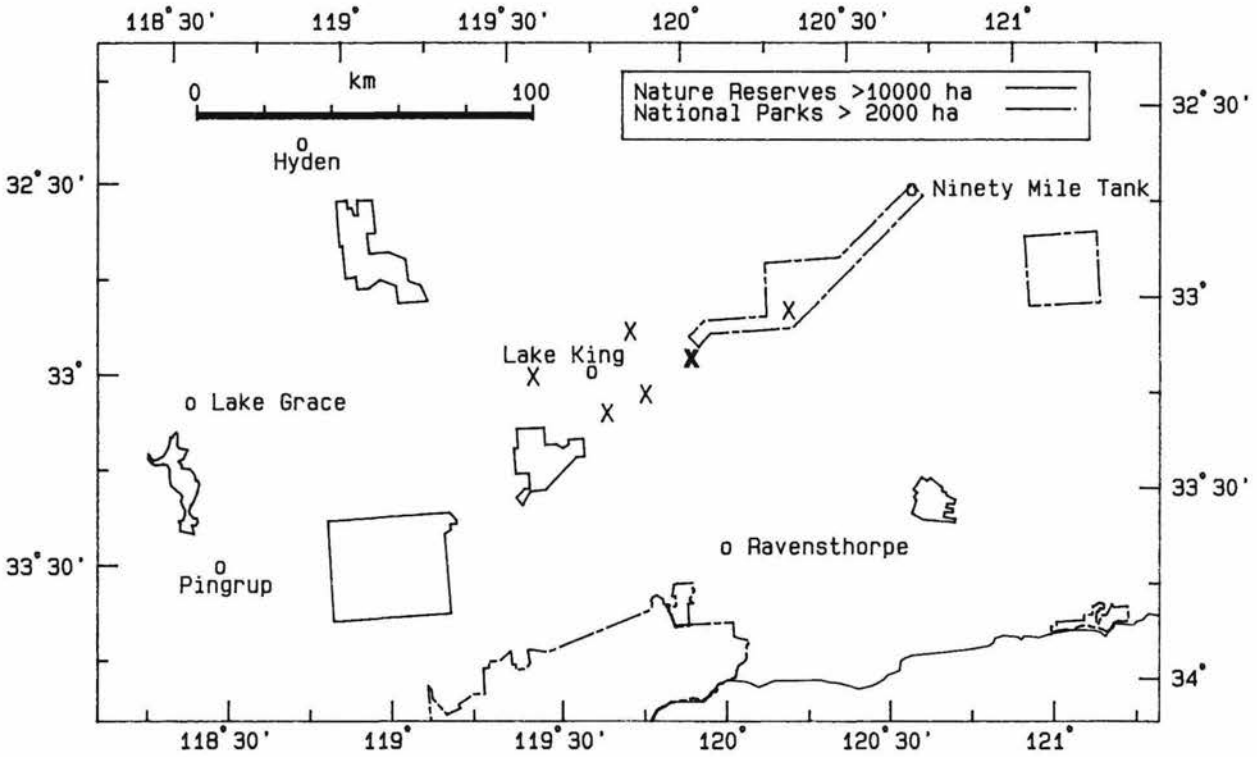
Flowering period: November - February

*Eucalyptus depauperata* is restricted to an area from west of Lake King to Frank Hann National Park. It is found growing in mallee and woodland on sandy flats or gentle slopes. *E. melanoxylon*, *E. flocktoniae* and *E. scyphocalyx* were recorded in association. Three of the known populations (43 per cent of total records) are from conservation reserves, including a large population of >100 plants in Frank Hann National Park and ten to twenty plants in a nature reserve north-east of Lake King. No other population size data were provided. *E. depauperata* grades into *E. eremophila* and it is often difficult to confidently determine species identity. Closer investigation of these species in the area is required.

*E. depauperata* is a small mallee with smooth, erect stems and glossy leaves. It is closely allied to *E. eremophila*, differing in its generally smaller habit and smaller buds and fruits. The buds of *E. depauperata* are usually < 3 cm in length.

Specific Reference: Hill and Johnson (1992).





**EUCALYPTUS DESERTICOLA** D.J.Carr & S.G.M. Carr

**Desert Bloodwood**

Number of records: 2 (see note below)

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(2)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (50%), Not (50%), Unspecified (0%)

Height: 6 m

Flowering period: unknown

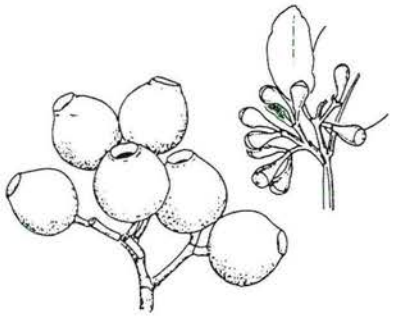
At the commencement of the survey *Eucalyptus desertícola* was known in Western Australia only from collections near Percival Lakes in the Great Sandy Desert and in the Hamersley Range National Park. It had also been recorded from the Stuart Bluff Range in the Northern Territory. At the northern site the habitat was described as red sandplain, with some gravel, in association with *Acacia* sp. and tussock grasses. Population sizes and habitat of the southern population were not recorded.

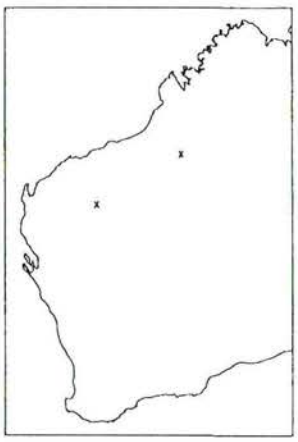
This species was believed to be rare when originally described so was included as a species of interest in the survey. Recent curation of the collection at the Western Australian Herbarium has found it to be widespread throughout the Pilbara Region.

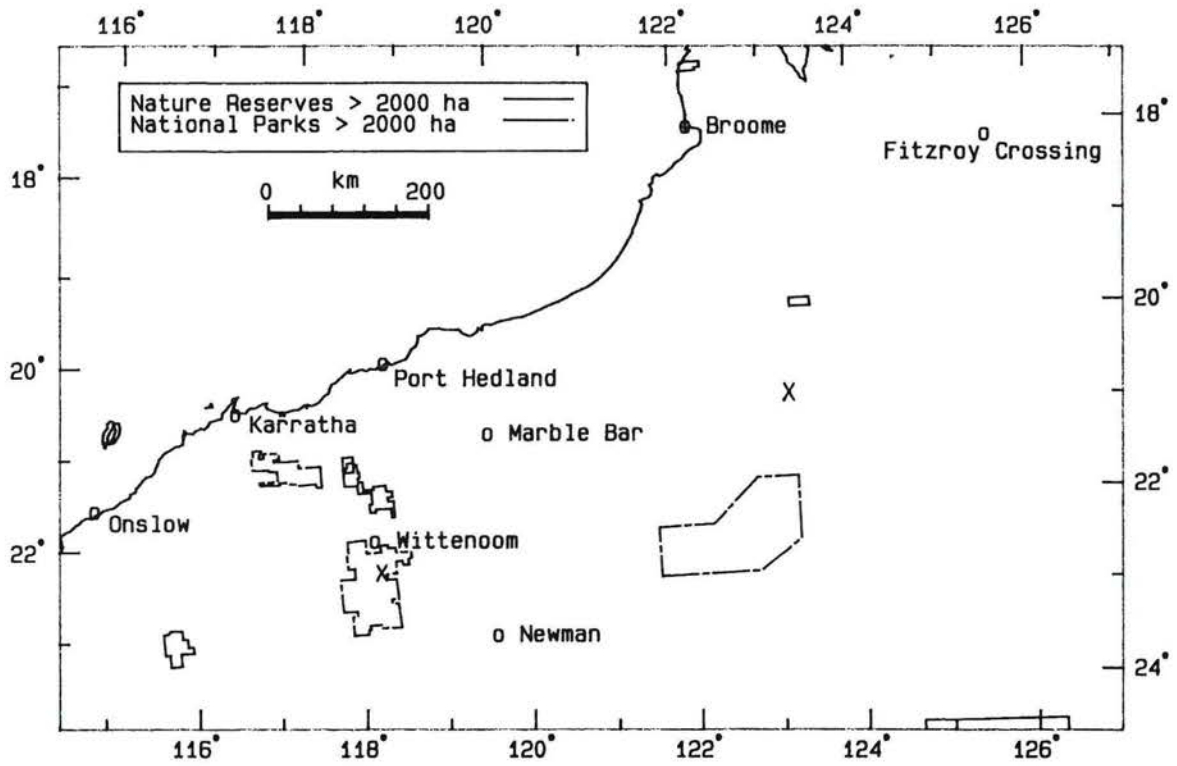
*E. desertícola* is a rough-barked tree or mallee with thick, green adult leaves that resemble the juvenile leaves. The leaves are sessile or shortly petiolate, opposite or almost so. The ovoid fruits are shortly pedicellate.

Specific References: Carr and Carr (1985, 1987), Chippendale (1988).

Illustration by M. Risby (in Chippendale 1988).







**EUCALYPTUS DESMONDENSIS** Maiden & Blakely

**Desmond Mallee**

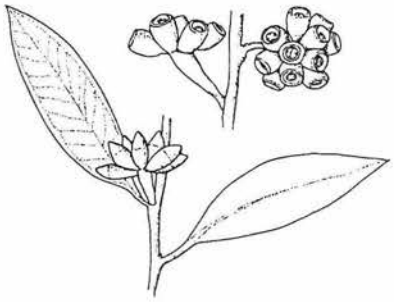
Number of records: 18

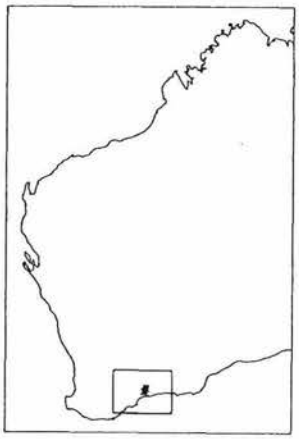
Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(9) >500(0) unspecified(9)

Conservation Status
Restricted to road verge (5.5%), Not (89%), Unspecified (5.5%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

Height: 2.5 m

Flowering period: irregularly throughout year

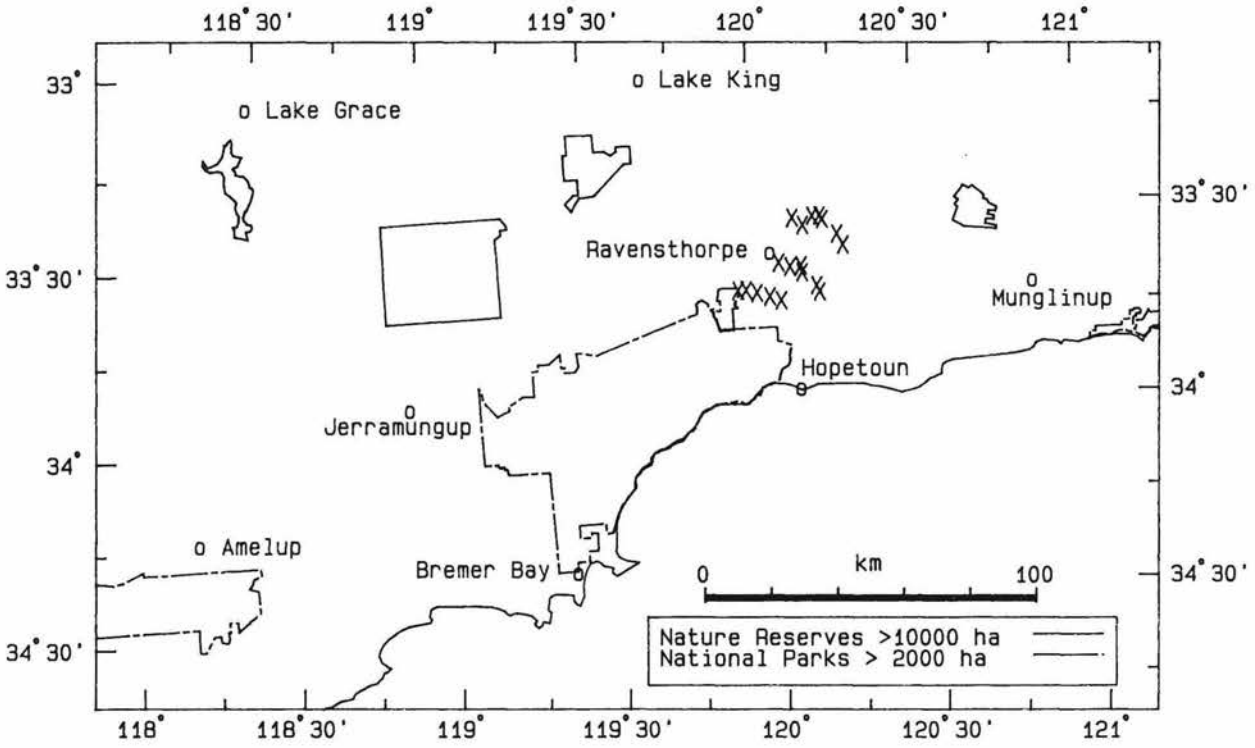




*Eucalyptus desmondensis* occurs in three disjunct groups in the Ravensthorpe region - near Carlingup, in the vicinity of Mt Desmond and near Norndup. It grows emergent from mallee scrub on stony granitic soils of hill and valley slopes. *Melaleuca uncinata* and *Allocasuarina campestris* are usually associated. Other eucalypt species recorded include *E. redunca, E. 'nutans', E. flocktoniae* and *E. conglobata*. It has been well surveyed and found to be locally abundant and dominant at many of the sites. There is an estimated total of >3000 plants, with three populations of at least 100 individuals each in a timber reserve. There are no records from conservation areas (i.e. nature reserves or national parks). Populations in the Ravensthorpe Range, which is largely common and Crown land, are threatened by mining activities. Populations on private property are threatened by further clearing. Protection of this species in conservation reserves would be desirable.

*E. desmondensis* is a straggly, slender-stemmed mallee with smooth bark that may be rough and flaking at the base. It has an open, drooping crown and shining red, glaucous branchlets. It differs from other members in the *Levispermae* series in its shorter, less elongated buds with wholly inflexed stamens.

Specific References: Maiden and Blakely (1925), Holliday and Watton (1980), Pryor (1981), Rye and Hopper (1981), Bennett (1982), Elliot and Jones (1986), Brooker and Hopper (1991).



**EUCALYPTUS DIELSII** Gardner

**Cap-fruited Mallet**

Number of records: 31

Population Size
<10(0) 10-20(0) 20-50(1) 50-100(1) 100-500(1) >500(1) unspecified(27)

Conservation Status
Restricted to road verge (3%), Not (68%), Unspecified (29%)
In conservation reserve (10%), Not (77%), Unspecified (13%)

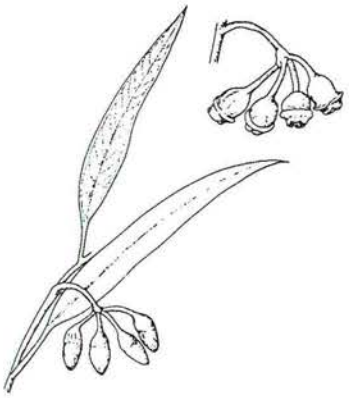
Height: 1.5-10 m

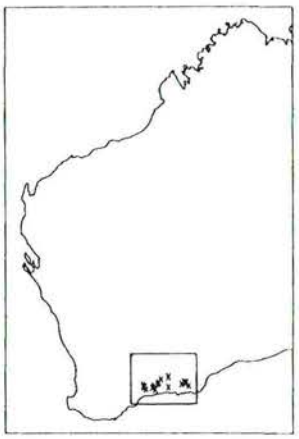
Flowering period: December - January

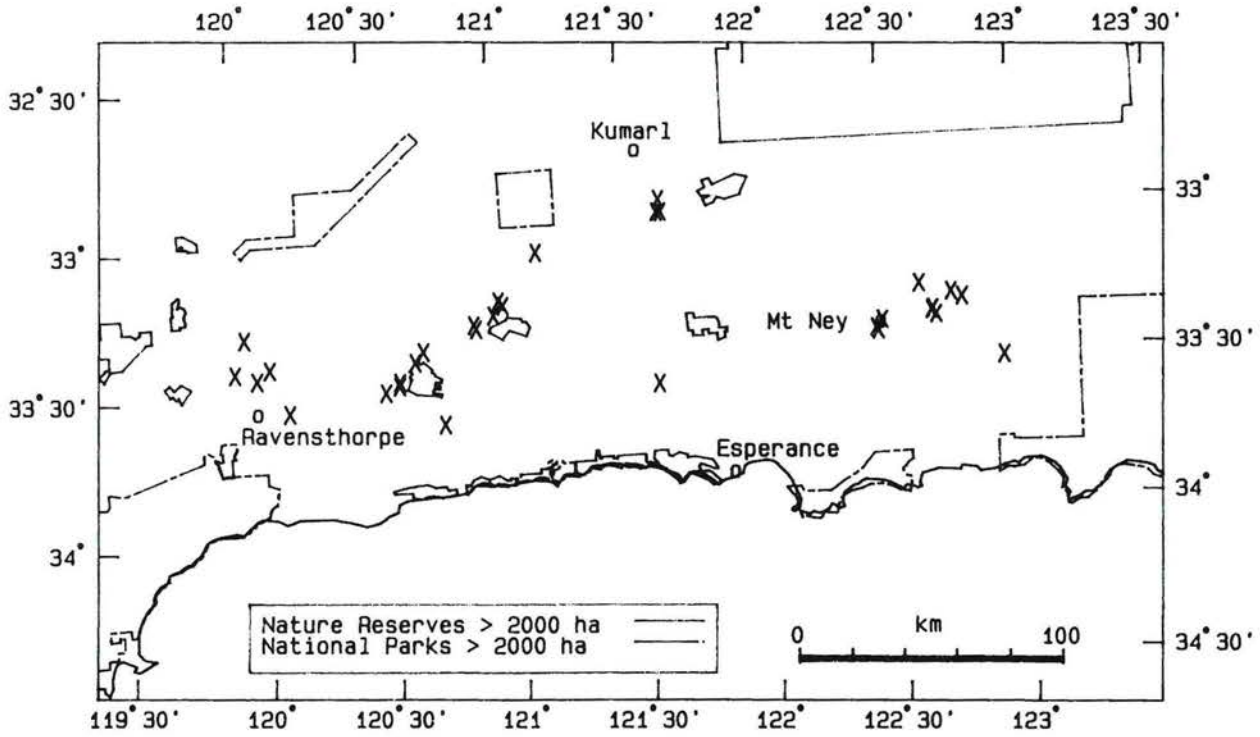
A species of scattered distribution from north-west of Ravensthorpe, east to Salmon Gums and the Mt Beaumont area. It grows as a component of mallee-heath or woodland on clayey flats, slopes and depressions. It occurs with a range of other species, the most commonly encountered being *Eucalyptus longicornis, E. annulata, E. diptera* and *E. calycogona*. Collections provide little population size data but a previous survey of the Eyre district noted it as 'locally abundant in places' (Burgman 1985a). Only three populations (10 per cent of total) are confirmed records from conservation reserves. *E. dielsii* is under no immediate threat. However, its distribution is largely confined to agricultural areas. Monitoring of populations with regard to further land clearing and appropriate management of reserved populations is required.

*E. dielsii* is an erect-stemmed mallee or mallet recorded to 10 m in height but more commonly growing to 4-6 m. Its bark is smooth, mottled grey and coppery. The leaves are narrow and glossy. The fruits have a thick, flared 'cap-like' rim and are on long, down-curved pedicels and peduncles.

Specific References: Gardner (1926), Holliday and Watton (1980), Elliot and Jones (1986).







**EUCALYPTUS 'DIMINUTA'** Brooker & Hopper ined.

Number of records: 6

Population Size
<10(1) 10-20(0) 20-50(1) 50-100(1) 100-500(1) >500(0) unspecified(2)

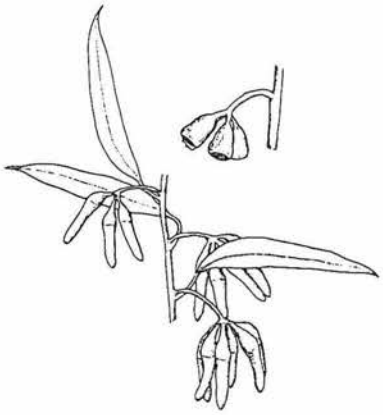
Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (17%), Not (83%), Unspecified (0%)

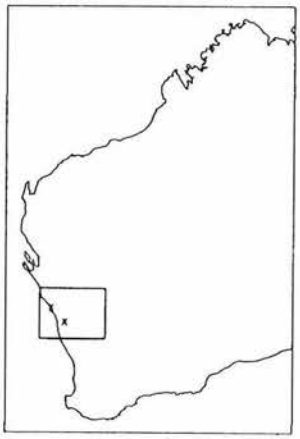
Height: 2.5-5 m

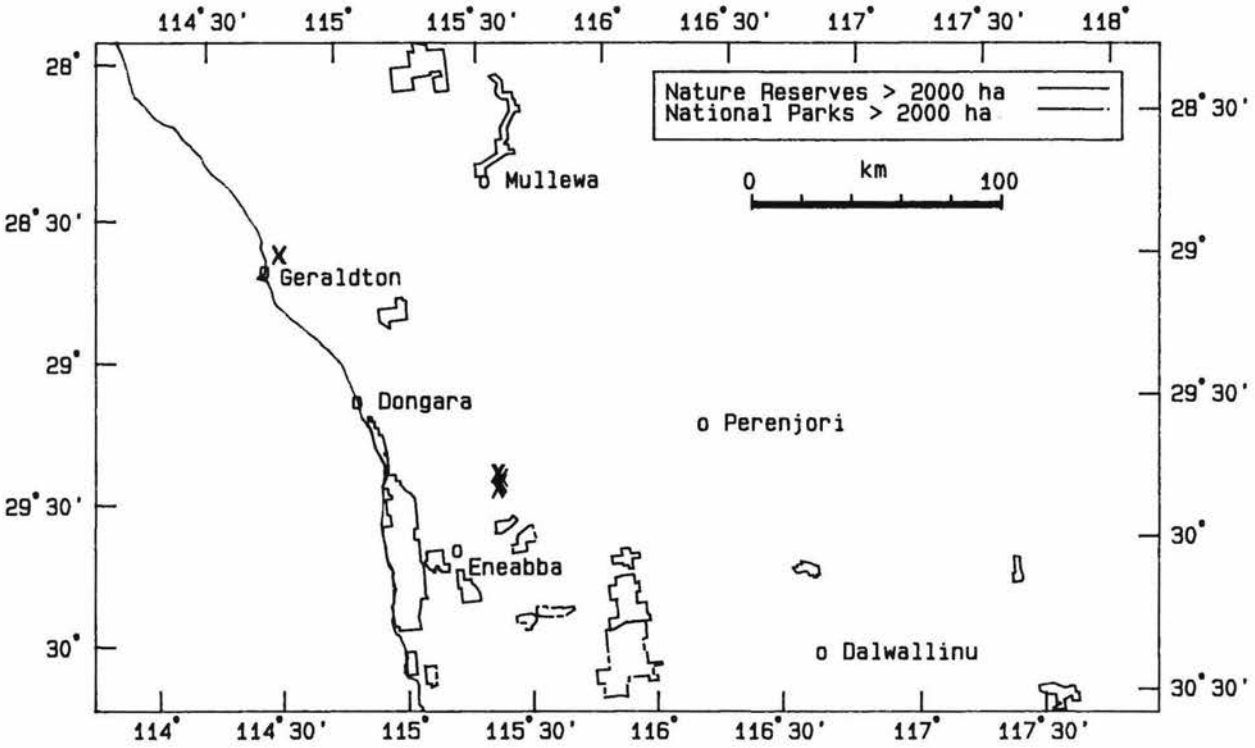
Flowering period: May, October - December

*Eucalyptus 'diminuta'* occurs north-east of Geraldton on a low rocky slope, and west of Three Springs on white clay soils below breakaways and on creekline flats. The southern records include five populations totalling several hundred plants. One of the populations is from a nature reserve. The record near Geraldton is from cleared farmland. Maintenance of genetic diversity within this species is important and close liaison with the owner of land supporting the northern population is required. Collection of seed from this population should be undertaken.

*E. 'diminuta'* is a smooth-barked, usually straggly mallee closely related to *E. stowardii*. It can be distinguished by its smaller, less glossy leaves and smaller buds and fruits without distinct ribbing.







**EUCALYPTUS DISSIMULATA** Brooker

**Red-capped Mallee**

Number of records: 67

Population Size
<10(2) 10-20(8) 20-50(18) 50-100(9) 100-500(1) >500(0) unspecified(29)

Conservation Status
Restricted to road verge (19%), Not (48%), Unspecified (33%)
In conservation reserve (6%), Not (94%), Unspecified (0%)

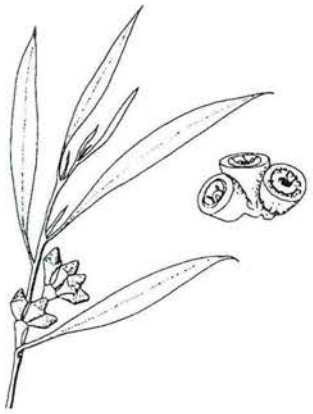
Height: 1-5 m

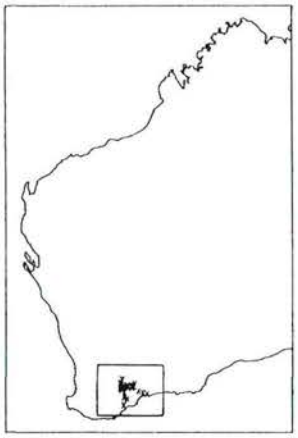
Flowering period: December - January

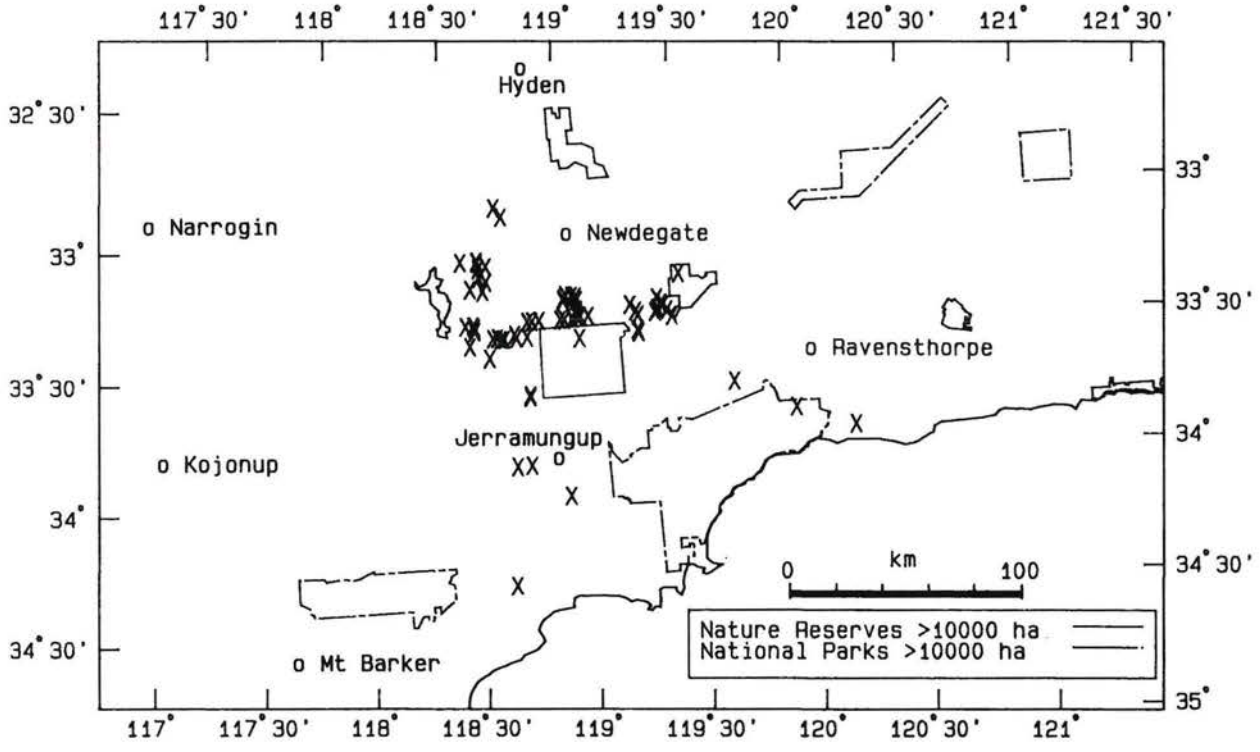
*Eucalyptus dissimulata* occurs from Burngup and Nyabing in the southern wheatbelt to Boxwood Hill and Hopetoun near the coast, usually in sandplain country but sometimes on low hills and clayey or loamy soils. It is a component of mallee and mallee-heath communities and associated with a variety of other eucalypts including *E. phaenophylla, E. perangusta, E. platycorys* and *E. incrassata*. It has been well surveyed in the Lake Grace-Dunn Rock-Pingrup area where it was commonly found in small stands of <50 plants. The majority of populations occur on private property and vacant Crown land with four populations (6 per cent of total) from three nature reserves and the Fitzgerald River National Park. It is probably more common in the south of its range, particularly in large bushland areas with limited access. It is often inconspicuous in the surrounding mallee vegetation and is easily overlooked. *E. dissimulata* is not under any threat but should be monitored with regard to further land clearing.

A smooth-barked mallee with narrow, glossy leaves and striking bright red budcaps near flowering. It is similar to *E. albida*, which occupies its range, and can be distinguished by its grey-green juvenile leaves, less glossy adult leaves and different bud and fruit form.

Specific Reference: Brooker (1988).







**EUCALYPTUS DOLICHORHYNCHA** Brooker (Brooker & Hopper)

**Fuchsia Mallee**

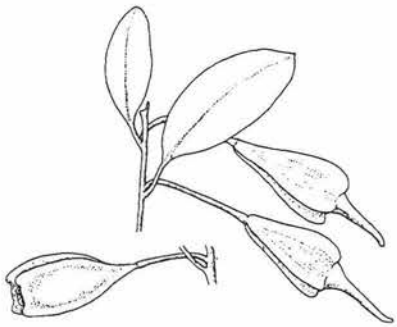
Number of records: 24

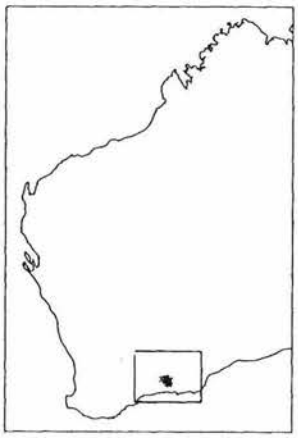
Population Size
<10(2) 10-20(1) 20-50(0) 50-100(1) 100-500(1) >500(3) unspecified(16)

Conservation Status
Restricted to road verge (33%), Not (59%), Unspecified (8%)
In conservation reserve (8%), Not (79%), Unspecified (13%)

Height: 2-3 m

Flowering period: April - June

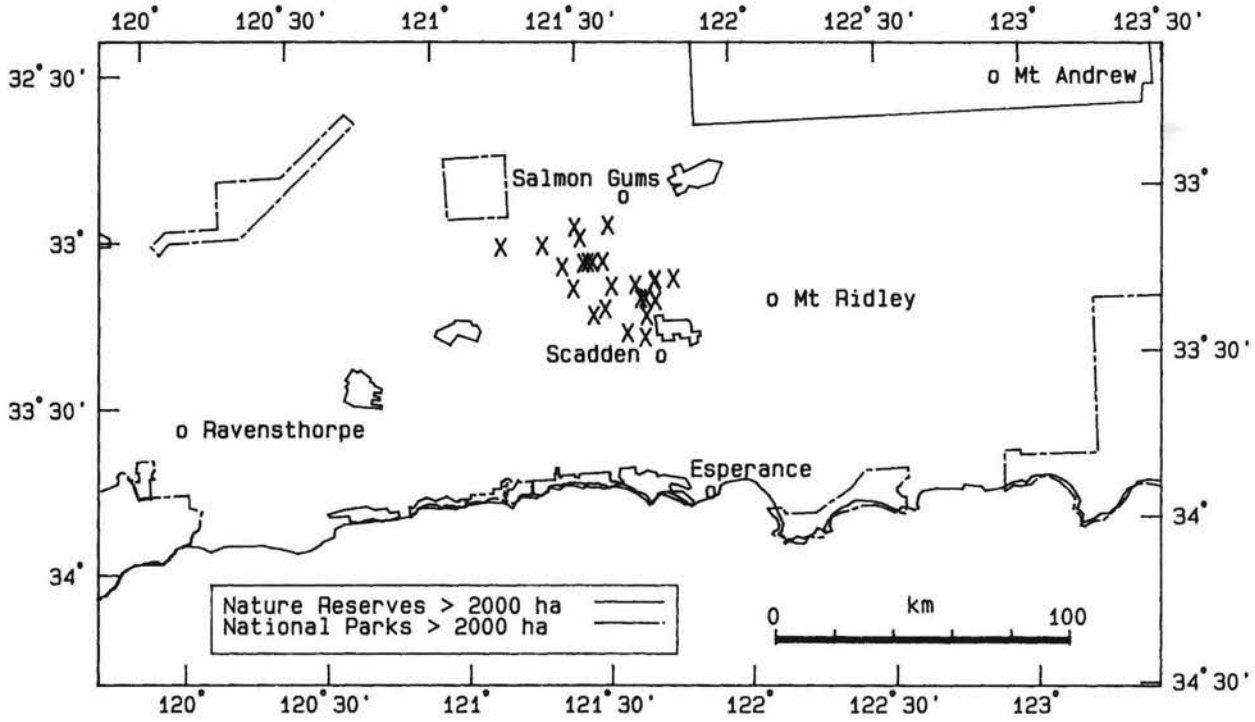




*Eucalyptus dolichorhyncha* is confined to the Salmon Gums-Scadden area where it grows on sandy clay, flat or gradually sloping country. It occurs north of the range of the closely related *E. forrestiana* and in association with it around Scadden. The surrounding vegetation is mallee or low forest with other eucalypt species including *E. eremophila, E. flocktoniae* and *E. leptocalyx*. Its range is entirely within agricultural areas with only two records (8 per cent of total) from conservation reserves. One reserved population consists of >1000 plants while the size of the second was unspecified. Other collections, including some of at least 500 individuals, are from water, gravel, government and Aboriginal reserves. It has been well surveyed over many years and is not expected to be more widely distributed. It may be endangered in the future by land status changes or further land clearing. It is widely cultivated as an ornamental tree throughout Australia.

*E. dolichorhyncha* had been regarded as a subspecies of *E. forrestiana* until recently. It differs from this species in its narrowly beaked operculum and smaller buds and fruits.

Specific References: Beard (1973b), Brooker (1973), Holliday and Watton (1980), Robinson (1984), Elliot and Jones (1986), Brooker and Hopper (1993).



**EUCALYPTUS DOLOROSA** Brooker & Hopper

**Dandaragan Mallee**

Number of records: 1

Population Size
<10(1) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

Height: 2.5 m

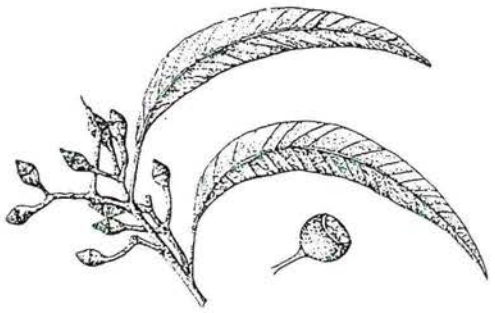
Flowering period: March

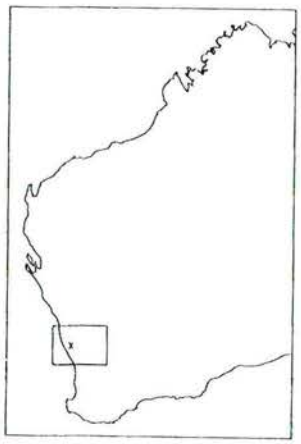
A mallee known from a single population on the summit and slopes of a lateritic hill east of Cataby. The population, comprising eight 'clumps' over a few hectares, grows in uncleared mallee-heath on private property. *Eucalyptus gittinsii, E. pluricaulis* and *E. abdita* occur nearby. All individuals were thought to be sterile until fruit set was observed by Kings Park and Botanic Garden staff in 1991. It is believed to be a relict species close to extinction. Protection of this species through close liaison with the landowner is essential. Further survey of likely habitats and research on the reproductive biology and genetic structure of the population is necessary. Collection and storage of seed is desirable and promotion of fruit set by hand pollination may be needed. It is gazetted as Declared Rare Flora [Appendix 2].

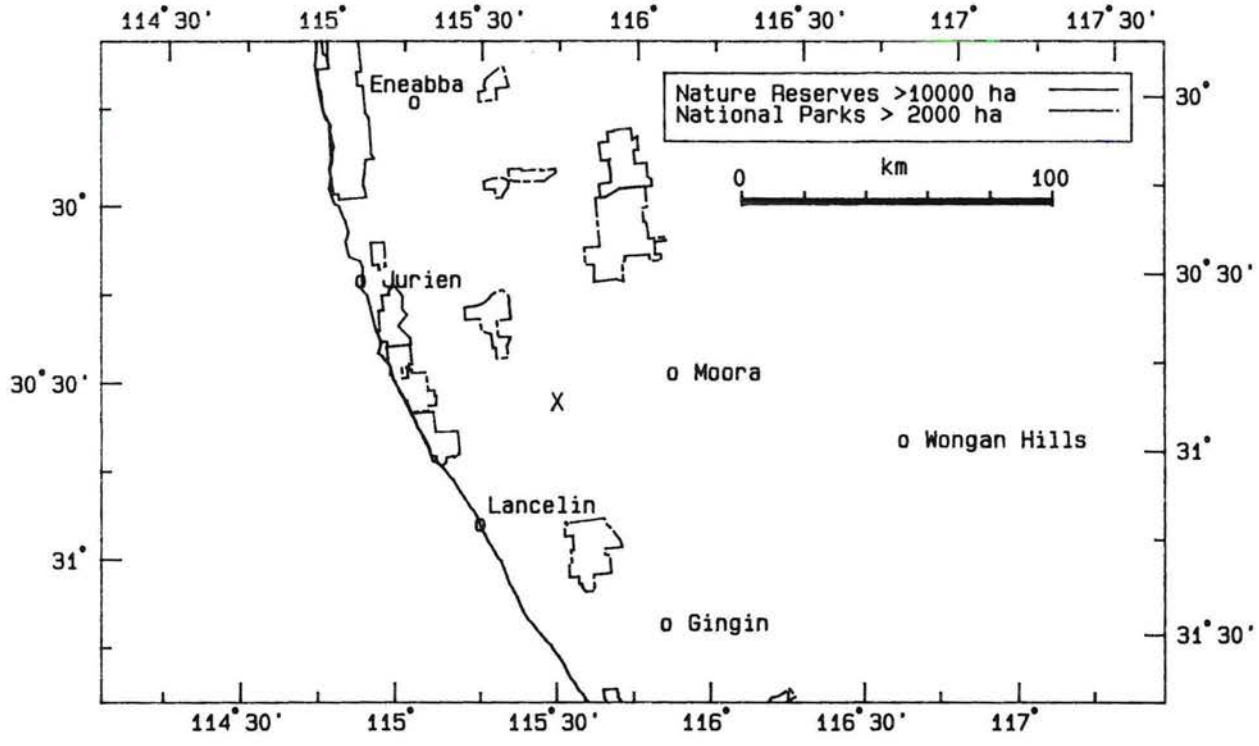
*E. dolorosa* is a low mallee with stout stems and rough, grey bark. It is distantly related to *E. todtiana* and *E. lateritica* differing in its small, falcate leaves, pseudo-terminal inflorescences, long pedicels and glaucous coppice leaves.

Specific Reference: Brooker and Hopper (1993).

Illustration by E. Cooper (in Brooker and Hopper 1993).







**EUCALYPTUS EBBANOENSIS** Maiden ssp. **PHOTINA** Brooker & Hopper

Number of records: 8

Population Size
<10(3) 10-20(0) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(4)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

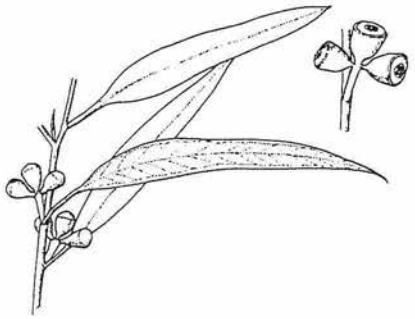
Height: 2-6 m

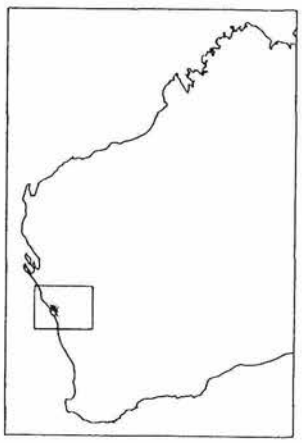
Flowering period: unknown

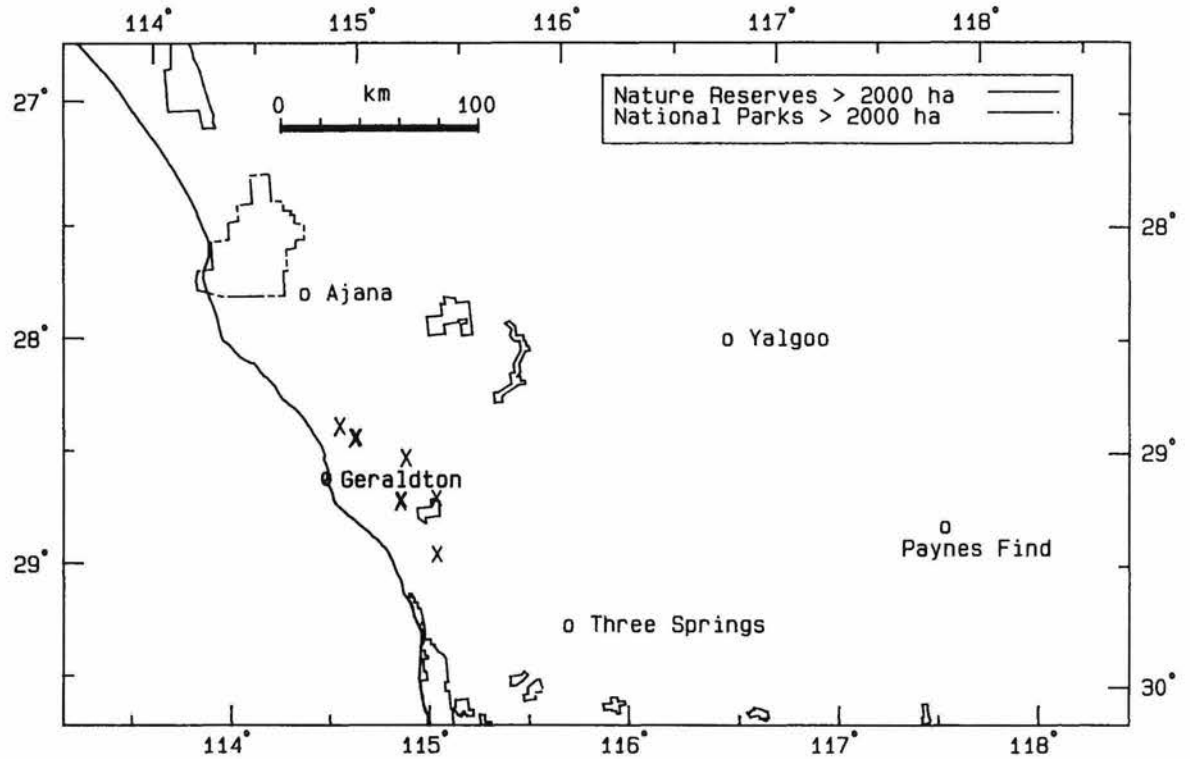
*Eucalyptus ebbanoensis* ssp. *photina* is known from scattered localities north-east and south-east of Geraldton where it grows on steep lateritic slopes and breakaways with *E. eudesmioides, E. obtusiflora, E. blaxellii* and *E. arachnaea*. It is restricted to the north-western extremity of the range of *E. ebbanoensis* ssp. *ebbanoensis* and there appears to be some gradation between the two subspecies. Some of the recently collected specimens assigned to ssp. *photina* were not fully glossy while some populations of ssp. *ebbanoensis* seen on the sandplain country south of Geraldton were tending towards glossy. Additional populations are expected to occur in unsurveyed bush on private property of the Moresby Range. Such populations are relatively safe as the areas are generally unsuitable for farming. There are no records from conservation reserves.

*E. ebbanoensis* ssp. *photina* is a mallee with shiny branchlets and a canopy of glossy, green leaves. It is similar in bud and fruit form to ssp. *ebbanoensis* which is distinguished by its dull, light green to blue-green leaves.

Specific Reference: Brooker and Hopper (1993).







**EUCALYPTUS EFFUSA** Brooker

**Rough-barked Gimlet**

Number of records: 12

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(2) >500(0) unspecified(10)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

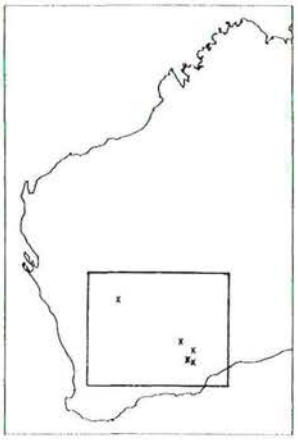
Height: 2-5.5 m

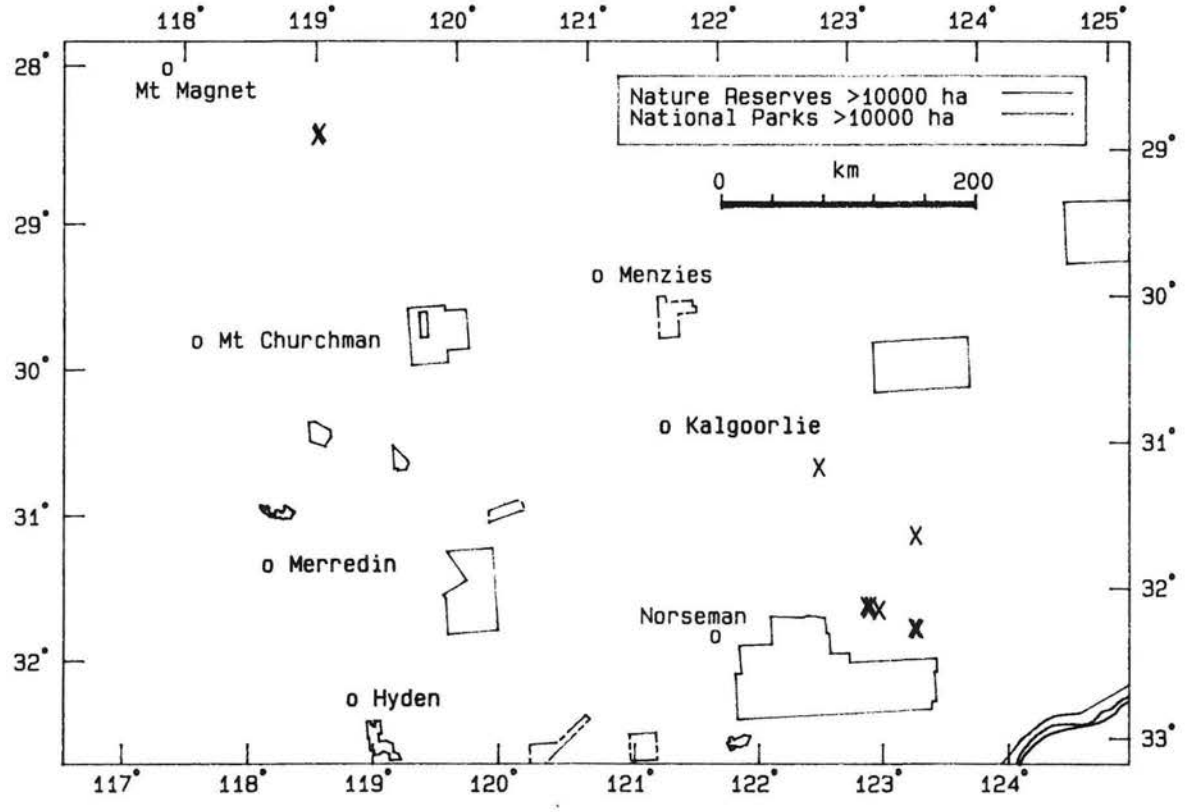
Flowering period: October, January - March

*Eucalyptus effusa* occurs from the Fraser Range east toward Balladonia, with outlying populations near Buningonia Spring, Karonie and Sandstone. It grows in stony sand or clay loams in flat or low undulating terrain, often in pure mallee stands with a heath, spinifex *(Triodia* sp.) or saltbush *(Maireana* sp.) understorey. Associated eucalypts include *E. grossa, E. histophylla* and *E. leptophylla*. The majority of populations were recorded from along transport routes and their extent is not known. Two collections specify *E. effusa* as 'common'. Further surveys throughout its range are required.

*E. effusa* is a usually small, straggly mallee with partly shed, grey-black bark accumulating at the base. It is occasionally a tall mallee with rough bark over most or all of the stems. It differs from other gimlet species such as *E. salubris, E. campaspe* and *E. diptera* in its usually straggly mallee habit, unfluted stems and retention of the dead bark.

Specific References: Brooker (1976a), Hall and Brooker (1977c), Elliot and Jones (1986), Johnson and Hill (1991).





**EUCALYPTUS ERECTIFOLIA** Brooker & Hopper

**Stirling Range Mallee**

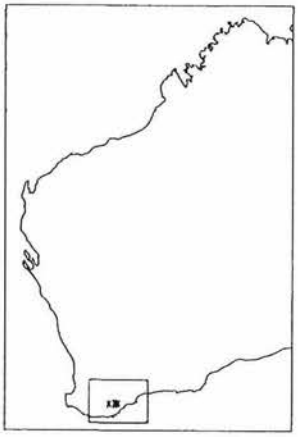
Number of records: 18

Population Size
<10(2) 10-20(0) 20-50(4) 50-100(0) 100-500(2) >500(0) unspecified(10)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (100%), Not (0%), Unspecified (0%)

Height: 1-4 m

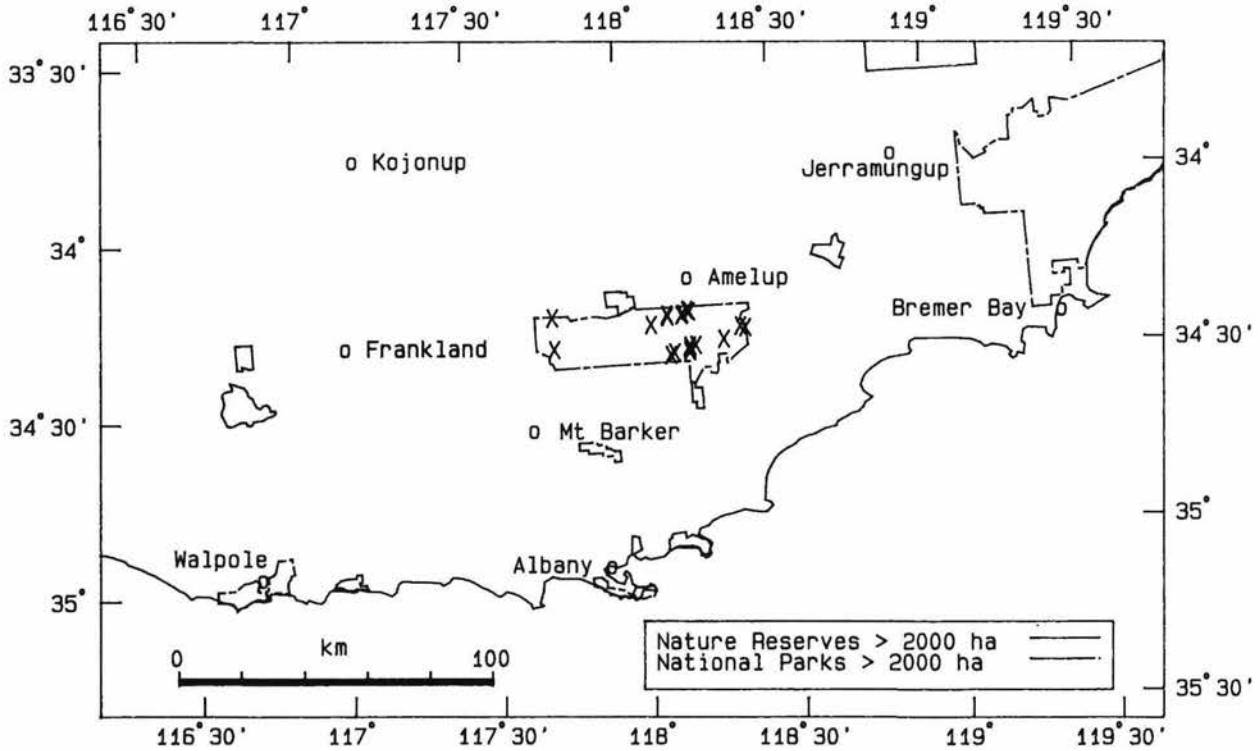
Flowering period: March - May



*Eucalyptus erectifolia* is a rare and restricted species confined to the lower slopes and flats of the Stirling Range. It grows in isolated clumps in open shrub-mallee over heath, often with an open jarrah (*E. marginata*) woodland upperstorey. Soils are mostly lateritic sandy loams. Other species recorded in association include *E. decurva, E. pachyloma, E. buprestium* and *E. tetragona*. There are about 15 'populations' in total, however, it is not well represented genetically as research has shown some populations to be a single clone, i.e. one genetic individual (Moran, personal communication). Most of the 'populations' are from along firebreaks and roads where they may be susceptible to dieback disease (*Phytophthora* spp.). The impact of this disease on *E. erectifolia* is unknown and the populations require monitoring and careful management. Hybrids with *E. buprestium* and *E. marginata* have been recorded. It is gazetted as Declared Rare Flora [Appendix 2].

*E. erectifolia* is a mallee characterized by its steep branching, smooth stems and erectly-held leaves. It can be distinguished from the related *E. pachyloma* and *E. buprestium* by its broader leaves, cupular fruits and spindle-shaped to ovoid buds.

Specific Reference: Brooker and Hopper (1986).



**EUCALYPTUS ERYTHRANDRA** Blakely & Steedman

**Rosebud Gum**

Number of records: 30

Population Size
<10(17) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(13)

Conservation Status
Restricted to road verge (23%), Not (54%), Unspecified (23%)
In conservation reserve (37%), Not (60%), Unspecified (3%)

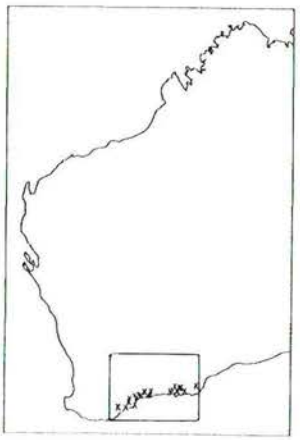
Height: 1.5-7 m

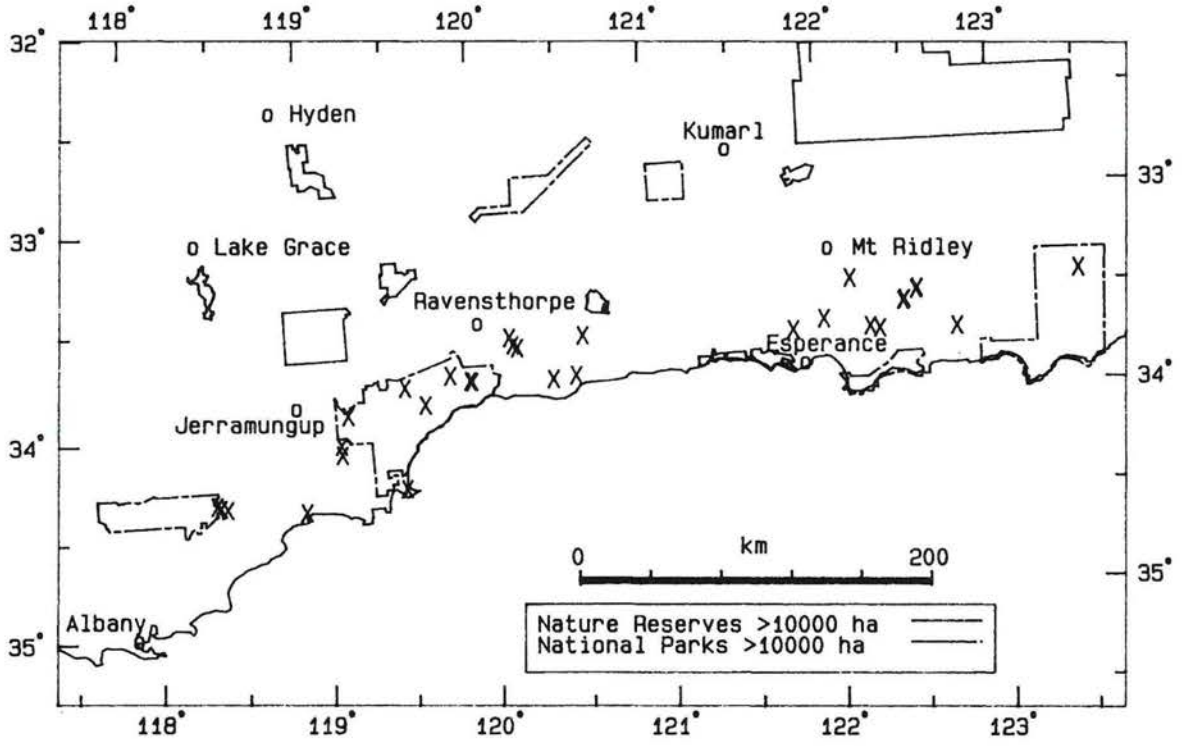
Flowering period: irregularly throughout year

*Eucalyptus erythrandra* has a widespread distribution over a 500 km range in coastal and subcoastal areas between the Stirling Range and Mt Ragged. It grows in small populations of scattered plants on sandy flats or gradual slopes. Surrounding vegetation is mallee-heath with *E. tetraptera, E. tetragona* and *E. angulosa* most commonly associated. It is well represented in conservation areas including the Stirling Range, Fitzgerald River and Cape Arid National Parks and two nature reserves. Recent surveys, with the addition of 15 new records, indicate that it is probably more common as scattered individuals in areas of uncleared land along the coast. Careful management of the reserved populations which provide a good representation of this species throughout its range is essential.

*E. erythrandra* is a smooth-stemmed mallee with thick, glossy leaves and bright red buds in groups of three. It is a hybrid between *E. tetraptera* and *E. angulosa* and is intermediate in leaf, bud and fruit form. It has been recorded to a height of 7 m but more commonly grows to 2.5-3 m.

Specific References: Blakely, McKie and Steedman (1938), Beard (1973a).





**EUCALYPTUS EXIGUA** Brooker & Hopper

Number of records: 10

Population Size
<10(1) 10-20(1) 20-50(0) 50-100(1) 100-500(0) >500(0) unspecified(7)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (10%), Not (90%), Unspecified (0%)

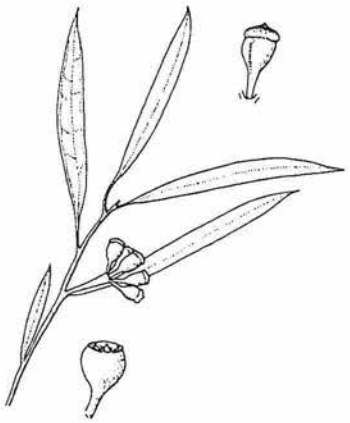
Height: 2-5 m

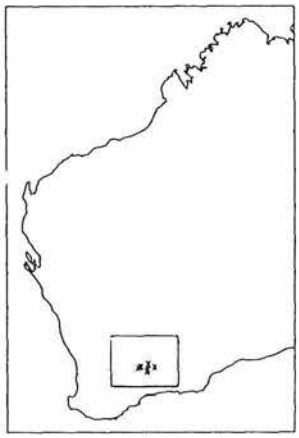
Flowering period: unknown

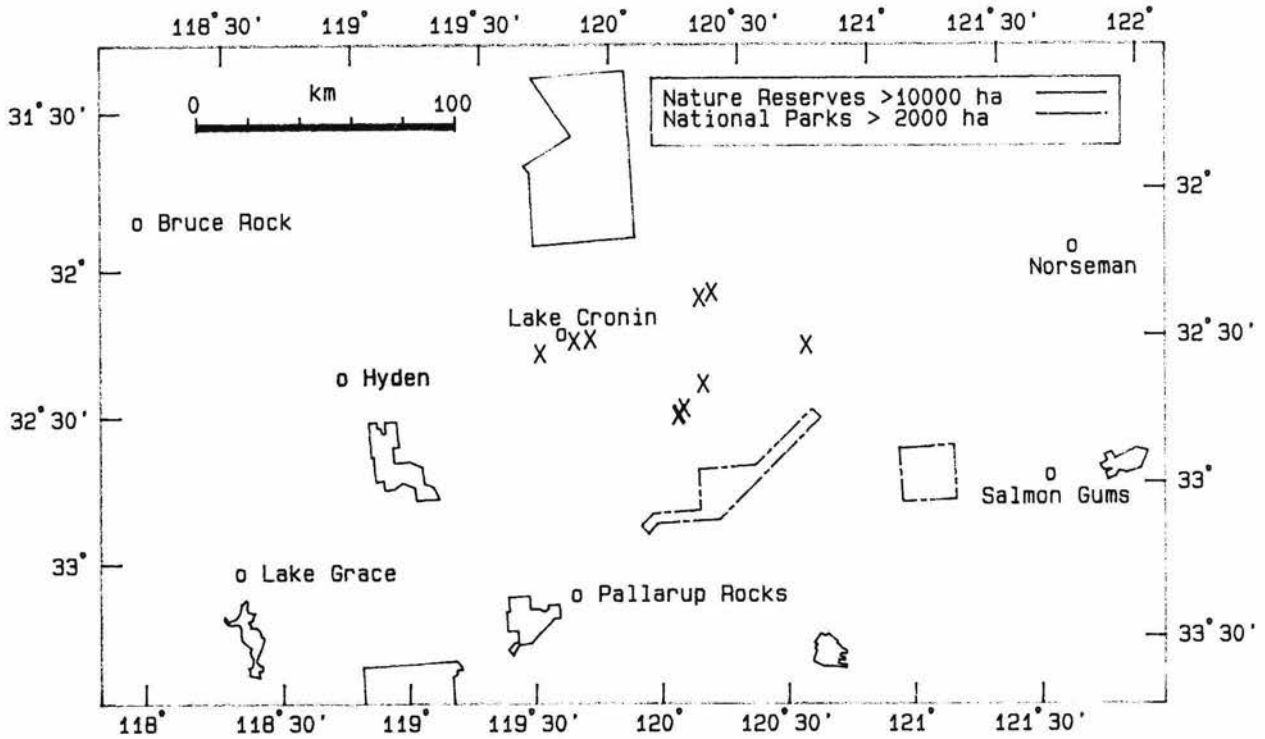
*Eucalyptus exigua* has a scattered distribution from the Lake Cronin area, south and east to Lake Hope and the Bremer Range. It grows in sandy or loamy soils on flat or gently undulating terrain, occasionally along creeklines. The surrounding vegetation is shrub-mallee over heath, often with an open woodland overstorey. *E. melanoxylon, E. sheathiana, E. salicola* and *E. gracilis* are most commonly associated. Only one population (10 per cent of total records) is from a conservation reserve while all others are from vacant Crown land. Surveys for this species have been restricted to the vicinity of tracks and gridlines and it is expected to be more widespread and abundant throughout its range. Mining interests in the Lake Cronin, Mt Day and Bremer Range areas may endanger some populations.

*E. exigua* is a slender, erect-stemmed mallee or rarely a thick-trunked tree-mallee with smooth bark and narrow, glossy leaves. It is closely allied to *E. brachycorys*, of the wheatbelt and Comet Vale areas, but differs in its lower habit, smooth bark, smaller buds and fruits and short, flattened budcaps.

Specific Reference: Brooker and Hopper (1993).







**EUCALYPTUS EXILIS** Brooker

**Boyagin Mallee**

Number of records: 14

Population Size
<10(1) 10-20(0) 20-50(2) 50-100(0) 100-500(0) >500(0) unspecified(11)

Conservation Status
Restricted to road verge (0%), Not (93%), Unspecified (7%)
In conservation reserve (50%), Not (50%), Unspecified (0%)

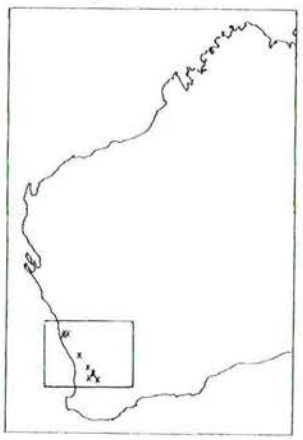
Height: 2-6 m

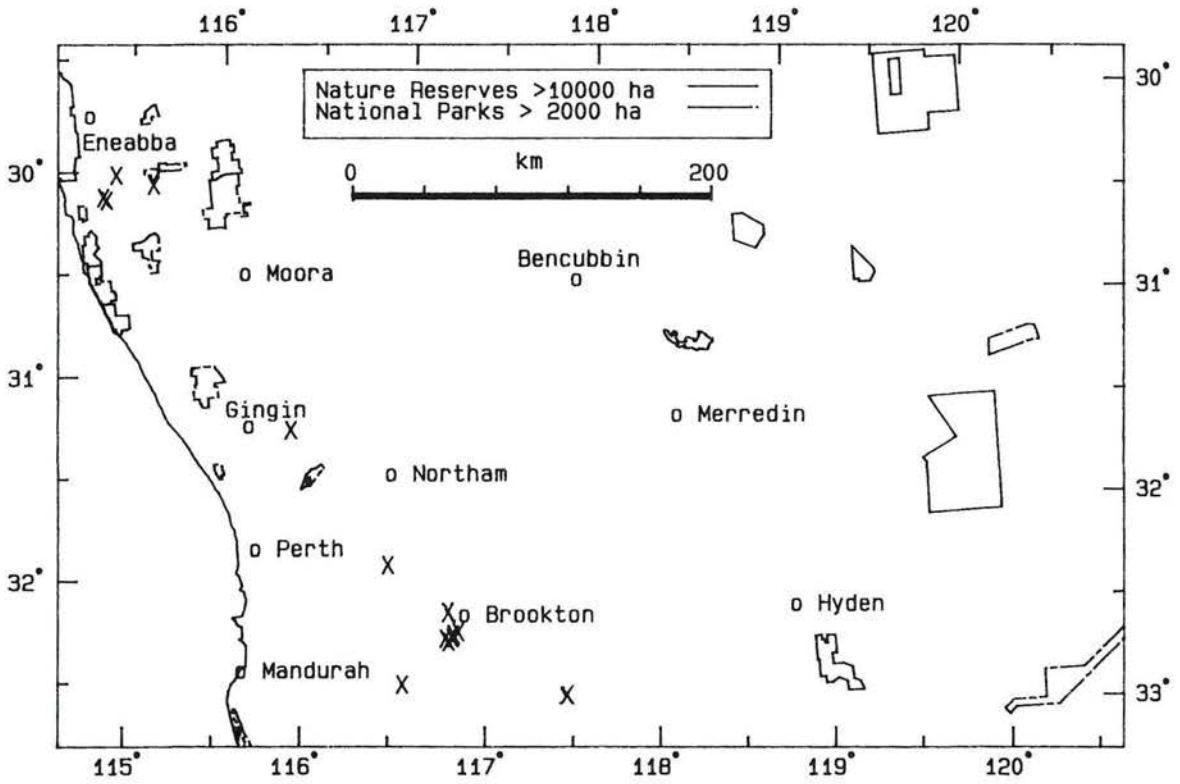
Flowering period: August - October

*Eucalyptus exilis* has a scattered distribution over a range of *ca* 380 km between Warradarge Hill and Wickepin. It grows emergent from dense heath in sandy and loamy soils on lateritic slopes and hilltops. Associated species include *E. gittinsii* and *E. todtiana* in the north, and *E. drummondii, E. marginata* and *E. accedens* in the south. It is found in large numbers in Boyagin Nature Reserve and as smaller populations in Wandering State Forest and nature reserves near Bindoon and Wickepin. A population in the north of its range is in the Lesueur National Park. Some of the populations on private land are in remnant vegetation in otherwise cleared farmland. Its range is largely developed and has been relatively well surveyed.

*E. exilis* is a slender, erect mallee with smooth stems, glaucous branchlets and a sparse canopy of slightly glossy leaves. It is related to the 'weeping' species *E. pendens* and *E. sepulcralis*, differing in its erect habit and smaller leaves, buds and fruits.

Specific References: Brooker (1974), Hall and Brooker (1974d), Rye and Hopper (1981), Elliot and Jones (1986).





**EUCALYPTUS FAMELICA** Brooker & Hopper

Number of records: 38

Population Size
<10(7) 10-20(4) 20-50(8) 50-100(5) 100-500(2) >500(3) unspecified(9)

Conservation Status
Restricted to road verge (0%), Not (84%), Unspecified (16%)
In conservation reserve (16%), Not (82%), Unspecified (2%)

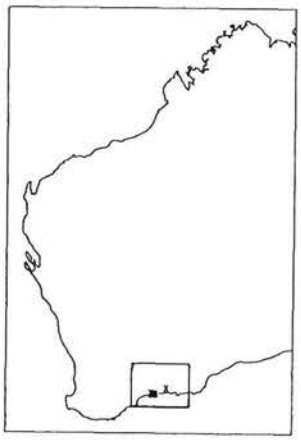
Height: 2-3 m

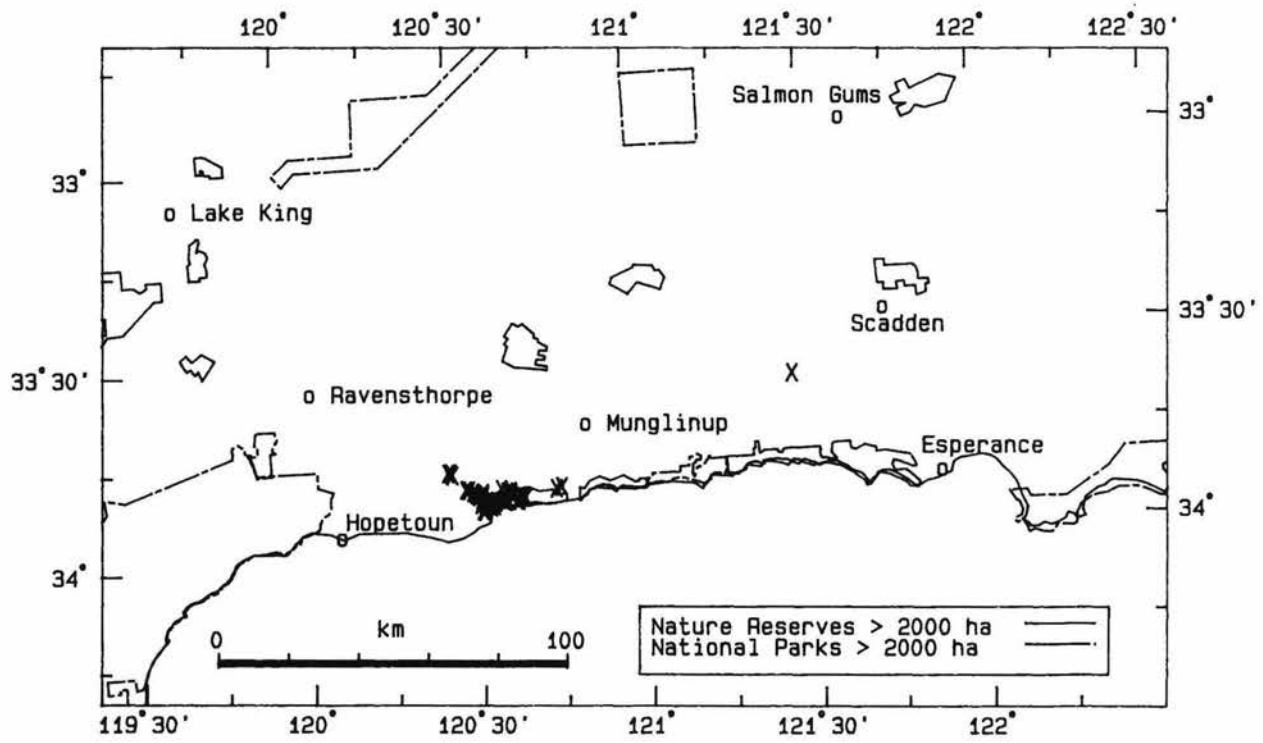
Flowering period: April - July

Prior to the survey, *Eucalyptus famelica* was known from only a few collections near Starvation Boat Harbour, Coomalbidgup and Jerdacuttup. Survey work in coastal areas east of Hopetoun has found it to be common and widespread in a nature reserve and nearby private property. It grows on low lying flats and around salt lakes in open mallee over low shrubs. In some areas it exists as scattered remnant vegetation along salty watercourses. There appears to be some variation throughout its range with differences in operculum length, fruit shape and length of the pedicel and peduncle (McQuoid, personal communication). Suspected hybrids with *E. incrassata* were recorded. Salt and water-logging trials have been initiated to assess the impact of rising water levels and increased salinity owing to clearing. This species may prove to be of value in the reclamation of salt-affected lands. Further survey is required to the east of its main distribution and near Coomalbidgup.

*E. famelica* is an erect or spreading mallee with a dense crown to ground level. The bark is smooth throughout, or in taller individuals is rough at the base. It is related to *E. litorea* and *E. rigens*, differing in its habit and bud and fruit form.

Specific Reference: Brooker and Hopper (1989).





**EUCALYPTUS FICIFOLIA** F. Muell.

**Red-flowering Gum**

Number of records: 26

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(1) >500(0) unspecified(25)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (31%), Not (69%), Unspecified (0%)

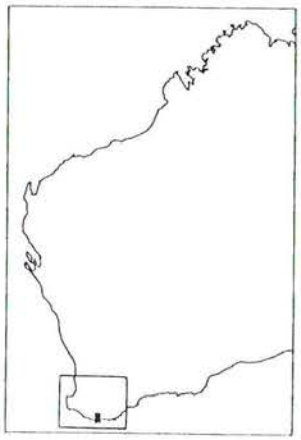
Height: 8-10 m

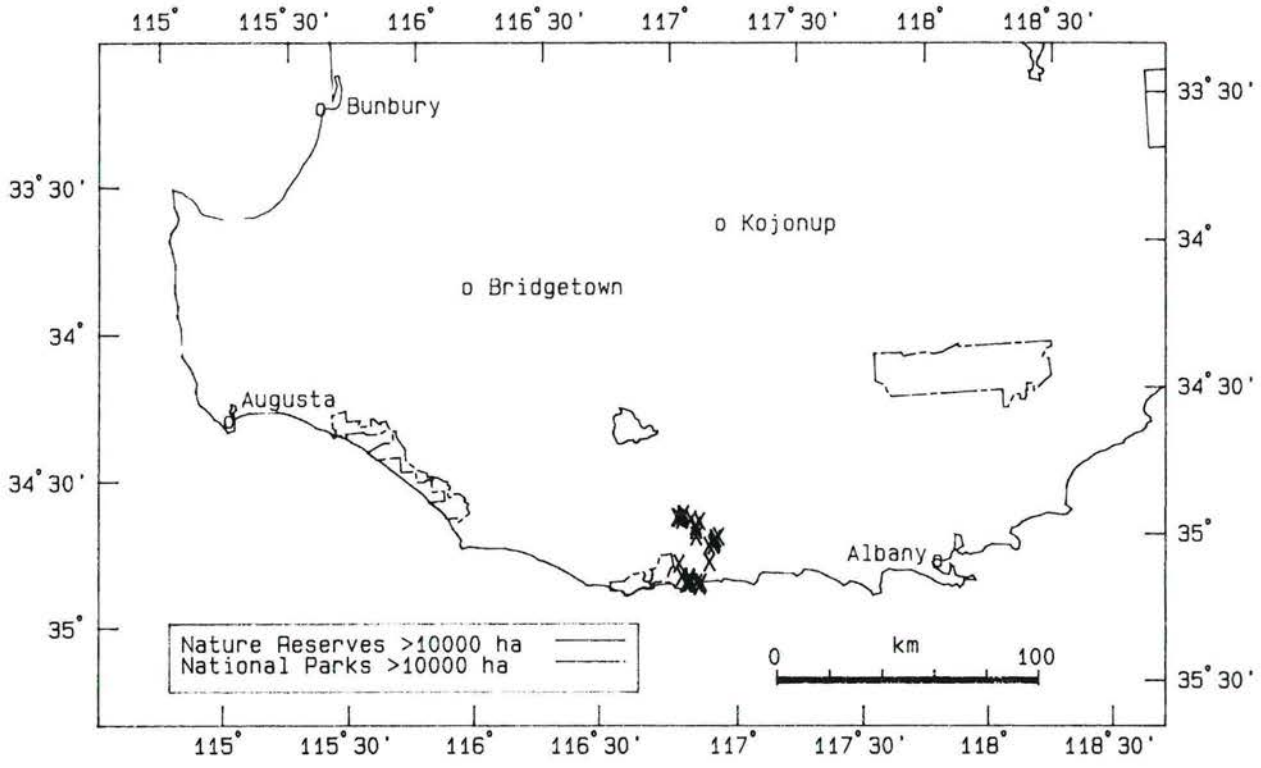
Flowering period: January - April

*Eucalyptus ficifolia* is confined to, but locally abundant in, an area east and north-east of Walpole over a range of *ca* 30 km. It favours sandy soils of poorly drained plains, depressions and gently undulating terrain. It forms forest and woodland communities with *E. marginata, E. patens* and less commonly *E. staeri* and *E. megacarpa* (Wardell-Johnson, personal communication). Other species found in association include *Banksia attenuata, B. ilicifolia, Agonis* species and *Allocasuarina fraseriana*. The majority of populations (54 per cent of total records) occur in State forest while 31 per cent are from Walpole-Nornalup National Park and flora reserves. Plants near Walpole townsite and south-east of the inlet have been introduced. *E. ficifolia* has been well surveyed and few, if any, further populations are likely to occur. It is an attractive ornamental species in wide cultivation.

*E. ficifolia* is a small, straggly tree with spectacular bright red to orange flowers in terminal inflorescences. Its bark is rough throughout and the leaves are dull to slightly glossy. The fruits are woody, barrel-shaped to slightly urn-shaped, on long pedicels.

Specific References: Mueller (1860-61), Holliday and Watton (1980), Pryor (1981), Elliot and Jones (1986).





**EUCALYPTUS FITZGERALDII** Blakely

**Paper-barked Box**

Number of records: 4

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0)
unspecified(4)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

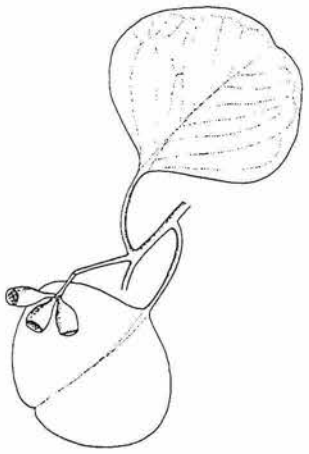
Height: 6-7 m

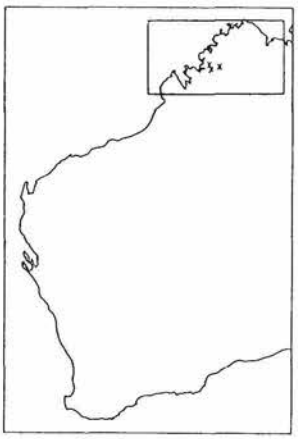
Flowering period: July

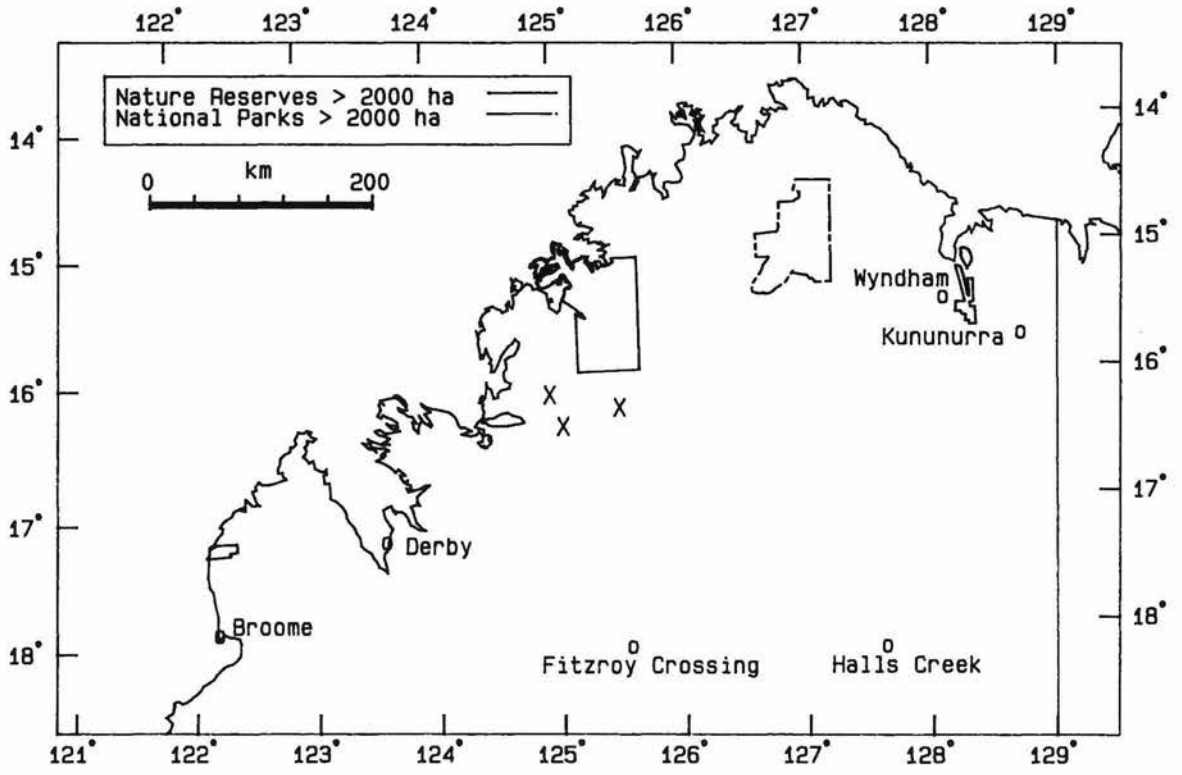
*Eucalyptus fitzgeraldii* is known from three localities in the ranges east of Walcott Inlet, and a disjunct collection to the north-east at Vansittart Bay. Near the Artesian Range, habitat was recorded as barren, rocky sandstone. The population near Lookout Hill occurs on loam with outcropping dolorite in a woodland association with *E. tectifica, Terminalia* sp. and *Themeda* sp. It has not been recorded from any conservation reserves and population sizes are unknown. *E. fitzgeraldii* has been poorly surveyed and there may be some taxonomic confusion with *E. oligantha*. Further research and survey is required. Its remote distribution affords considerable protection.

*E. fitzgeraldii* is a tree distinguished from related species by its rough, grey bark which sheds in papery flakes. It has dull, ovate or orbicular leaves on long petioles and up to seven-flowered inflorescences on terete peduncles.

Specific Reference: Blakely (1934).







**EUCALYPTUS FLAVIDA** Brooker & Hopper

**Yellow-flowered Mallee**

Number of records: 24

Population Size
<10(0) 10-20(0) 20-50(6) 50-100(4) 100-500(7) >500(2) unspecified(5)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (4%), Not (96%), Unspecified (0%)

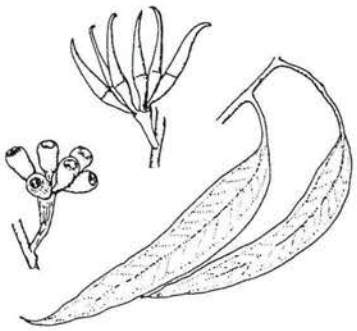
Height: 5-15 m

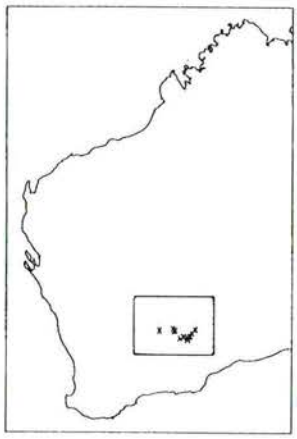
Flowering period: November - December

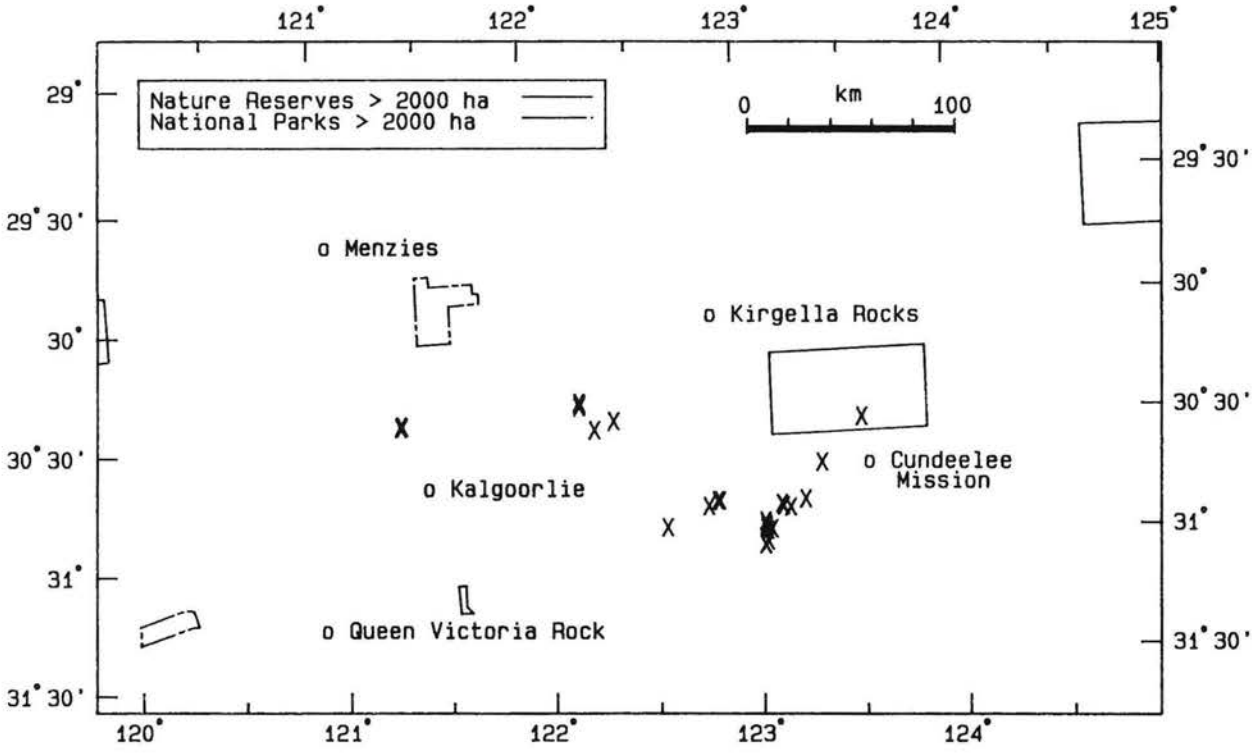
*Eucalyptus flavida* occurs north and east of Kalgoorlie from Broad Arrow to Queen Victoria Spring, a range of *ca* 220 km. It is locally abundant in open low woodlands and mallee on breakaways and gently undulating country. Soils are loamy with quartz and gravel or rocky outcrops of weathered granite. *E. salmonophloia, E. salubris, E. celastroides, E. loxophleba* ssp. *lissophloia* and species of *Eremophila* and *Acacia* are often associated. Seventeen new records have confirmed and extended known occurrences, and include new discoveries east of Arcoona and north of Chifley Siding. One collection (4 per cent of total records) is from Queen Victoria Spring Nature Reserve while 37.5 per cent of records are from two sandalwood reserves which afford considerable protection.

*E. flavida* is a tree or mallee characterized by its lanceolate, glossy green juvenile leaves. Its bark is rough and flaky at the base or smooth throughout. It has very long, horn-shaped budcaps, slightly glossy leaves and yellow flowers.

Specific Reference: Brooker and Hopper (1991).







**EUCALYPTUS FOECUNDA** Schauer

**Fremantle Mallee, Coastal dune Mallee**

Number of records: 31

Population Size
<10(4) 10-20(2) 20-50(4) 50-100(1) 100-500(6) >500(1) unspecified(13)

Conservation Status
Restricted to road verge (0%), Not (87%), Unspecified (13%)
In conservation reserve (13%), Not (87%), Unspecified (0%)

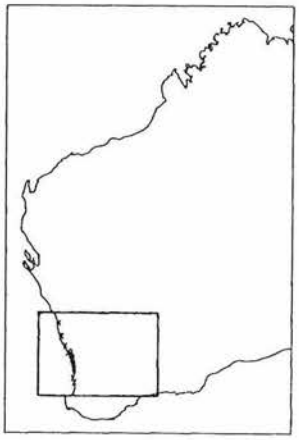
Height: 1-5 m

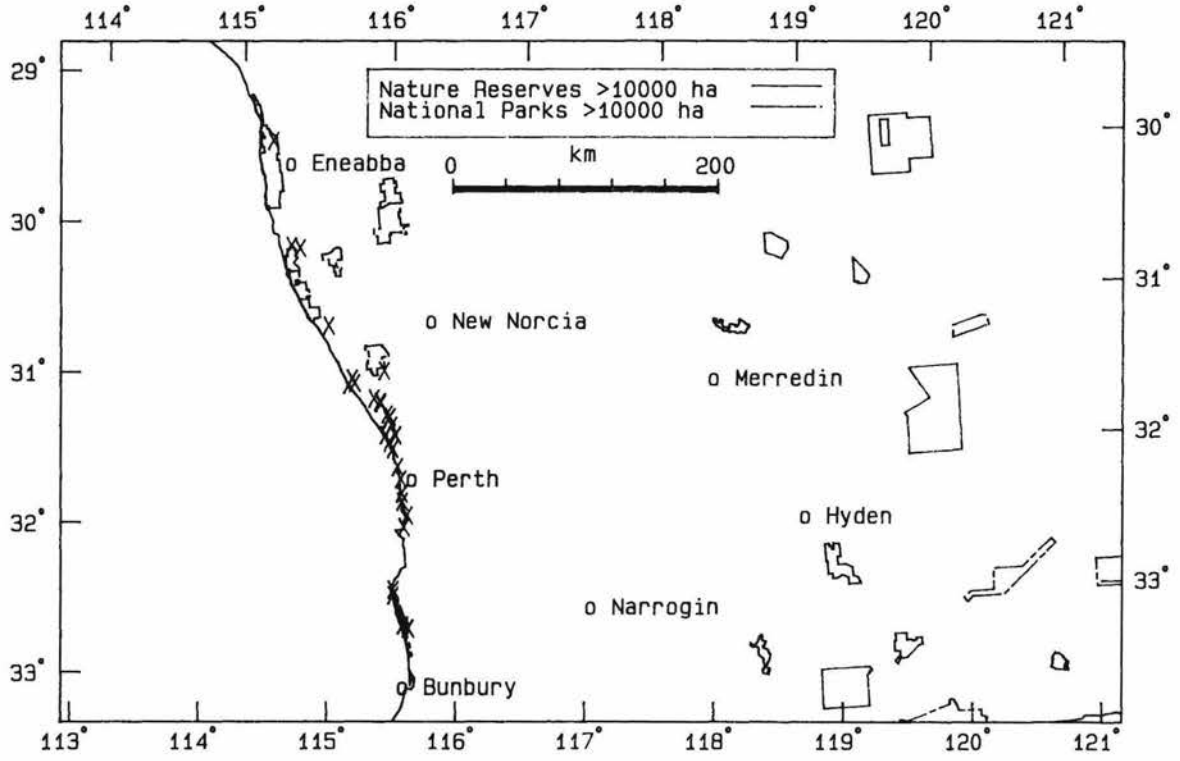
Flowering period: January - May

A mallee restricted to coastal areas from north-west of Eneabba to south of Mandurah, growing on sandy slopes and ridges often with outcropping limestone. It is emergent above heath of *Dryandra sessilis,* and *Melaleuca* and *Acacia* species, often in association with *Eucalyptus decipiens, E. petrensis* and *E. gomphocephala.* It occurs in usually small stands of <50 plants and is reserved only in Yalgorup National Park south of Perth. Recent surveys resulted in 19 new records and a northern range extension of over 180 km. The identity of a collection from south-west of New Norcia (not shown on map) is uncertain as it appears most closely related to *E. foecunda* but occurs in sandy gravel habitat. Continued developments along the coast threaten a number of populations, particularly those directly north of the Perth metropolitan area. Further survey of inaccessible areas in the north of its range is required.

*E. foecunda* is a profusely-flowering mallee with thin, rough, bark, and narrow, glossy leaves. It has spindle-shaped buds and barrel-shaped fruits in inflorescences usually clustered towards the ends of the branchlets. Its rough bark, coastal distribution and green, lanceolate juvenile leaves distinguish it from closely related species.

Specific References: Lehmann (1844), Brooker (1979, 1988).





**EUCALYPTUS FOECUNDA** Schauer ssp. **"CLIFF HEAD"**

Number of records: 4

Population Size
<10(0) 10-20(2) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(2)

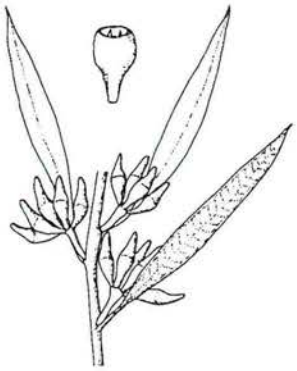
Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

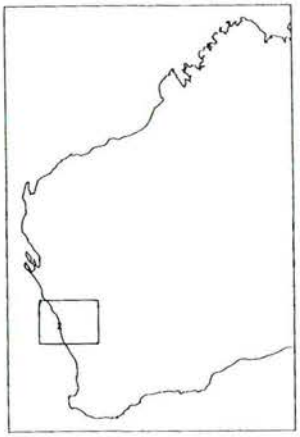
Height: 1-4 m

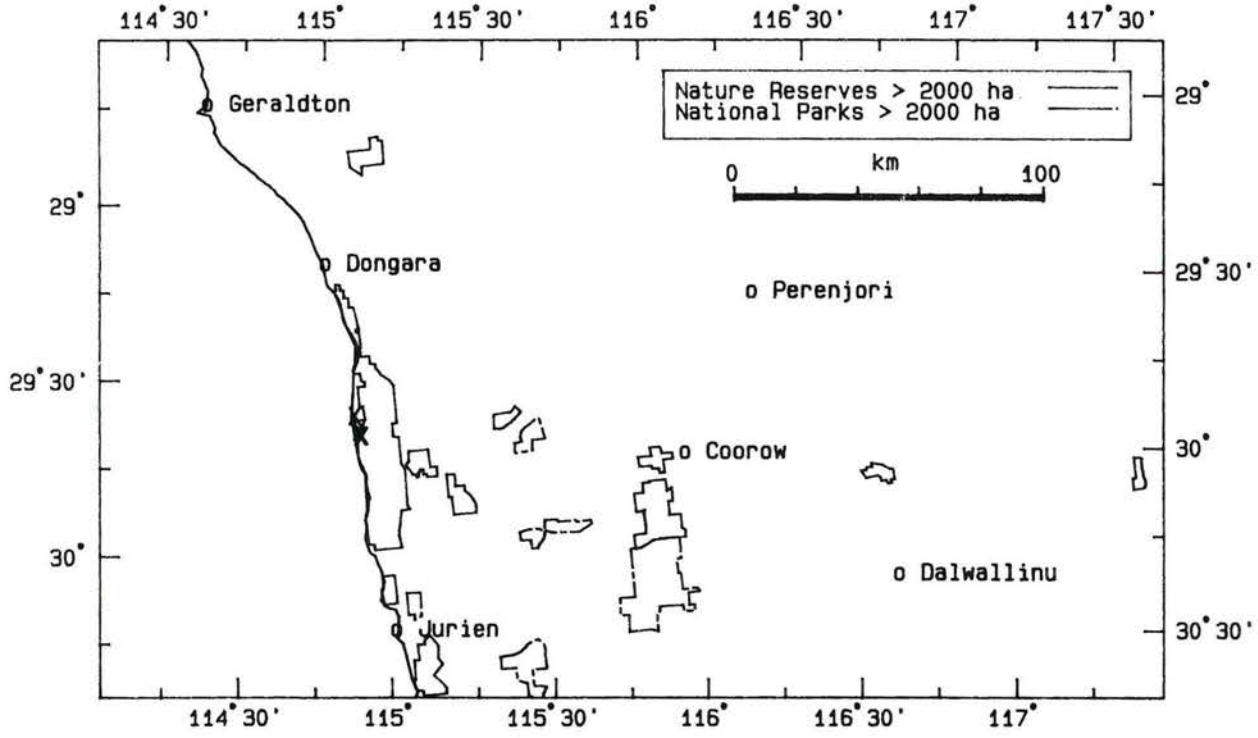
Flowering period: unknown

*Eucalyptus foecunda* ssp. "Cliff Head" is known from four populations over a 7 km range on the coastal dunes north of Coolimba. It occurs as scattered plants on white sand and outcropping limestone with *E. zopherophloia, E. foecunda* and *E.* aff. *socialis*. Surrounding vegetation is low heath of *Acacia* and *Melaleuca* species. Although no populations are recorded from conservation reserves, three are within an area reserved for the purpose of flora protection and apiculture. *E. foecunda* ssp. "Cliff Head" is a localized variant of *E. foecunda*, occurring at the northern extent of its range. It is not expected to be more widely distributed and should be protected as a form with interesting physical, and possibly genetic, characters. Too-frequent burning and road maintenance operations are the main concerns.

*E. foecunda* ssp. "Cliff Head" is very similar to *E. foecunda*, differing in its distinctly beaked opercula and smooth grey bark shedding in ribbons to reveal yellow-brown bark beneath. *E. foecunda* has thin, rough bark and conical to slightly beaked opercula.







**EUCALYPTUS FORMANII** Gardner

Number of records: 29

Population Size
<10(0) 10-20(2) 20-50(10) 50-100(11) 100-500(1) >500(0) unspecified(5)

Conservation Status
Restricted to road verge (0%), Not (90%), Unspecified (10%)
In conservation reserve (28%), Not (72%), Unspecified (0%)

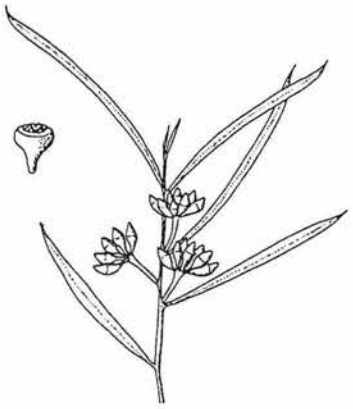
Height: 3-11 m

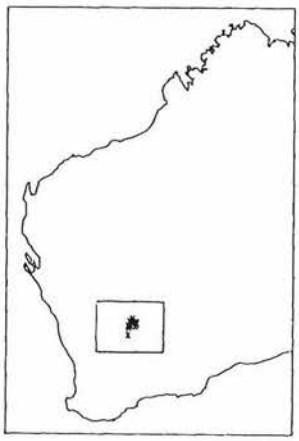
Flowering period: December - April, September

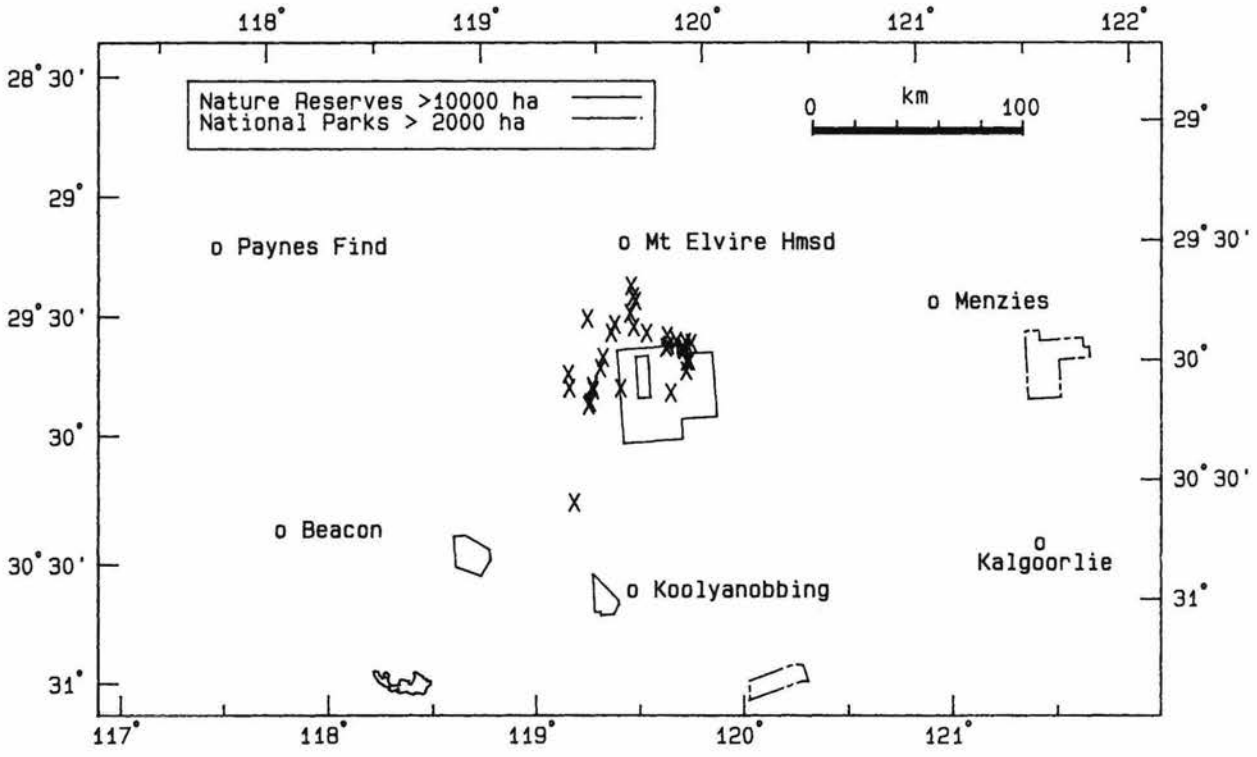
*Eucalyptus formanii* occurs in the vicinity of the Mt Manning and Die Hardy Ranges and north to near Mt Elvire homestead, with an isolated record south of Boondine Hill. Its habitat is flat and gently undulating plains of sandy and loamy soils, occasionally with laterite. It forms mallee or open woodland communities with *E. oleosa*, *E. leptopoda* and *E. clelandii*. Commonly associated scrub and heath species are *Callitris columellaris*, *Casuarina cristata*, *Acacia* spp. and *Triodia* sp. Prior to the survey, *E. formanii* was known from only six collections over a 60 km range. Survey in the area has found it to be locally abundant and extended its range to *ca* 110 km. Of the total records, 28 per cent are from the Mt Manning Nature Reserve, with others occurring on pastoral stations and vacant Crown land.

*E. formanii* is a tree, or rarely a mallee, characterized by its linear, whitish grey, very crowded juvenile leaves and narrow, linear adult leaves. It has rough and persistent bark on the lower trunk and is closely related to *E. perangusta* of the Ravensthorpe district which has smooth bark and green juvenile leaves.

Specific References: Gardner (1942), Brooker (1979), Holliday and Watton (1980), Elliot and Jones (1986).

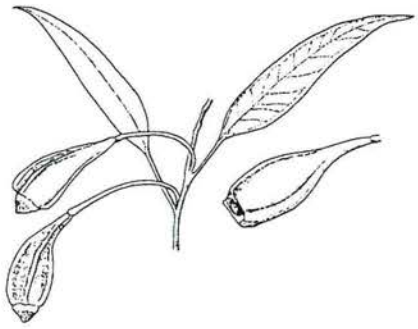






**EUCALYPTUS FORRESTIANA** Diels

**Fuchsia Mallee**



Number of records: 73

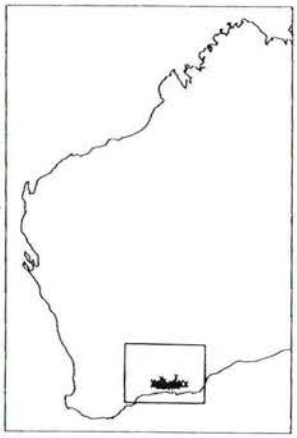
Population Size
<10(5) 10-20(1) 20-50(4) 50-100(3) 100-500(3) >500(0) unspecified(57)

Conservation Status
Restricted to road verge (23%), Not (55%), Unspecified (22%)
In conservation reserve (27%), Not (68%), Unspecified (5%)

Height: 1.5-6 m

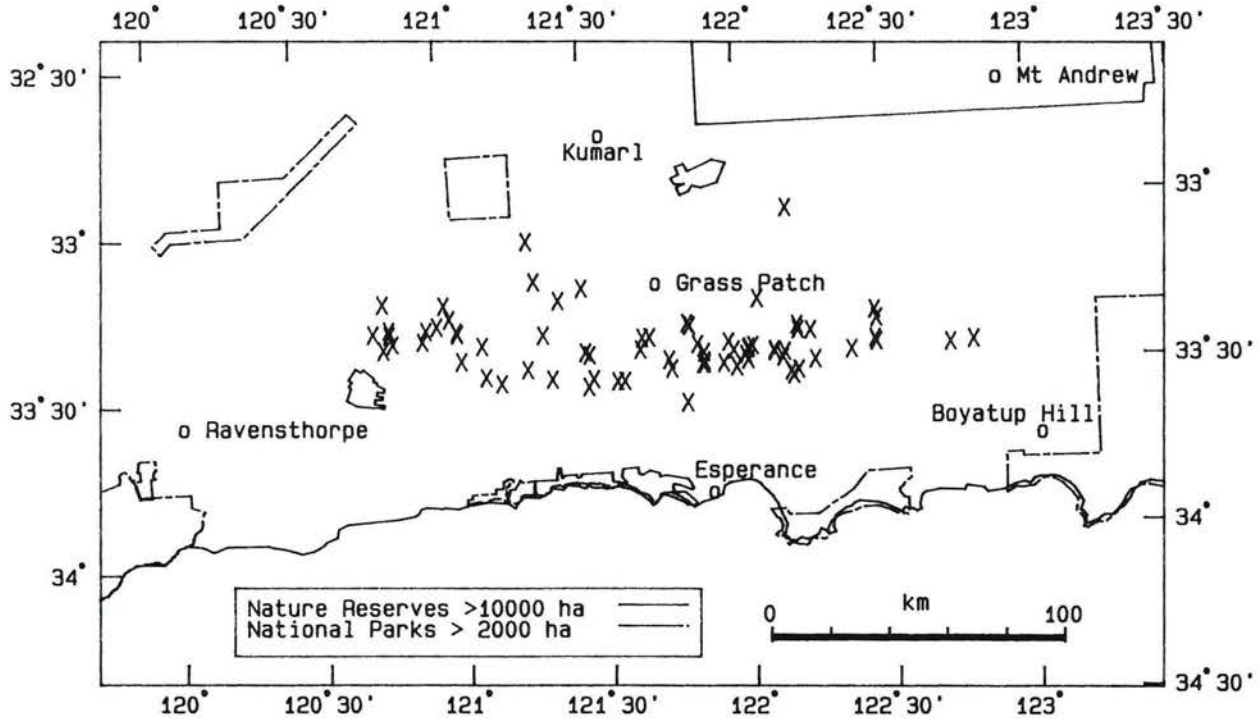
Flowering period: January - June

*Eucalyptus forrestiana* is a conspicuous species with a restricted range from north-east of Ravensthorpe to east of Mt Beaumont. It is abundant within this area, particularly in the Cascades-Scadden region. It most commonly occurs in mallee or low forest communities on sandy or sandy clay soils. Landform is flat or gently sloping, sometimes along drainage lines and creek banks. Most commonly associated species include *E. eremophila, E. kessellii, E. leptocalyx* and *E. uncinata*. Its range is largely within agricultural land. However, it is well represented in conservation areas with 27 per cent of the total records in eleven nature reserves. Intermediates with *E. stoatei* have been recorded in the west of its range.



*E. forrestiana* is a mallet or mallee with thick, glossy leaves and smooth bark shedding in ribbons. Its distinctive red buds and fruits are quadrangular or four-winged and borne singly, or rarely in threes, on long, down-curved peduncles.

Specific References: Diels and Pritzel (1904), Beard (1973b), Robinson (1984), Elliot and Jones (1986).



**EUCALYPTUS FRASERI** (Brooker) Brooker ssp.
**"BLACKBUTT"**

Number of records: 1

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0)
unspecified(1)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

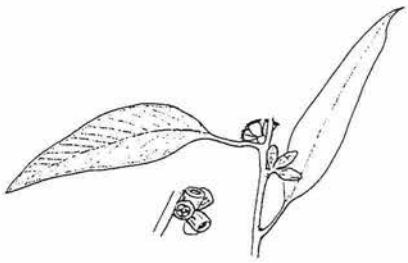
Height: 12 m

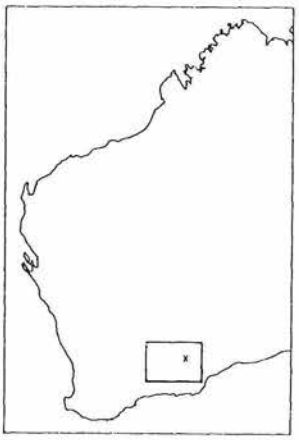
Flowering period: January - March

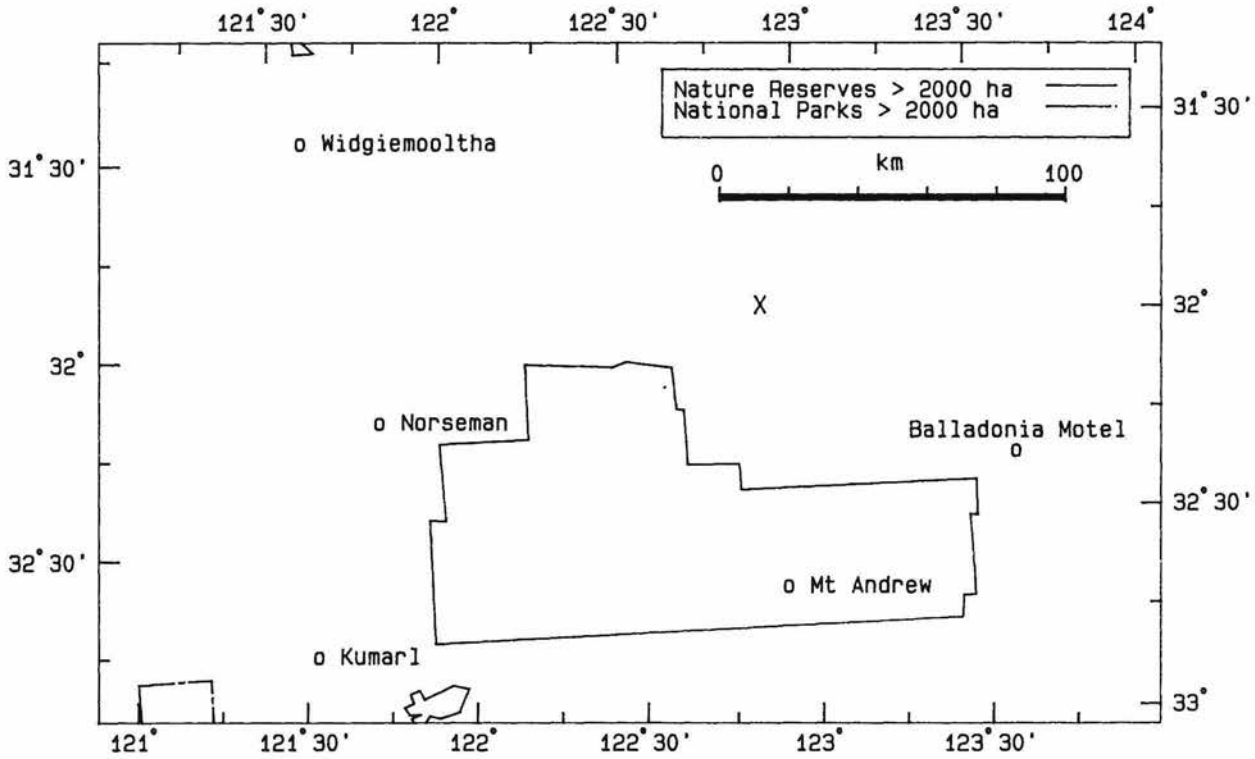
A taxon of very restricted occurrence in the Fraser Range between Norseman and Balladonia. It is a subspecies of the more widespread *Eucalyptus fraseri* which occurs from the Fraser Range to east of Balladonia and south toward Mt Ragged. Habitat and population size is unrecorded. Further survey of the area is required before conservation status can be accurately assessed.

*E. fraseri* ssp. "blackbutt" is a glossy-leaved tree with rough, grey-black basal bark. It has ovoid buds and cup-shaped fruits that are usually ribbed. The stocking of rough bark distinguishes it from ssp. *fraseri* which has smooth bark throughout.

Specific Reference: Brooker (1976b).







**EUCALYPTUS GEORGEI** Brooker & Blaxell ssp. **FULGIDA** Brooker & Hopper

Number of records: 5

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(1) 100-500(2) >500(0) unspecified(2)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

Height: 8-10 m

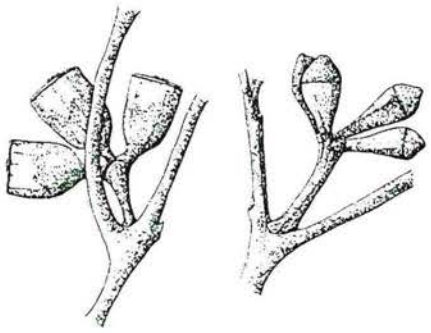
Flowering period: unknown

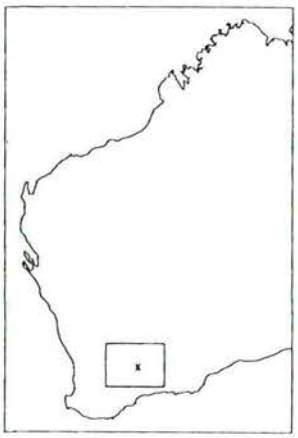
*Eucalyptus georgei* ssp. *fulgida* is confined to a few populations east of Lake Cronin. It is found in clay-loam and sandy loam depressions in undulating terrain, usually as pure woodlands flanked by mallee of *E. transcontinentalis, E. yilgarnensis, E. flocktoniae* or *E. 'olivina'*. It was first collected in 1989 and further survey may find it to be more abundant in nearby areas. Protection of the populations from accidental destruction is essential.

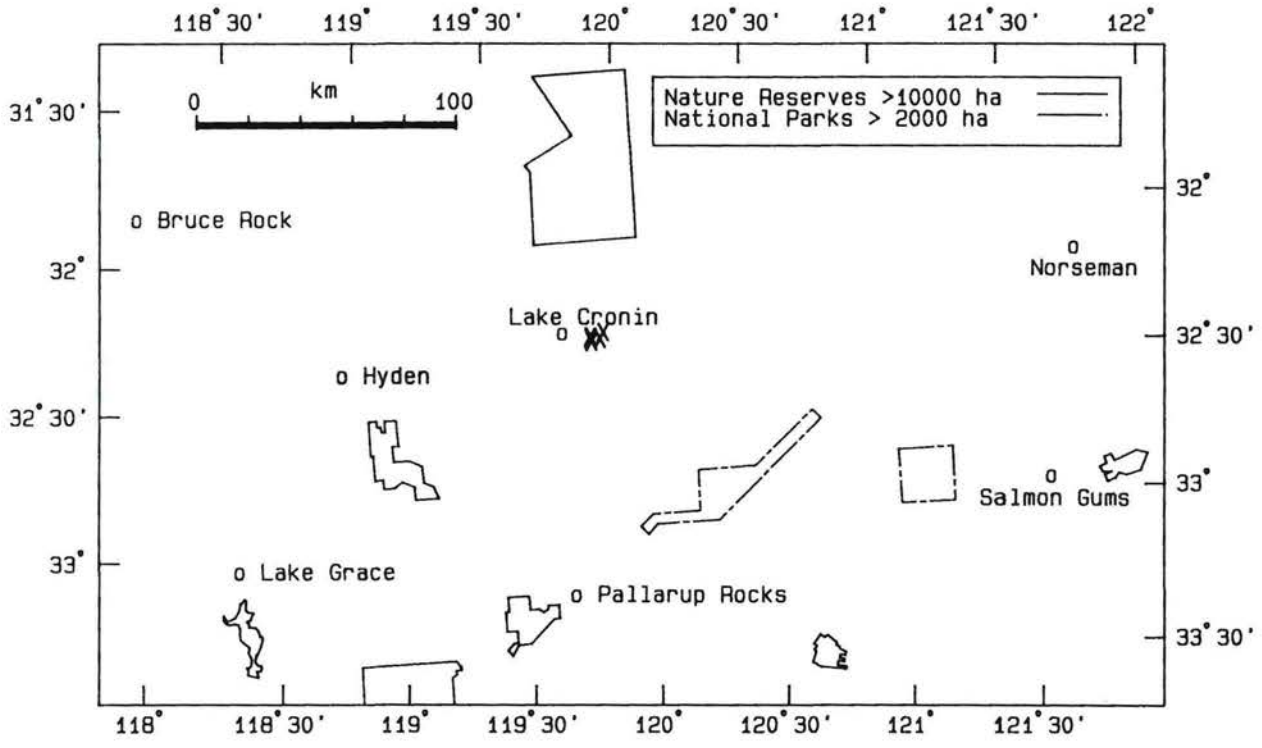
*E. georgei* ssp. *fulgida* is a straight-trunked tree with a terminal crown of glossy leaves and smooth bark hanging in long, trailing ribbons. Its shiny green leaves, flattened peduncle and absence of a distinct pedicel on the buds and fruits distinguish it from ssp. *georgei*.

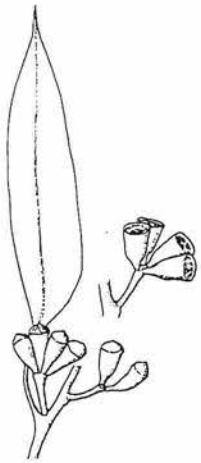
Specific Reference: Brooker and Hopper (1993).

Illustration by E. Cooper (in Brooker and Hopper 1993).









**EUCALYPTUS GEORGEI** Brooker & Blaxell ssp. **GEORGEI**

Number of records: 11

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(3) 100-500(3) >500(2) unspecified(3)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

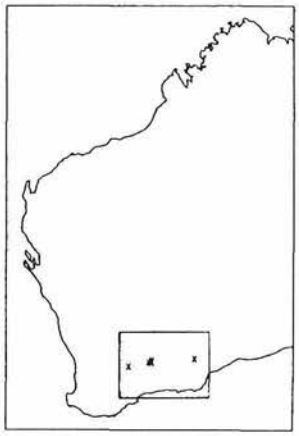
Height: 3-5 m

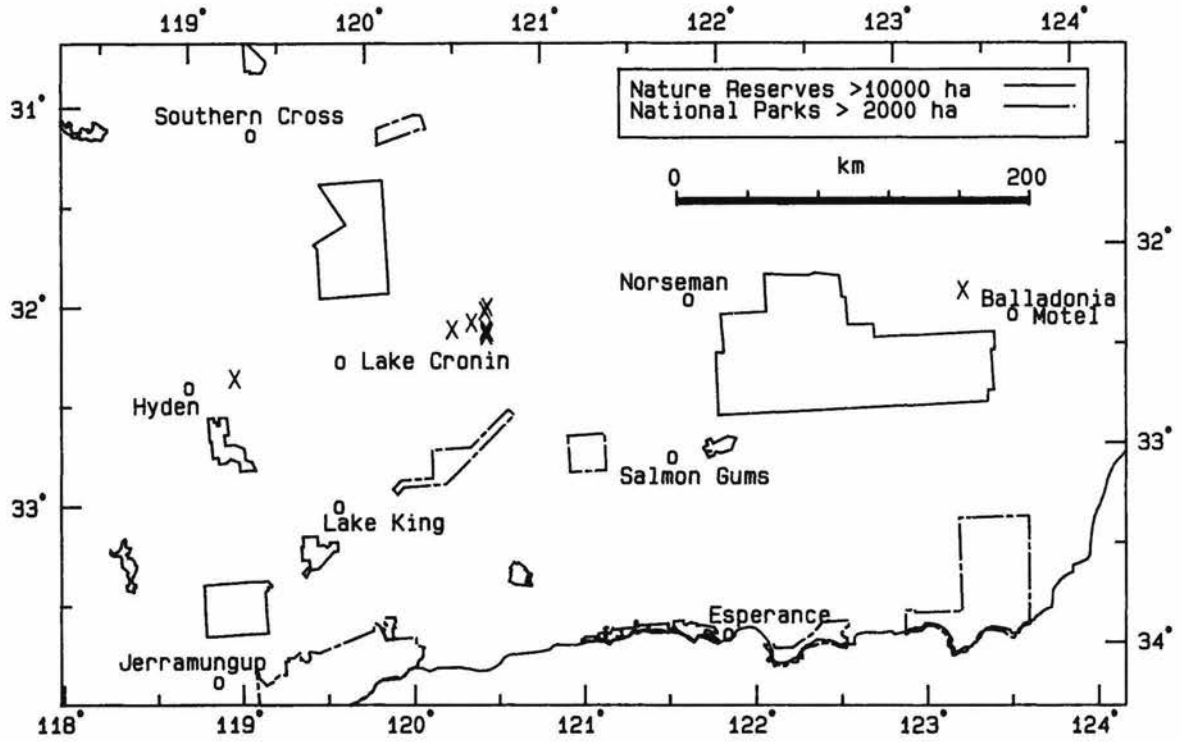
Flowering period: January - March

*Eucalyptus georgei* ssp. *georgei* is known from a number of populations in the Lake Johnston area, and from disjunct collections east of Hyden and north-west of Balladonia. It is locally abundant in its main area of occurrence, growing on flats and greenstone and lateritic rises. Soils are usually loamy. *E. loxophleba, E. flocktoniae* and *E. salubris* are common associates in the open low woodland communities. Near Hyden it was collected from mallee heath on a low, sandy gravel rise. Several new collections from south of the Hyden-Norseman track indicate that it may be more common in this area. Mining interests may endanger some populations.

*E. georgei* ssp. *georgei* is an attractive tree, or more rarely a mallee, with smooth bark deciduous in long ribbons. The canopy is dull, yellow-green to grey-green and the inflorescences and branchlets intensely glaucous. It is related to *E. woodwardii* differing in its creamy white flowers, hemispherical bud caps and smaller buds and fruits.

Specific References: Brooker and Blaxell (1978), Elliot and Jones (1986).





**EUCALYPTUS GONIANTHA** Turcz. ssp. **GONIANTHA**

Number of records: 7

Population Size
<10(1) 10-20(0) 20-50(3) 50-100(1) 100-500(0) >500(0) unspecified(2)

Conservation Status
Restricted to road verge (14%), Not (72%), Unspecified (14%)
In conservation reserve (14%), Not (86%), Unspecified (0%)

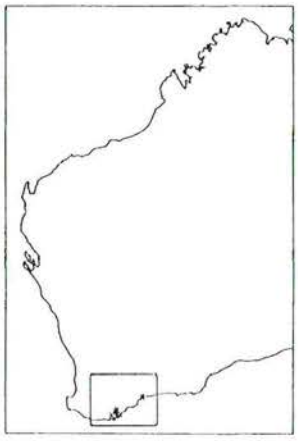
Height: 3-6 m

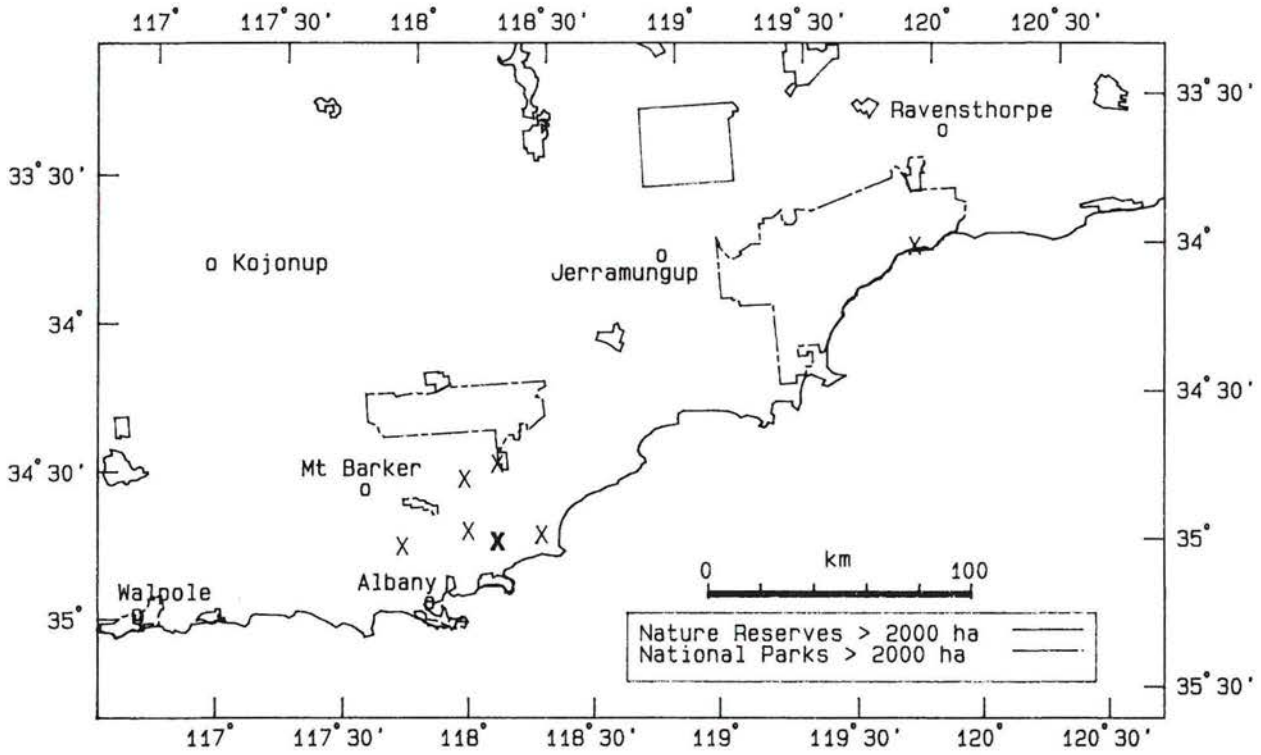
Flowering period: November - February

Prior to the survey *Eucalyptus goniantha* ssp. *goniantha* was known from only three populations in the Manypeaks area north-east of Albany. New records have extended its distribution to south of the Stirling Range, west towards Narrikup and east to Quoin Head. It grows in mallee associations, often as an understorey in *E. calophylla* - *E. marginata* woodland, on slopes of gravelly sands and loams. The easternmost collection is from a sandy slope in open heath. The populations are small, with all but one from private property and road verge. Close liaison with the landowners and collection of seed for propagation is required. More adequate reservation of this species would be desirable. The new discoveries indicate that it may be more frequent than previously thought. It is gazetted as Declared Rare Flora [Appendix 2].

*E. goniantha* ssp. *goniantha* is a mallee or occasionally a small tree with smooth, mottled bark and glossy, grey-green leaves. It has slightly ribbed or angular buds and fruits in usually erect inflorescences. The operculum is conical to beaked. Both ssp. *goniantha* and ssp. *notactites* have previously been confused with the more common *E. kessellii* (Appendix 1) which has larger leaves and coarser buds and fruits.

Specific References: Turczaninow (1847), Brooker (1976a), Elliot and Jones (1986), Hill and Johnson (1992).





**EUCALYPTUS GONIANTHA** Turcz. ssp. **NOTACTITES**
L.Johnson & K.Hill

Number of records: 32

Population Size
<10(2) 10-20(1) 20-50(2) 50-100(5) 100-500(1) >500(1) unspecified(20)

Conservation Status
Restricted to road verge (0%), Not (84%), Unspecified (16%)
In conservation reserve (22%), Not (75%), Unspecified (3%)

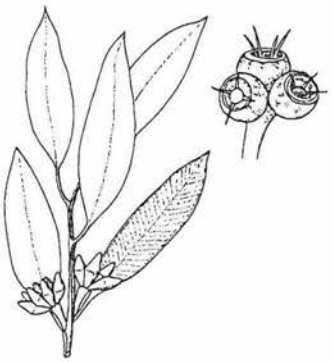
Height: 1-4 m

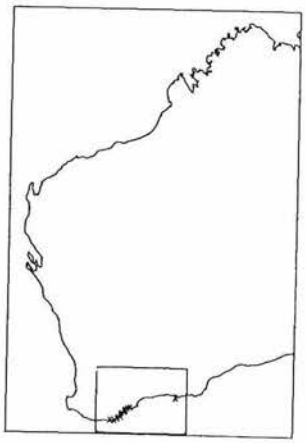
Flowering period: February - April

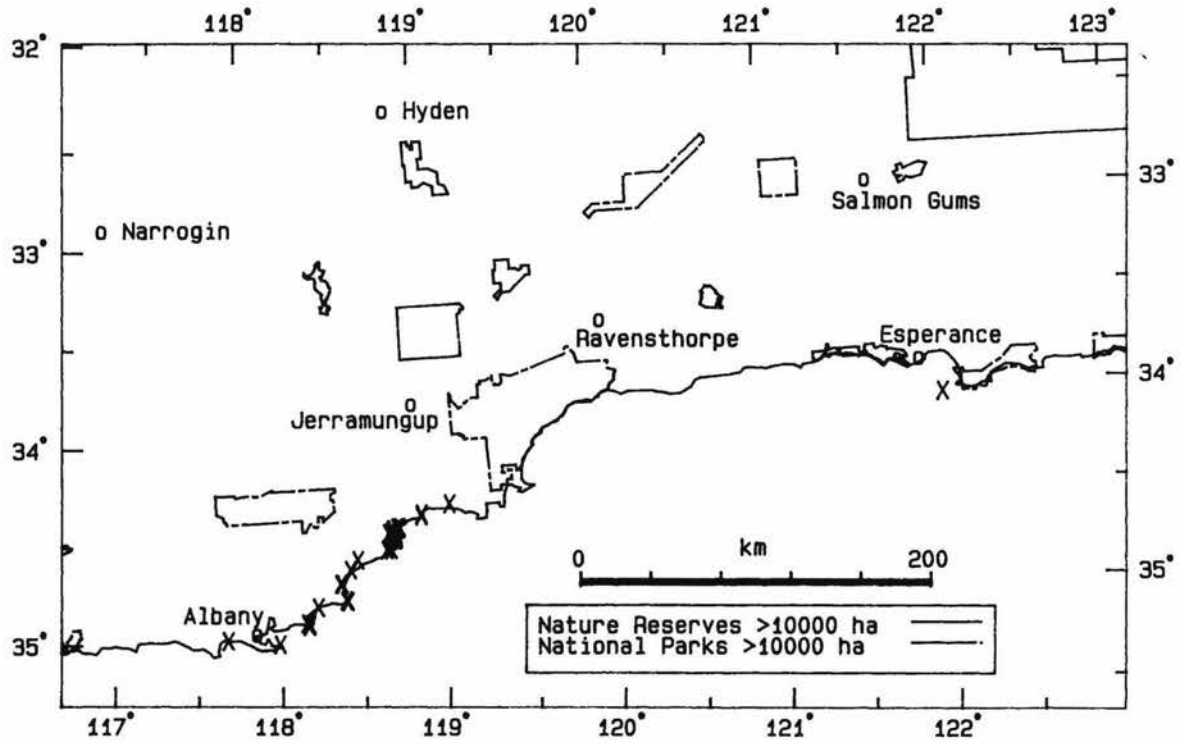
A coastal mallee occurring from Torbay Inlet to east of Mt Groper, with a disjunct record from Sandy Hook Island south-east of Esperance. It is confined to coastal habitats, growing on the slopes of dunes and ridges in sandy soils usually over limestone. Clay and gravel substrates have also been recorded. Surrounding vegetation is mallee-heath with associated species including *Eucalyptus lehmannii, E. preissiana, E. angulosa, Agonis flexuosa, Dryandra sessilis* and *Banksia praemorsa*. Of the total records, 22 per cent are from five conservation reserves including Torndirrup National Park and Two Peoples Bay, Mt Manypeaks and Recherche Archipelago Nature Reserves. It is abundant in recreation reserves, unvested Crown land, private property and government reserves in the Cape Riche, Mt Groper and Hassell Beach areas. It is likely to be more common in inaccessible areas along the coast. Its occurrence in conservation reserves and lands generally unsuitable for development afford it considerable protection.

*E. goniantha* ssp. *notactites* is a stout mallee recorded to heights of up to 4 m but more commonly growing to 2-3 m. It differs from ssp. *goniantha* and *E. semiglobosa* in its angular branchlets, larger leaves and sessile or shortly pedicellate buds and fruits. The ovoid buds have a conical to beaked budcap that is narrower than the hypanthium.

Specific Reference: Hill and Johnson (1992).







**EUCALYPTUS 'GRANITICOLA'** Hopper ined.

**Scarp Road Mallee**

Number of records: 1

Population Size
<10(1) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(0)

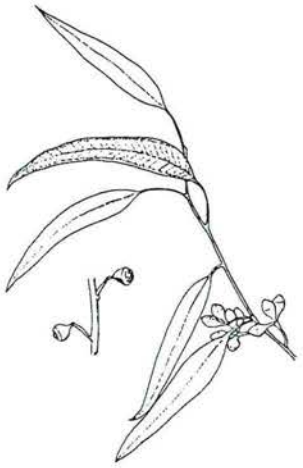
Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

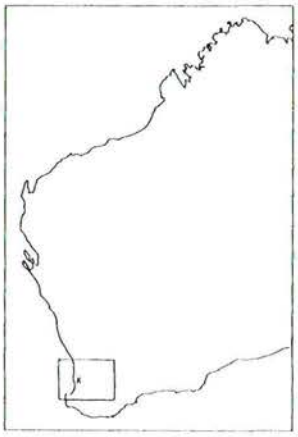
Height: 4 m

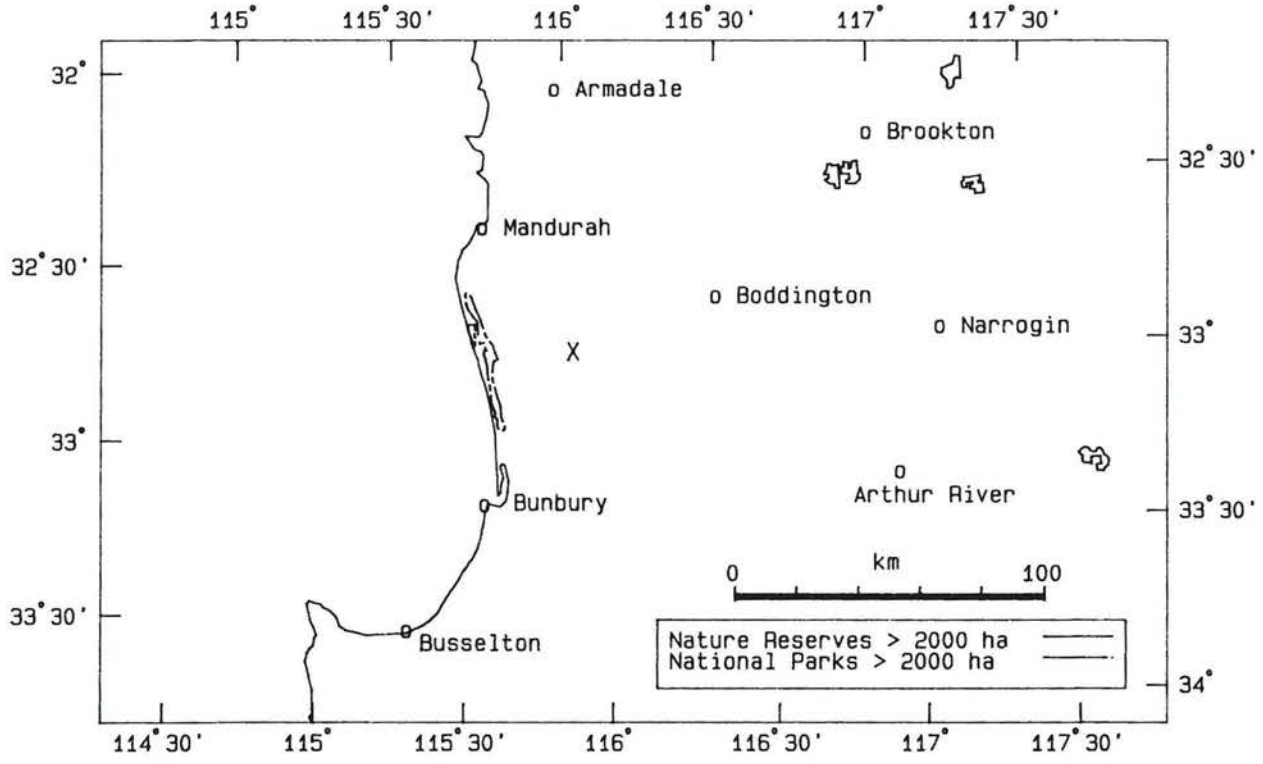
Flowering period: September - October

A mallee known from one locality in State forest south-east of Waroona where it grows in granitic loam at the foot of a steep sheet-granite slope. It is emergent from dense heath of *Calothamnus quadrifidus, Dodonaea ceratocarpa, Hemigenia sericea* and *Verticordia plumosa*. The population consists of a solitary mallee of about twenty stems. The site is within a bauxite mine lease and is downslope from a rehabilitated mine pit. The area is not under direct threat from mining operations but recent evidence indicates that it may be contaminated by dieback disease. Surveys of granite outcrops in the vicinity have failed to locate any further populations. Research on its taxonomic affinities and dieback susceptibility is required. The long term survival of *Eucalyptus 'graniticola'* is endangered and it should be established in cultivation. It is gazetted as Declared Rare Flora [Appendix 2].

*E. 'graniticola'* is an erect-stemmed mallee with smooth powdery bark and dull leaves. It is allied to *E. lanepoolei* which differs in its taller tree habit, slightly glossy, bright green leaves, globular buds and larger fruits.







**EUCALYPTUS GRIFFITHSII** Maiden ssp. **"SMALL FRUITED"**

Number of records: 3

Population Size
<10(0) 10-20(1) 20-50(2) 50-100(0) 100-500(0) >500(0) unspecified(0)

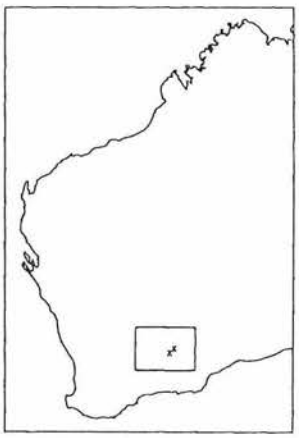
Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

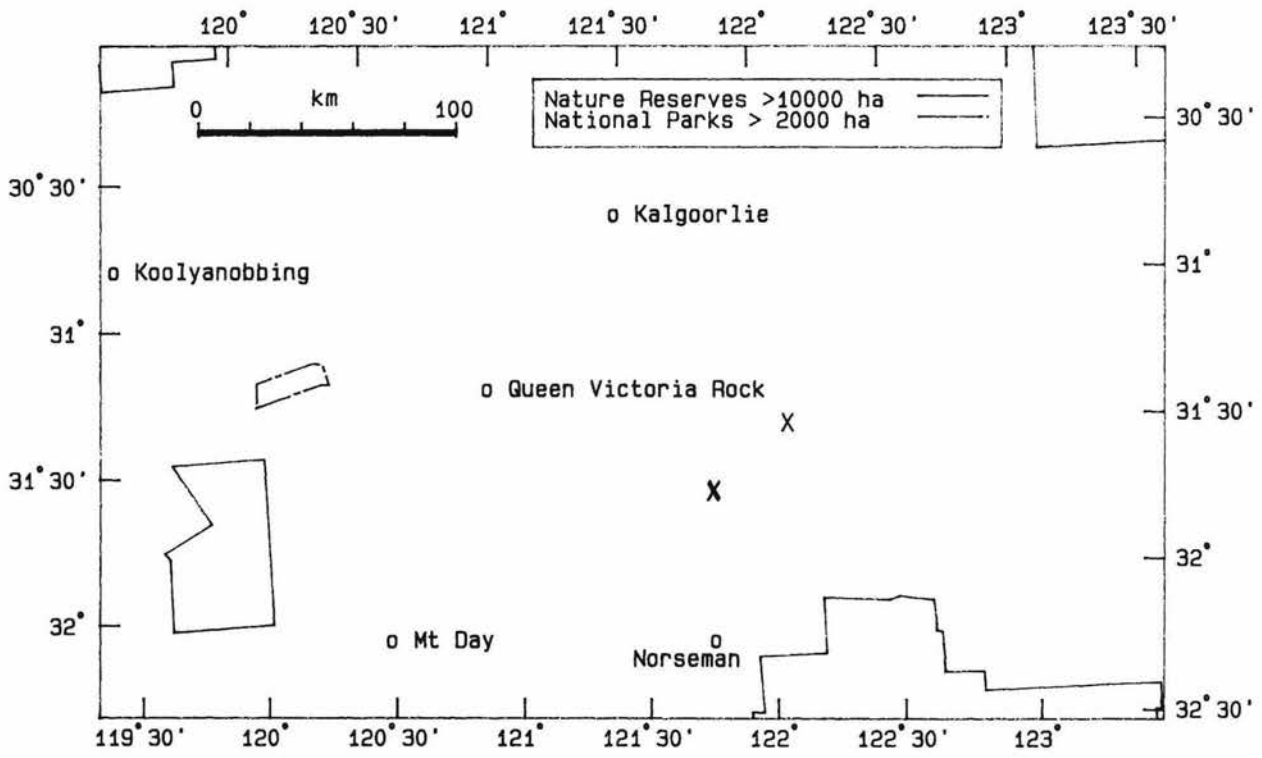
Height: 3-6 m

Flowering period: unknown

*Eucalyptus griffithsii* ssp. "small fruited" is known from only three populations east and south-east of Widgiemooltha. It grows in woodlands or emergent from scrub on loamy flats or gently sloping terrain. *E. oleosa, E. loxophleba, Acacia acuminata, Eremophila* sp. and *Cassia* sp. are associated. None of the populations are from conservation reserves. Survey for this taxon has been opportunistic and further, more intensive, searching is required before its conservation status can be assessed.

A possible subspecies of *E. griffithsii* with smaller buds and fruits measuring <1 cm in diameter. It is usually a mallee with smooth stems throughout or with some loose, grey bark at the base. It is closely related to *E. concinna* which has buds and fruits in seven- rather than three-flowered inflorescences.





**EUCALYPTUS GUILFOYLEI** Maiden

**Yellow Tingle**

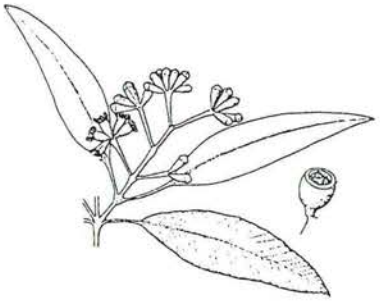
Number of records: 46

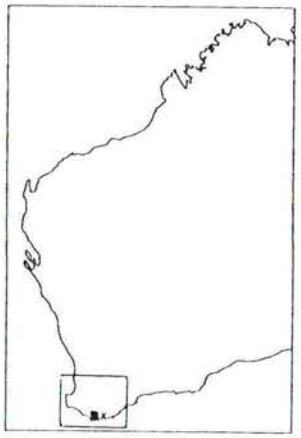
Population Size
<10(0) 10-20(0) 20-50(0) 50-100(1) 100-500(0) >500(1) unspecified(44)

Conservation Status
Restricted to road verge (0%), Not (98%), Unspecified (2%)
In conservation reserve (30%), Not (70%), Unspecified (0%)

Height: 5-40 m

Flowering period: November - January

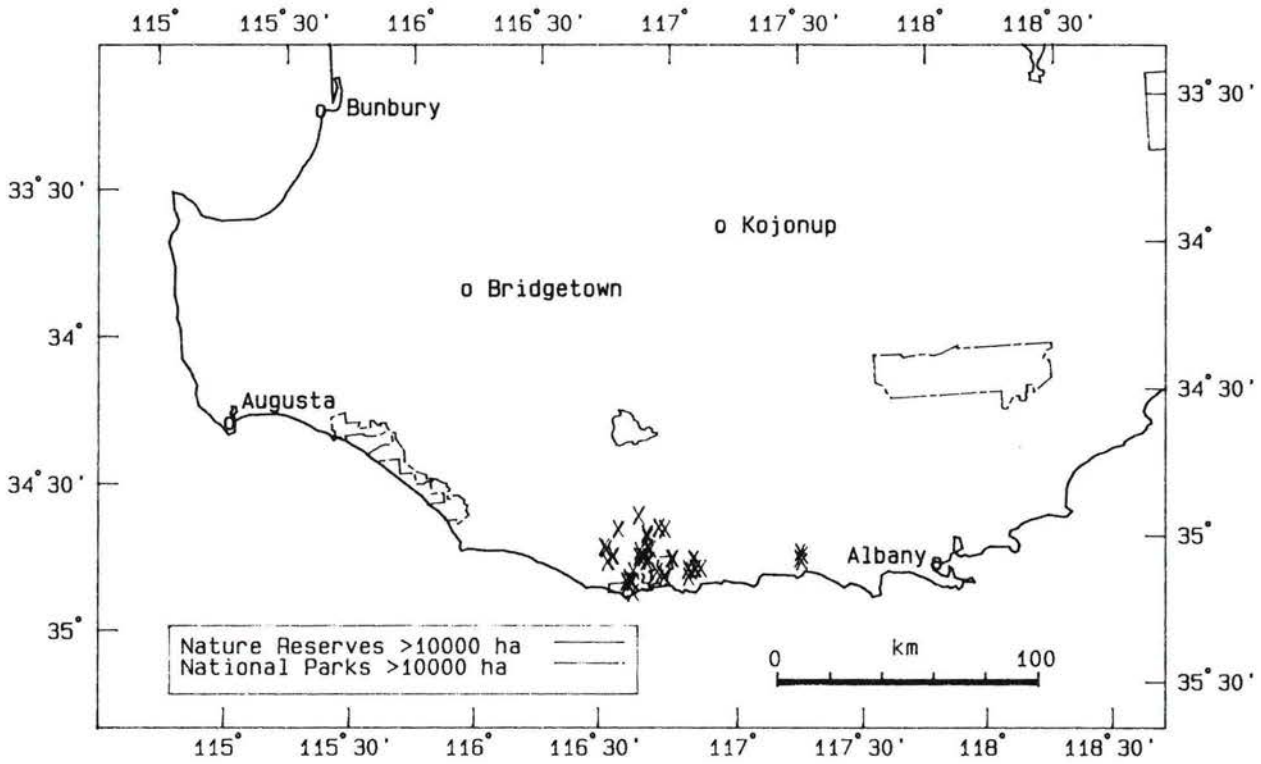


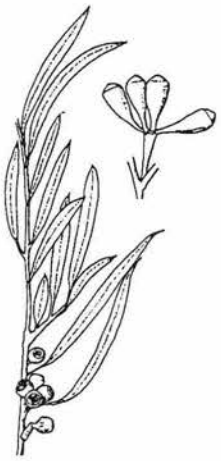


A species of restricted distribution in the Walpole area from Deep River in the west, east to Bow Bridge and north to near Mt Frankland, and with a few outlying populations near Denmark. It is most commonly found on hill crests and slopes in gravelly soils of sand and loam with a high clay content. It forms forest communities with *Eucalyptus marginata, E. calophylla, E. jacksonii* or *E. diversicolor*. *E. calophylla* and *E. megacarpa* are associated on the granite outcrops of Mt Hopkins. It occurs rarely in pure stands (Wardell-Johnson, personal communication). Of the total records, 61 per cent are from State forest and 30 per cent are from Walpole-Nornalup National Park and a nature reserve near Denmark. It has been well surveyed and is included in current studies on the biogeography and ecology of forest eucalypts endemic to the Walpole region (Wardell-Johnson, personal communication).

*E. guilfoylei* is taxonomically a unique species characterized by its branched, terminal inflorescences and butterfly-shaped anthers. It has rough, fibrous bark on the trunk and main branches and dull adult leaves. It may be confused with red tingle (*E. jacksonii*) as a whole tree but they are very dissimilar in bud and fruit.

Specific References: Maiden (1911), Elliot and Jones (1986).





**EUCALYPTUS HALOPHILA** D.J. Carr & S.G.M. Carr

Number of records: 48

Population Size
<10(3) 10-20(6) 20-50(5) 50-100(2) 100-500(1) >500(0) unspecified(31)

Conservation Status
Restricted to road verge (10.5%), Not (60.5%), Unspecified (29%)
In conservation reserve (23%), Not (71%), Unspecified (6%)

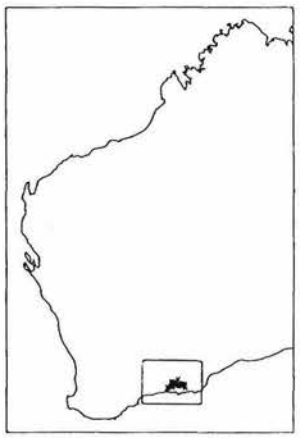
Height: 1-7 m

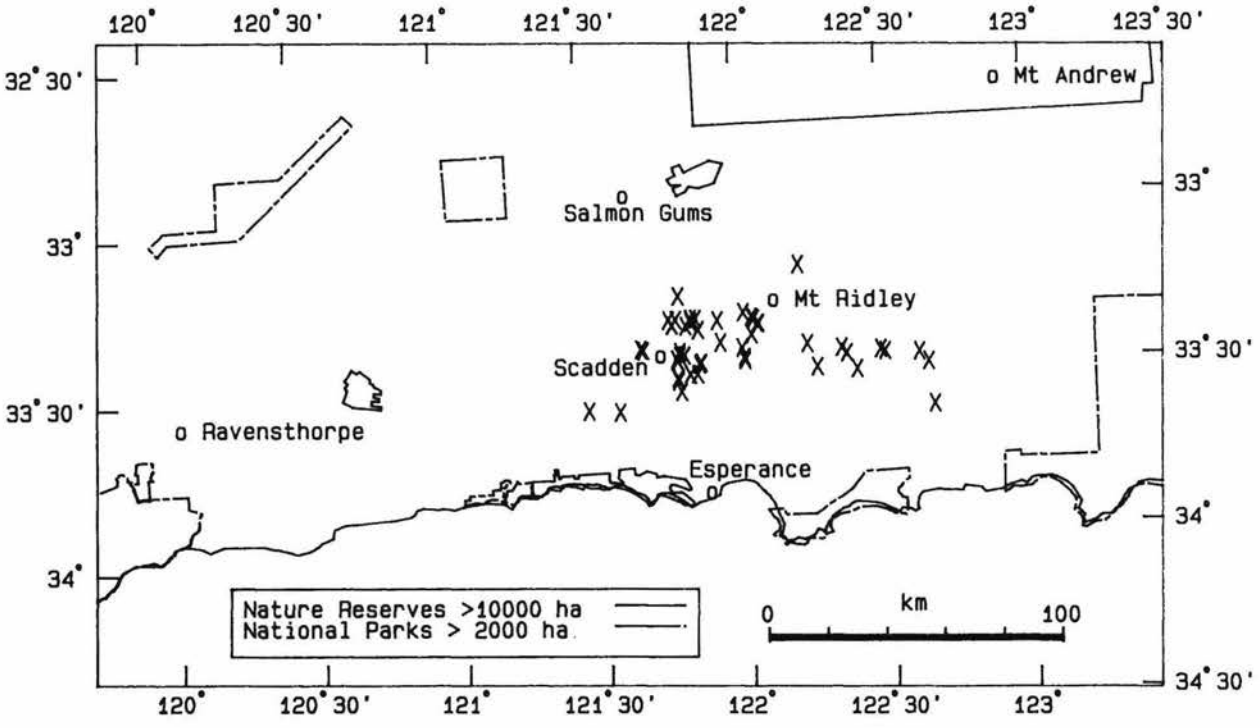
Flowering period: January - April

*Eucalyptus halophila* occurs in the area north of Esperance, with a concentration of populations between Speddingup, Grass Patch and Mt Ridley. It is confined to saline flats, lake margins and depressions where it grows emergent from dense heath and scrub dominated by *Melaleuca* spp. Soils are usually sand or sandy clay. *Eucalyptus* species found in association include *E. merrickiae, E. rigens, E. kessellii, E. uncinata* and *E. leptocalyx*. It is adequately represented in conservation areas with 23 per cent of the total records from six reserves, including large populations in Truslove Nature Reserve. Other populations are from private and vacant Crown land. There were 25 new records made during the survey. Although restricted to agricultural areas, its favoured habitat is mostly unsuitable for farming. It may be of value in the reclamation of salt affected areas.

*E. halophila* is an inconspicuous, shrubby mallee with rough or rarely smooth bark and narrow leaves that superficially resemble those of *Acacia* species. It has no known close relatives, although in gross appearance may be confused with *E. angustissima* which has a similar habit and occurs around salt lakes.

Specific References: Carr and Carr (1980b), Elliot and Jones (1986).





**EUCALYPTUS HERBERTIANA** Maiden

**Kalumburu Gum**

Number of records: 13

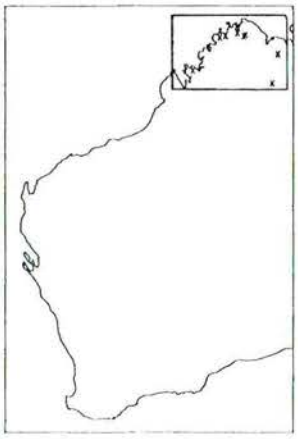
Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0)
unspecified(13)

Conservation Status
Restricted to road verge (0%), Not (92%), Unspecified (8%)
In conservation reserve (31%), Not (69%), Unspecified (0%)

Height: 3-8 m

Flowering period: January

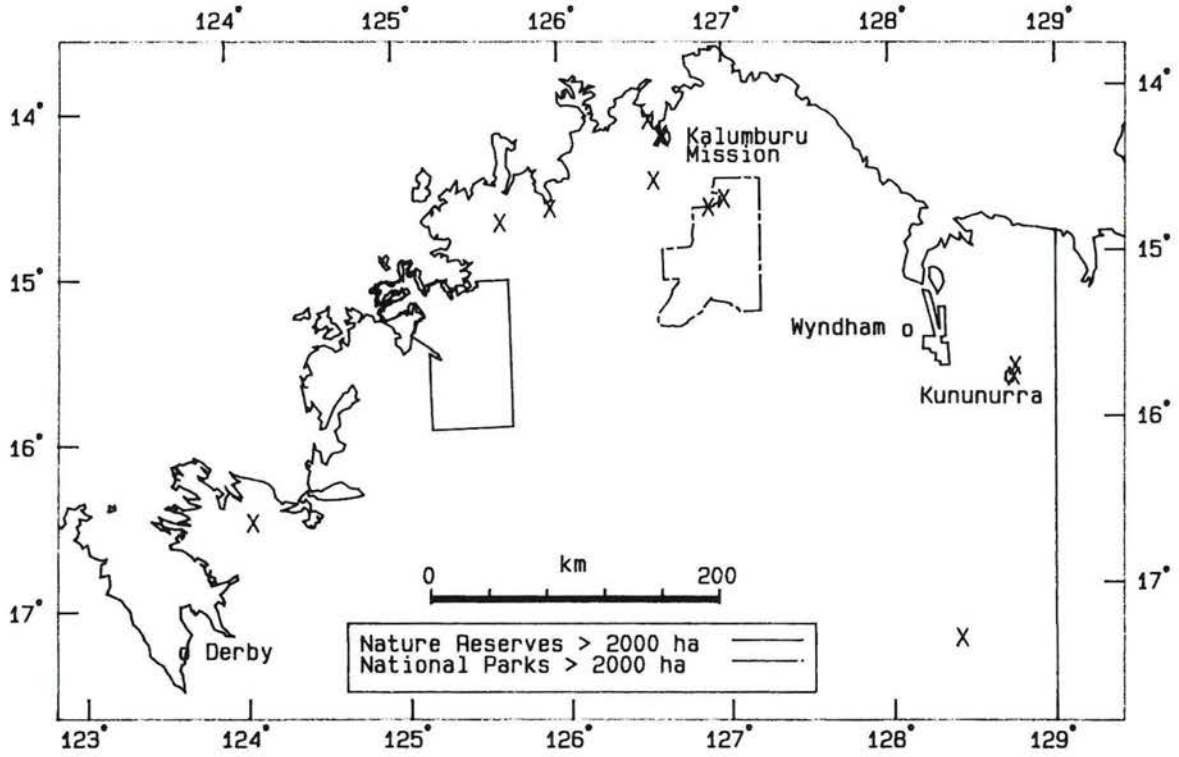
*Eucalyptus herbertiana* is a widespread species occurring in the Kimberley, Northern Territory and north-western Queensland. In Western Australia it has a scattered distribution from the McLarty Range in the west, north to Kalumburu Mission and east to Kununurra and the Bungle Bungle Range. It is found in open woodlands on rocky sandstone ridges, escarpments and along watercourses. The majority of collections are from aboriginal reserves and pastoral lands, with four records (31 per cent of total) from the Drysdale River, Hidden Valley and Purnululu (Bungle Bungle) National Parks. It is probably more abundant throughout northern Australia where botanical survey has been limited by restricted access. It is not under any threat given its remote and widespread distribution.



*E. herbertiana* is a mallee, or more often a small tree, with white to cream-yellow bark shedding in long ribbons. The buds and fruits are sessile or shortly pedicellate on thick, terete peduncles. It is related to *E. cupularis* which has powdery white bark and larger buds and fruits.

Specific References: Maiden (1903-1933), Blake (1953), Hall and Brooker (1974e), Elliot and Jones (1986).

Illustration by M. Flockton (in Chippendale 1981).



**EUCALYPTUS HISTOPHYLLA** Brooker & Hopper

Number of records: 10

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(10)

Conservation Status
Restricted to road verge (0%), Not (60%), Unspecified (40%)
In conservation reserve (20%), Not (80%), Unspecified (0%)

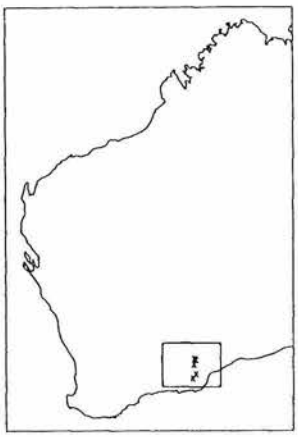
Height: 5-10 m

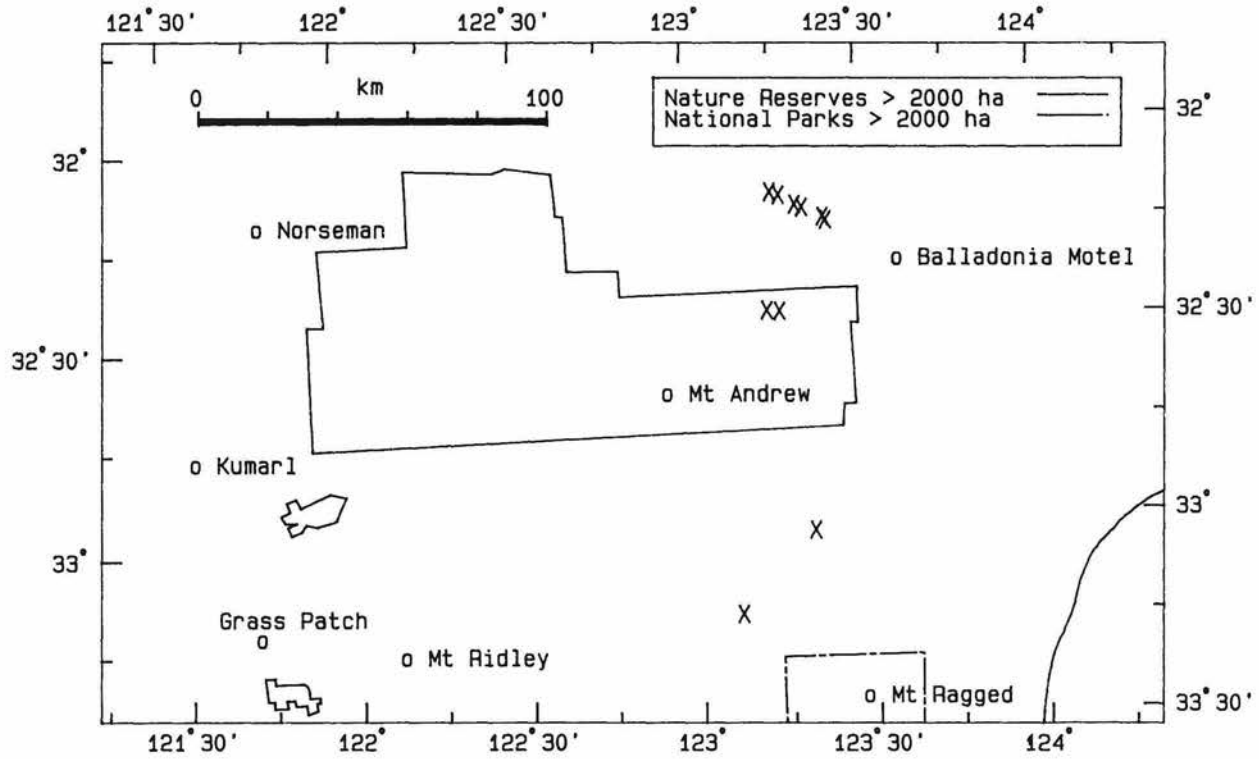
Flowering period: November - March

Previously known only from the area between Fraser Range and Balladonia but with recent surveys extending its range south towards Mt Ragged. It grows as pure stands or in mixed mallee, woodland or low forest associations with *Eucalyptus annulata, E. 'quadrans', E. leptophylla, E. eremophila* and *E. fraseri*. Habitat is varied and includes depressions, granite rock fringes and undulating country high in the landscape. Soils are mostly loamy. Exact population size was not specified for any of the collections but was recorded as 'common' or 'abundant' for a number of localities. Two of the populations are from Dundas Nature Reserve with others from road verge and vacant Crown land. The majority of collections have been made from along the Eyre Highway, and further searching within its poorly surveyed range is expected to locate more populations. Hybridization between *E. histophylla* and *E. grossa* was recorded at the most southern site.

*E. histophylla* is a tree or few-stemmed mallee with a distinctive canopy of erect, narrow leaves. The buds are spindle-shaped with a narrow, horn-shaped operculum often hooked at the tip and slightly narrower than the hypanthium at the join. The foliage is dull blue-green at first, maturing to glossy by the second year.

Specific Reference: Brooker and Hopper (1991).





**EUCALYPTUS IMPENSA** Brooker & Hopper

**Eneabba Mallee**

Number of records: 6

Population Size
<10(3) 10-20(2) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

Height: 1.5 m

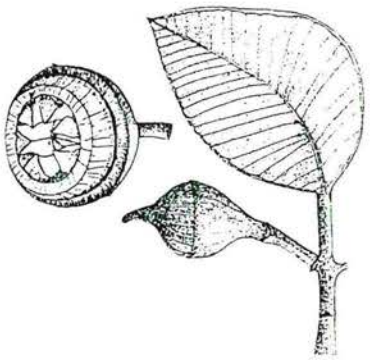
Flowering period: June - July

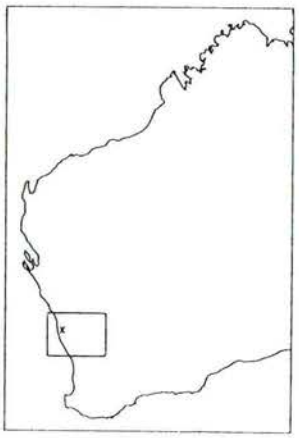
*Eucalyptus impensa* is a rare species restricted to several populations over a few kilometres on the sandplains south of Eneabba. It grows among low heath on gravelly sand of undulating plains and low breakaway slopes. Other mallee species in the vicinity include *E. macrocarpa, E. tetragona, E. johnsoniana* and *E. todtiana*. Less than 80 individuals in six populations have been recorded. Five of the populations occur on a flora (wildflower) lease and the sixth on adjoining private property. It is not presently endangered but reservation by acquisition of the land as a nature reserve would be desirable. Taxonomic research on the affinities of *E. impensa* is underway. It is gazetted as Declared Rare Flora [Appendix 2].

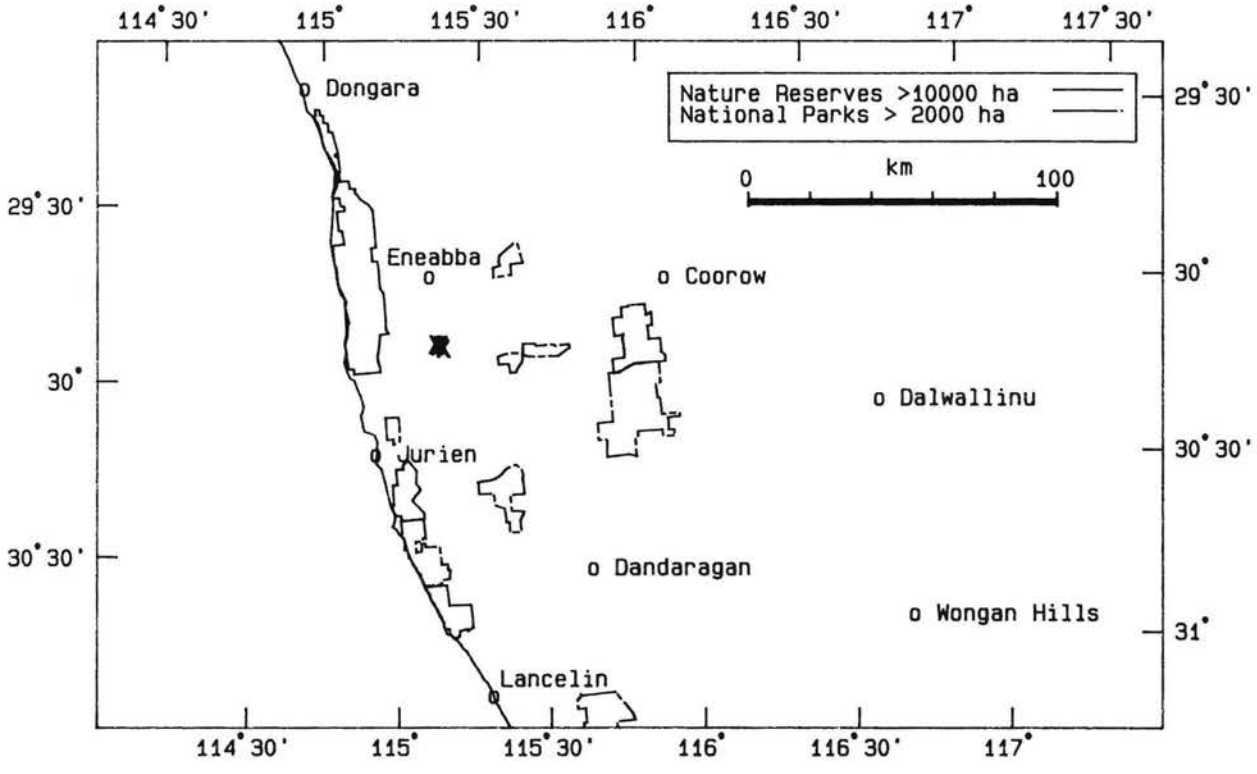
*E. impensa* is a low, spindly mallee with dull yellow-green leaves on stout petioles. The inflorescences are single-flowered on distinct peduncles. Its affinities are unclear but it is somewhat similar to *E. macrocarpa*, lacking the overall glaucous appearance and sessile or shortly stalked buds, fruits and leaves. Its new growth is light green compared with the glaucous new growth of *E. macrocarpa*.

Specific Reference: Brooker and Hopper (1993).

Illustration by E. Cooper (in Brooker and Hopper 1993).







**EUCALYPTUS INCRASSATA** Labill. ssp. **"NARROW"**

Number of records: 5

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(5)

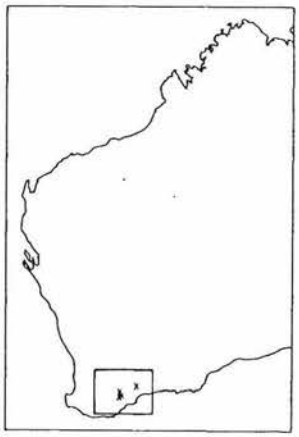
Conservation Status
Restricted to road verge (0%), Not (0%), Unspecified (100%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

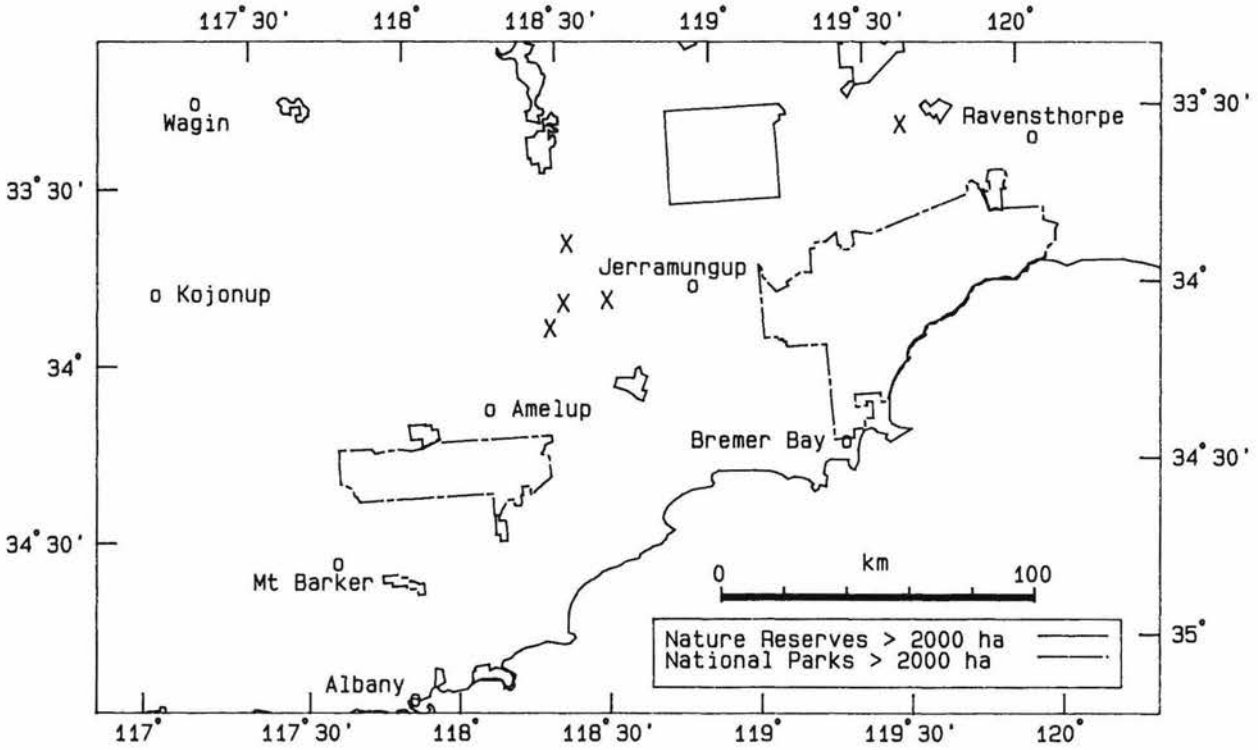
Height: 2-6 m

Flowering period: unknown

A narrow-leaved form of *Eucalyptus incrassata* from the Ongerup area, with a disjunct population west of Ravensthorpe. The only record of habitat is from sandplain. Population size was unspecified for all records, with no occurrences in conservation reserves. More intensive surveys for this taxon are required as it may easily be overlooked and assigned to true *E. incrassata* during routine work.

*E. incrassata* ssp. "narrow" is very similar to *E. incrassata*, differing only in its narrower, erect leaves up to 8 cm long x 0.7 cm wide. The leaves of *E. incrassata* measure up to 11 cm x 3 cm.





**EUCALYPTUS INCRASSATA** Labill. ssp. **"ROBUST"**

Number of records: 7

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(1) 100-500(0) >500(0) unspecified(6)

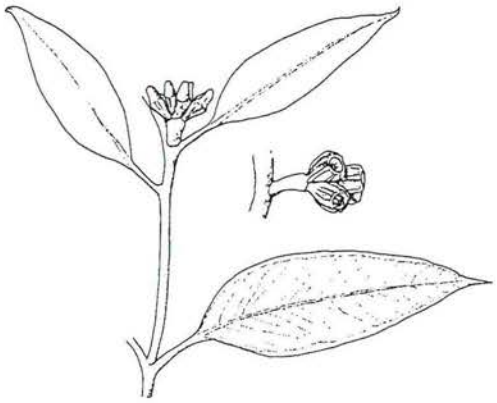
Conservation Status
Restricted to road verge (0%), Not (71%), Unspecified (29%)
In conservation reserve (14%), Not (86%), Unspecified (0%)

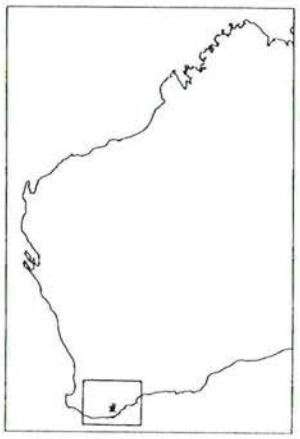
Height: 2.5 m

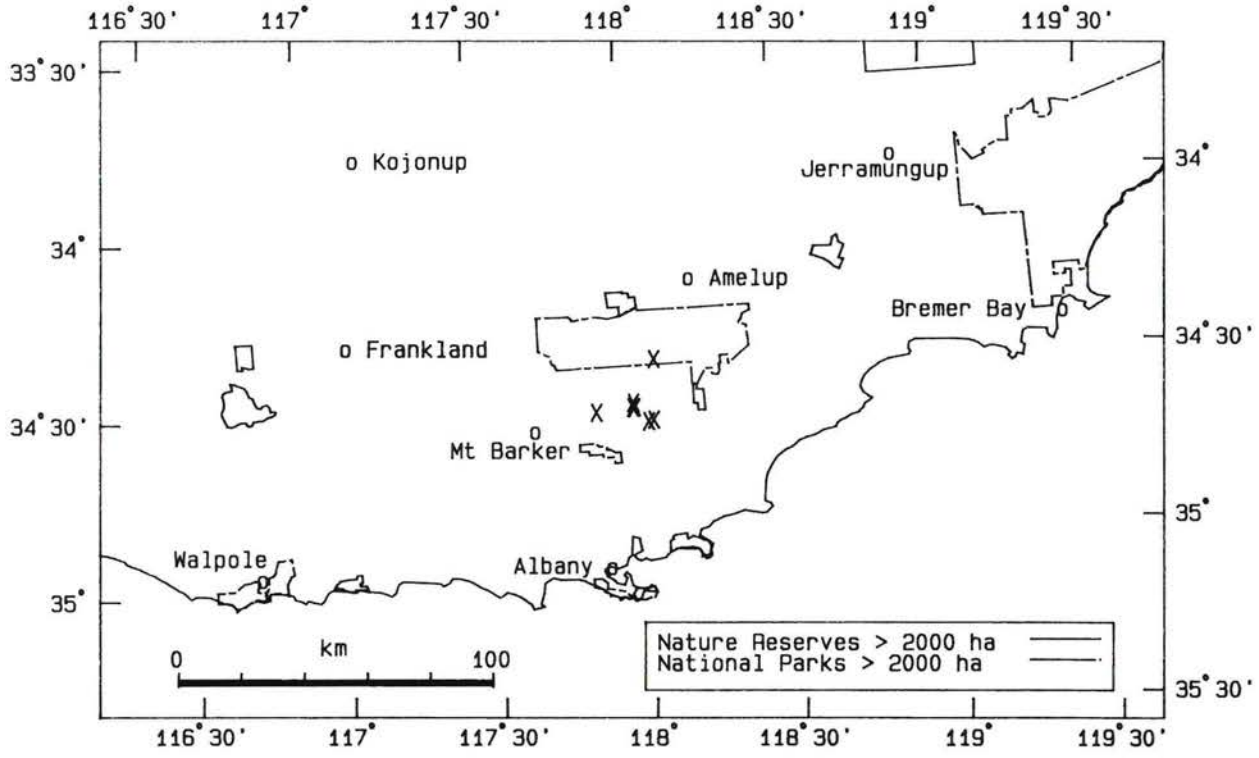
Flowering period: unknown

*Eucalyptus incrassata* ssp. "robust" is known from a few collections over about 25 km in the Kalgan River area south of the Stirling Range. Recorded habitat was laterite slopes and breakaways, in shrub-mallee with a variety of eucalypt species. One collection was from a clay depression on cleared farmland. A population of 50 to 100 plants occurs in the Stirling Range National Park and is the only record from a conservation reserve. Possible hybrids with *E.* aff. *xanthonema* were observed at two sites. As with *E. incrassata* ssp. "narrow", further surveys of the "robust" subspecies are required. It may easily be mistaken for *E. incrassata* or *E. angulosa*.

*E. incrassata* ssp. "robust" can be distinguished from *E. incrassata* by its wider leaves (up to 14.5 cm x 5.6 cm), smooth operculum and strongly ribbed fruits. It closely resembles *E. angulosa*, the coarse coastal form of *E. incrassata*, differing in its rounded operculum and inland habitat.







**EUCALYPTUS INSULARIS** Brooker

**North Twin Peak Island Mallee**

Number of records: 3

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(2) 100-500(0) >500(0)
unspecified(1)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (100%), Not (0%), Unspecified (0%)

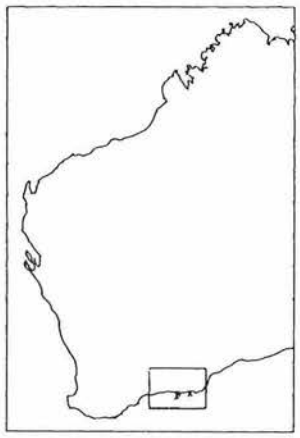
Height: 2-8 m

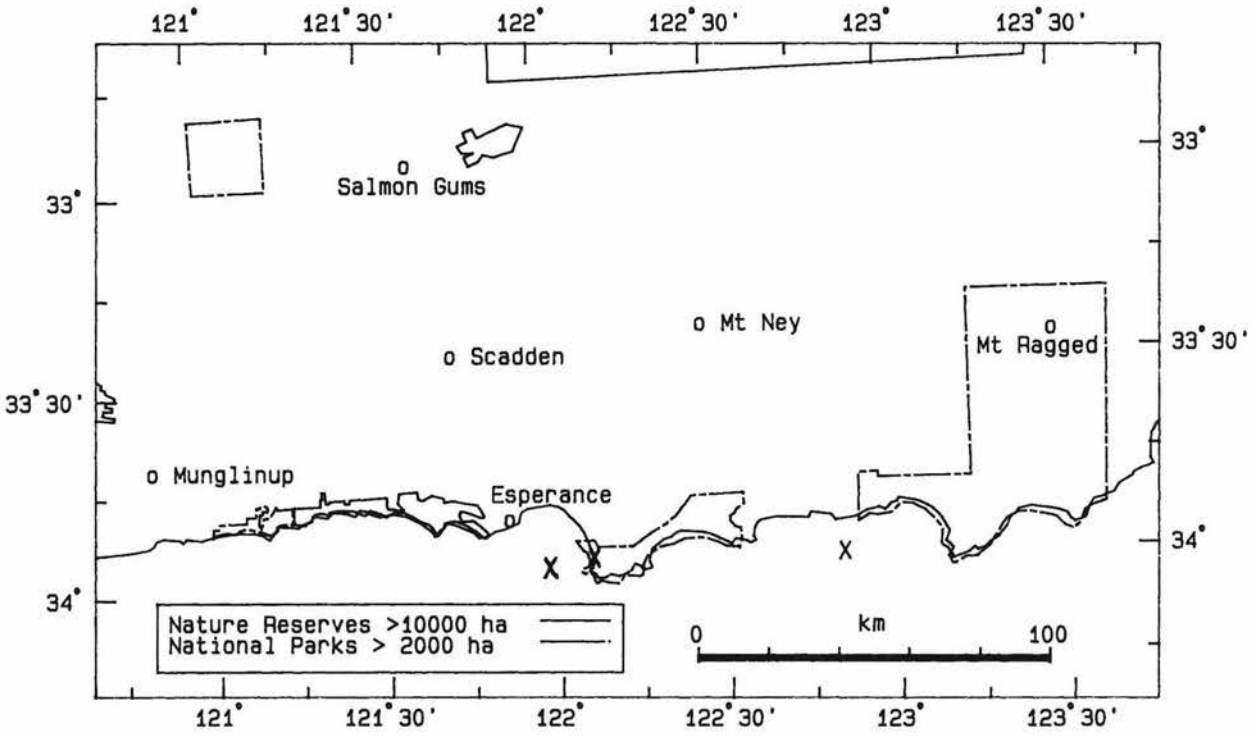
Flowering period: August - ?

A rare species occurring as a few small populations on North Twin Peak Island and near Mt Le Grand, with an unconfirmed record from Woody Island. It grows in shallow soils on granite hills and ridges, forming dense thickets or mallee associations. *Eucalyptus lehmannii, E. conferruminata* and *E. cornuta* occur nearby. Although rare in number, all records are from conservation reserves which afford considerable protection. It may be found in similar sites along the coast and on the larger islands of the Recherche Archipelago. It is gazetted as Declared Rare Flora [Appendix 2].

*E. insularis* is a mostly smooth-barked mallee with a dense canopy of tiny, light green leaves. It grows to 2 m in height in the Mt Le Grand area and up to 8 m on North Twin Peak Island where its basal bark may be red-brown and fibrous.

Specific References: Brooker (1974), Brooker and Hall (1975b), Pryor (1981), Rye and Hopper (1981), Elliot and Jones (1986).





**EUCALYPTUS JACKSONII** Maiden

**Red Tingle**

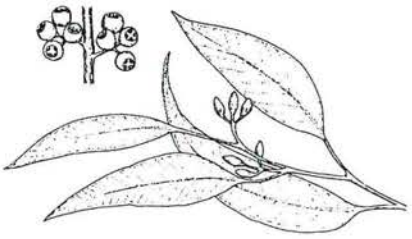
Number of records: 23

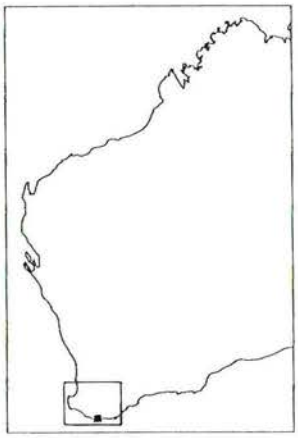
Population Size
<10(0) 10-20(0) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(22)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (74%), Not (26%), Unspecified (0%)

Height: 10-65 m

Flowering period: January - March

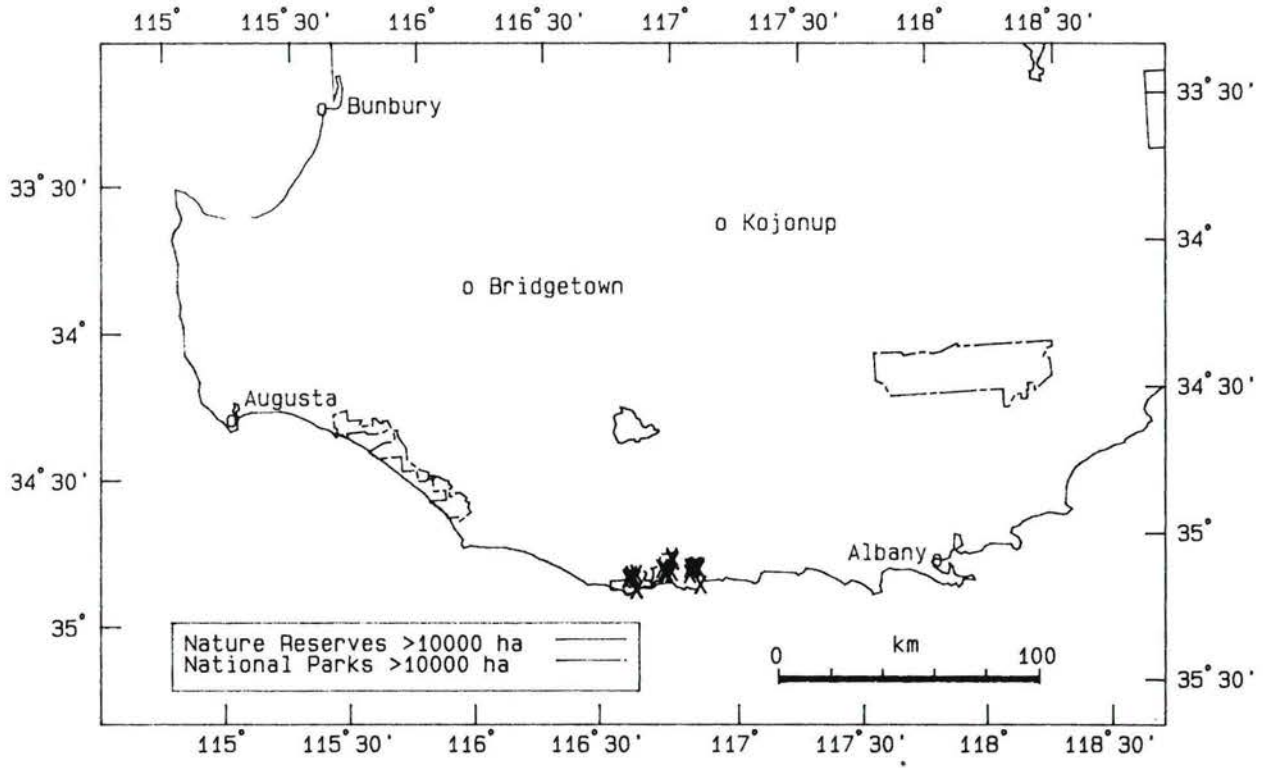




*Eucalyptus jacksonii* is endemic to the Walpole region, occurring from Deep River and Mt Hopkins in the west, east to Bow River and inland to within 10 km of the coast. Favoured habitat is hill and valley slopes and occasionally swampy sites. Soils are loamy to sandy often with gravel and outcropping granite. In some areas (e.g. Forest of Arms and Nuyts Wilderness) it occurs in pure stands, but is more commonly found in association with *E. diversicolor, E. guilfoylei* and *E. calophylla* (Wardell-Johnson, personal communication). It is well conserved with the majority of records (74 per cent of total) from Walpole-Nornalup National Park. All but one of the remaining records are from State forest. It has been well surveyed and is included in current research on the ecology and biogeography of endemic forest eucalypts of the Walpole area.

*E. jacksonii* is a tall forest tree with a prominently buttressed base and rough, reddish grey bark. It is allied to Rate's Tingle (*E. brevistylis*) but has red wood, fewer-flowered inflorescences and larger buds with conical budcaps. In some sites, the trees may have a base diameter of over 2.5 m and heights approaching 65 m (Wardell-Johnson, personal communication).

Specific References: Maiden (1914), Elliot and Jones (1986).



**EUCALYPTUS JIMBERLANICA** L. Johnson & K. Hill

Number of records: 1

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(1)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

Height: 8 m

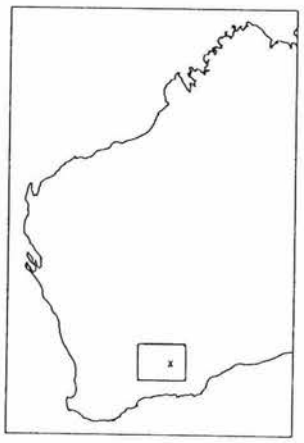
Flowering period: unknown

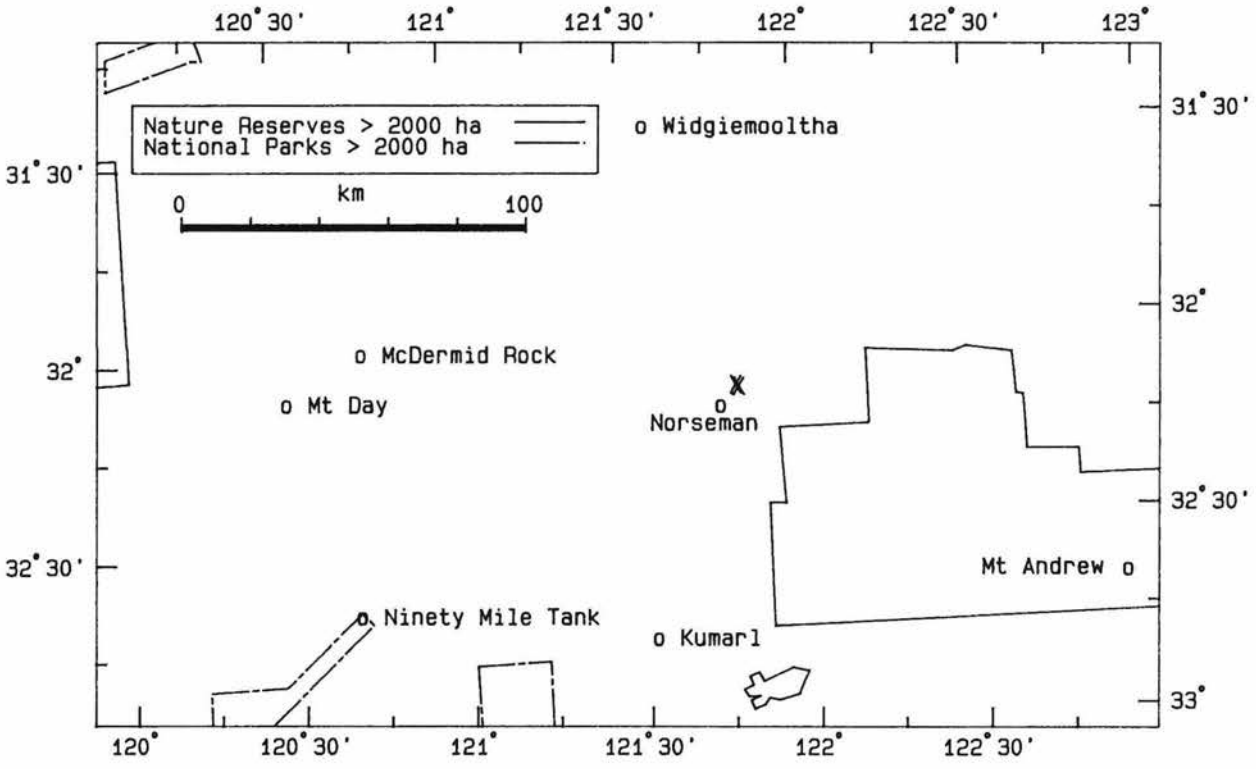
Recorded from a single locality north-east of Norseman, growing in woodland with *Eucalyptus brockwayi* on loamy slopes and flats. The population, of unknown size, occurs in a water reserve and requires protection from mining operations in the vicinity. It is a priority for further survey.

*E. jimberlanica* is a tree with smooth, slightly fluted trunks and glossy green leaves. It is distinguished from related species *E. diptera*, *E. terebra* and *E. creta* by its seven-flowered inflorescences, rounded buds and almost sessile fruits.

Specific References: Burgman (1985b), Johnson and Hill (1991).

Illustration by D. Mackay (in Johnson and Hill 1991).





**EUCALYPTUS JOHNSONIANA** Brooker & Blaxell

**Johnson's Mallee**

Number of records: 22

Population Size
<10(6) 10-20(1) 20-50(1) 50-100(1) 100-500(0) >500(0) unspecified(13)

Conservation Status
Restricted to road verge (0%), Not (77%), Unspecified (23%)
In conservation reserve (41%), Not (59%), Unspecified (0%)

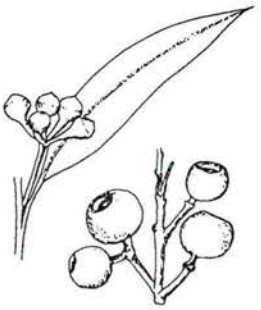
Height: 1-3.5 m

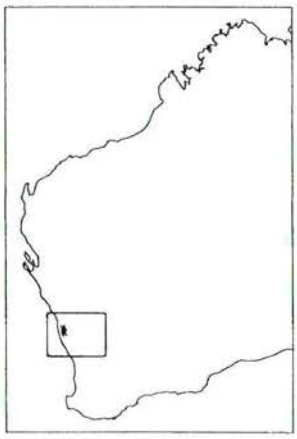
Flowering period: October - May

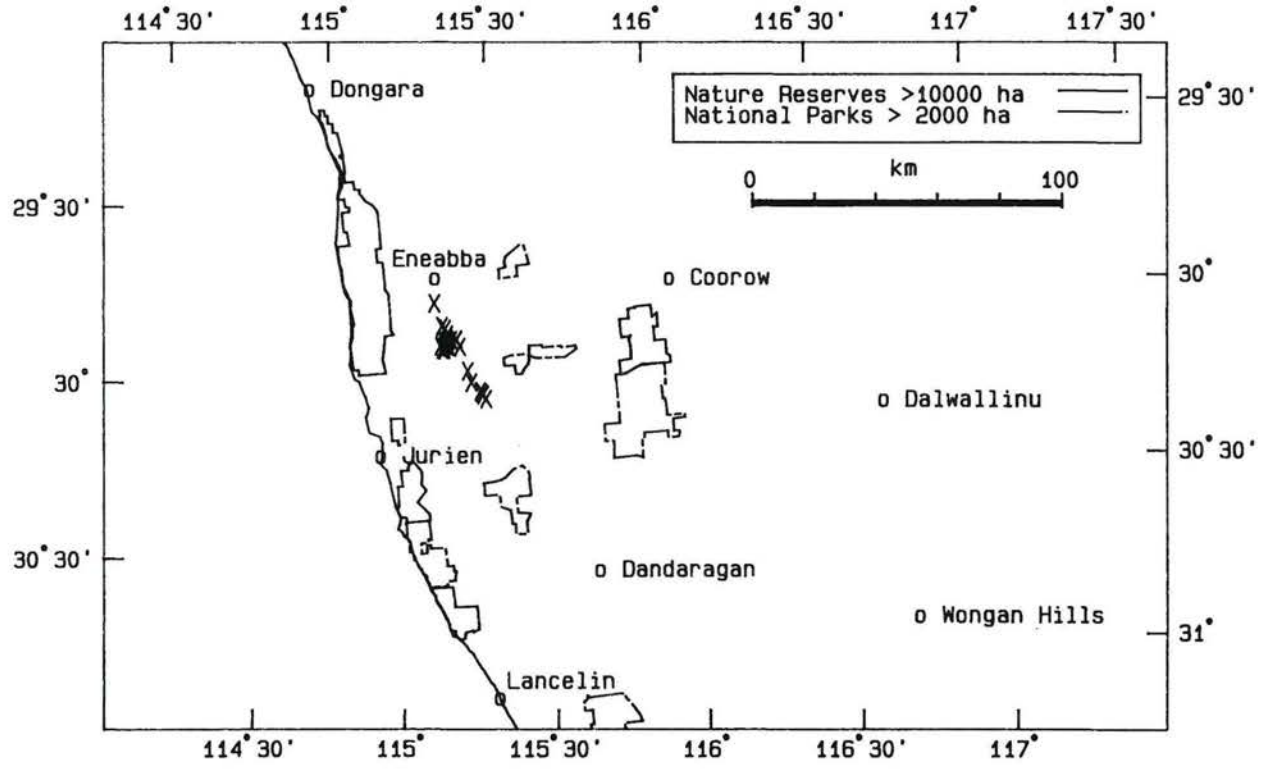
A species of restricted distribution between Eneabba and Coomallo Creek, growing emergent from dense heath on undulating sandplains and lateritic uplands. It occurs in usually small isolated populations or as scattered plants. *Eucalyptus todtiana, E. tetragona, E. impensa* and *E. macrocarpa* have been recorded in association. Forty-one per cent of the total records are from a nature reserve, with other populations located on the Brand Highway road reserve and both cleared and uncleared private property. Continued close liaison with the land managers regarding protection of this species is essential. It is gazetted as Declared Rare Flora [Appendix 2].

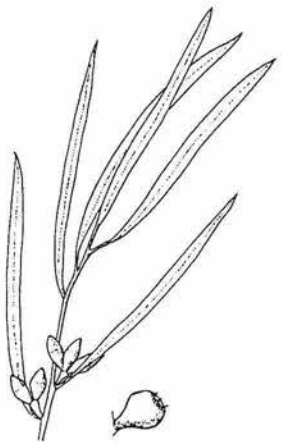
*Eucalyptus johnsoniana* is a small, spreading mallee characterized by its globular fruits and dense canopy of glossy leaves. Its bark is slightly rough and flaky at the base and smooth above. *E. todtiana*, which is often in association, differs in its rough, fibrous bark throughout and apparently glandless leaves.

Specific References: Brooker and Blaxell (1978), Lievense (1981), Rye and Hopper (1981), Leigh *et al.* (1984), Elliot and Jones (1986).









**EUCALYPTUS JUTSONII** Maiden

**Jutson's Mallee**

Number of records: 19

Population Size
<10(1) 10-20(0) 20-50(4) 50-100(3) 100-500(5) >500(3) unspecified(3)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (21%), Not (79%), Unspecified (0%)

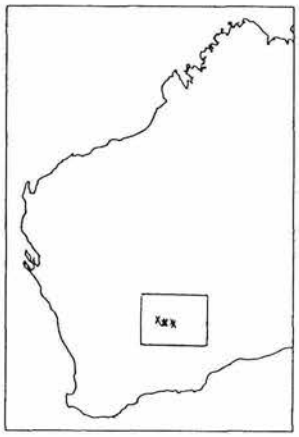
Height: 2.5-6 m

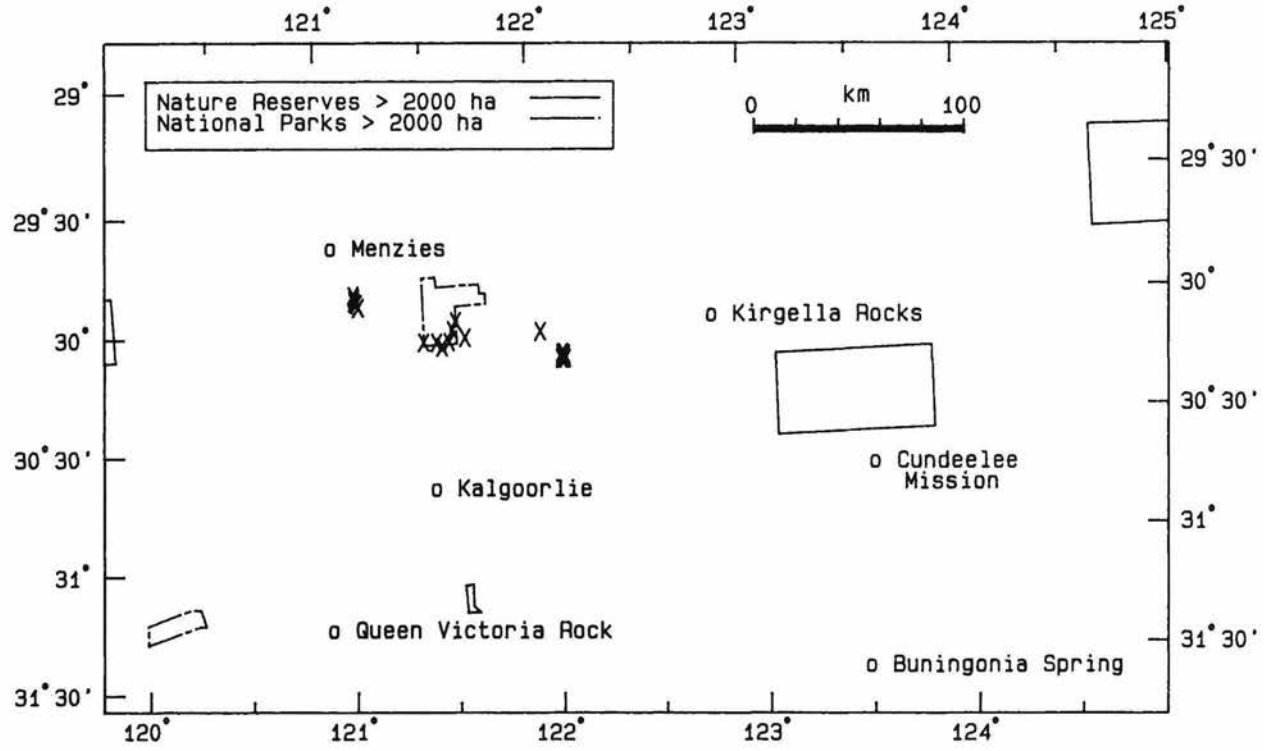
Flowering period: October - February

A species of restricted occurrence from Comet Vale south-east to near Binti Binti Rocks, growing in red and yellow sands on flat or undulating country. Surrounding vegetation is mallee over spinifex (*Triodia* sp.) and various shrub species. *Eucalyptus oldfieldii*, *E. ceratocorys* and *E. leptopoda* are common associates. Surveys have extended its distribution in the area of Carr Boyd Rocks and Goongarrie National Park, and found it in large numbers in dune country to the east. A number of the sites have been burnt, with *E. jutsonii* resprouting from the lignotuber. The recent discovery of populations *ca* 40 km east of previous records indicate that it may be more widespread and abundant in the poorly surveyed region.

*E. jutsonii* is a mallee or small tree easily distinguished by its erect canopy of glossy, very narrow leaves. The bark is rough and fibrous on the trunk and lower stems, ribbony and smooth above. It is allied to *E. mannensis* which has wider leaves and more pedicellate buds and fruits.

Specific References: Maiden (1919a), Elliot and Jones (1986).





**EUCALYPTUS KALGANENSIS** Maiden

**Kalgan Mallee**

Number of records: 9

Population Size
<10(4) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(5)

Conservation Status
Restricted to road verge (11%), Not (89%), Unspecified (0%)
In conservation reserve (78%), Not (22%), Unspecified (0%)

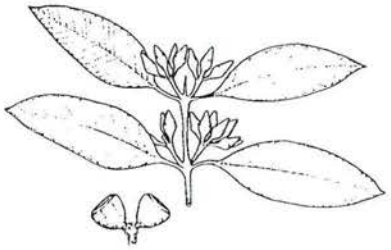
Height: 1.5-3 m

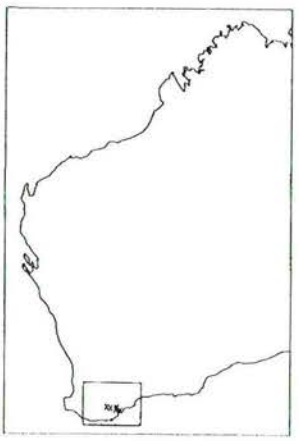
Flowering period: September - October

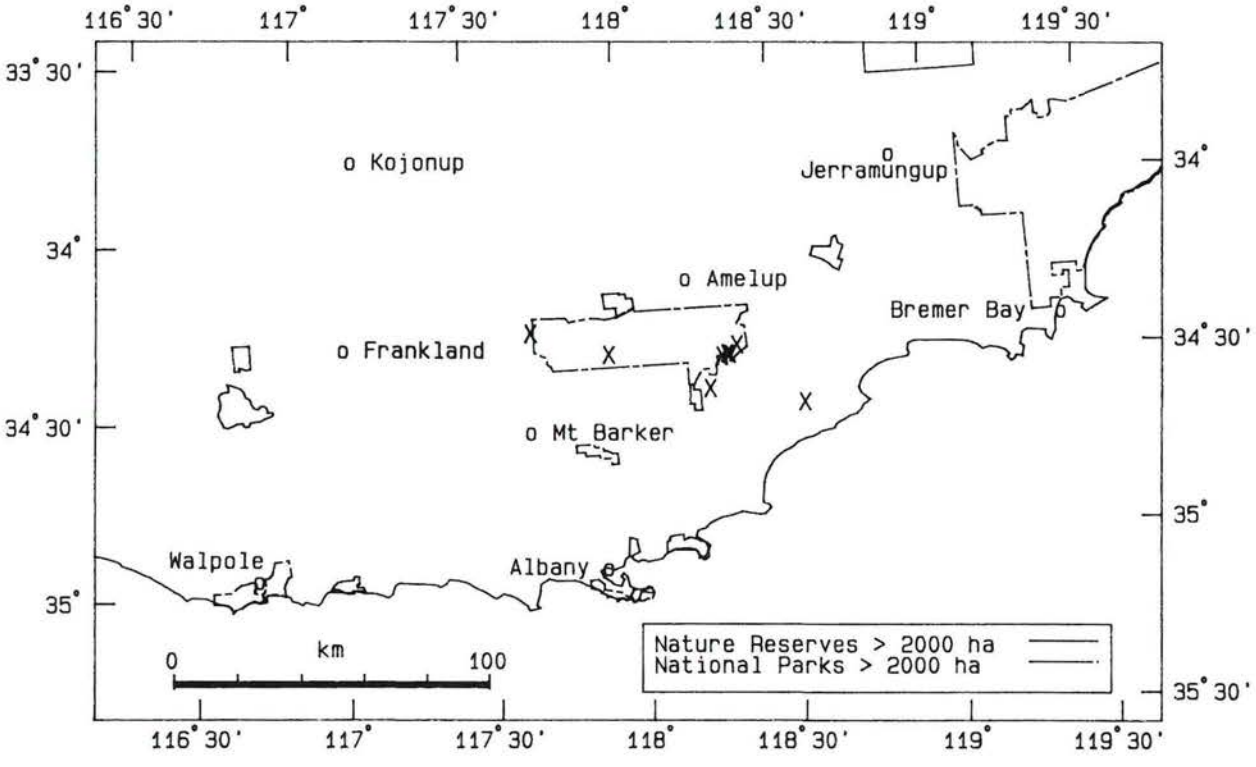
A presumed hybrid occurring in the Stirling Range National Park, with two collections from south and south-east toward Wellstead. It is usually found on lateritic loamy flats or gradual slopes high in the landscape. Surrounding vegetation is shrub-mallee over heath with *Eucalyptus preissiana, E. marginata, E. pachyloma* and *E. decipiens*. All records specifying population size were of less than ten individuals. The populations require special consideration in management of the national park.

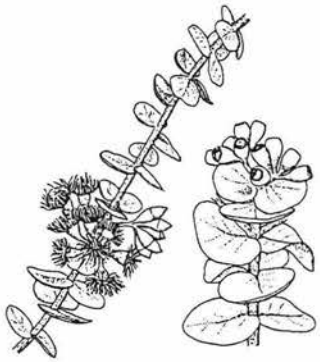
*E. kalganensis* is a slender-stemmed mallee believed to be a hybrid between *E. pachyloma* and *E. preissiana* or *E. marginata* and *E.preissiana*. It has thick, yellow-green leaves and up to seven-flowered inflorescences on long flattened peduncles.

Specific Reference: Maiden (1903-1933).









**EUCALYPTUS KRUSEANA** F. Muell.

**Book-leaf Mallee**

Number of records: 31

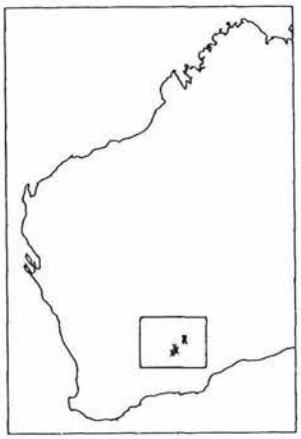
Population Size
<10(5) 10-20(6) 20-50(9) 50-100(4) 100-500(4) >500(0) unspecified(3)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (6%), Not (94%), Unspecified (0%)

Height: 1.5-4.5 m

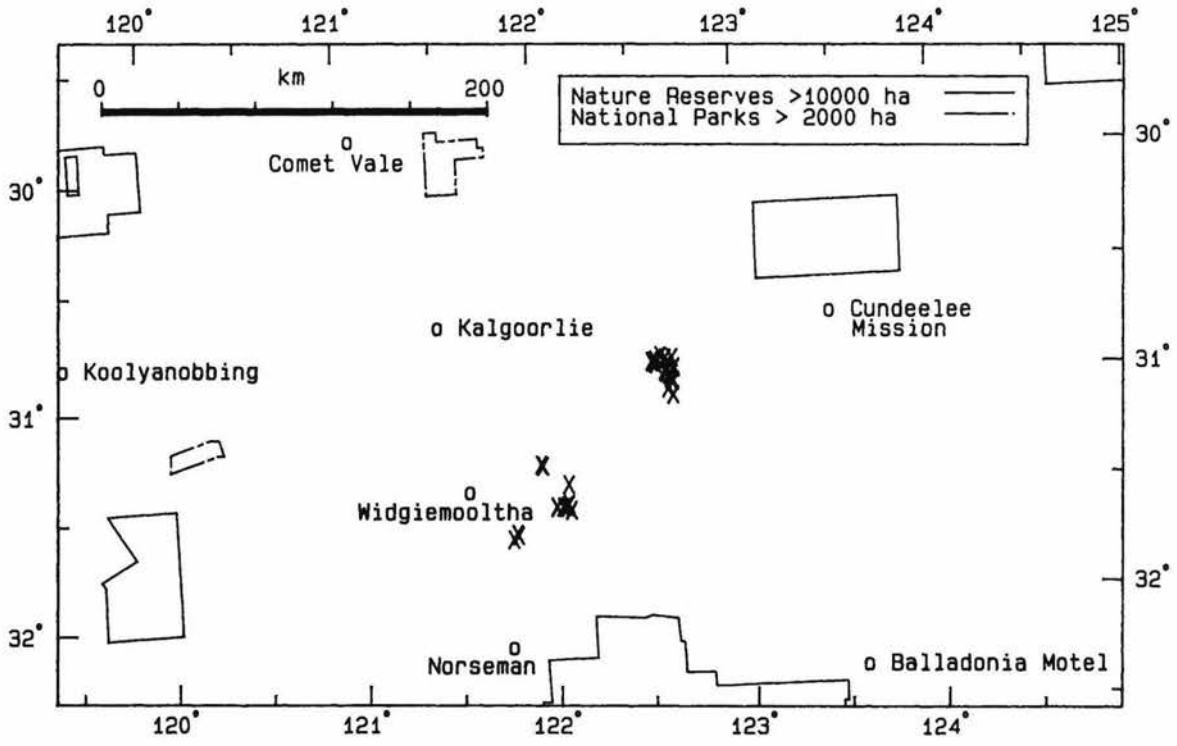
Flowering period: June - October

A species of restricted occurrence in the Goldfields Region, from Cardunia Rocks south to near Higginsville. It is usually associated with granite, growing in rocky loam soils on flat or gently sloping country. Surrounding vegetation is scrub and thicket dominated by *Acacia acuminata, Brachychiton gregorii* and various *Acacia* and *Eremophila* species. *Eucalyptus loxophleba* and *E. brachyphylla* (suspected hybrid between *E. kruseana* and *E. loxophleba*) are commonly found in association. More than 20 new records have extended its distribution at known sites and increased its range to the south-west by *ca* 30 km with discoveries near Cowan Hill and Yalca Hills. It is abundant in the localized populations but poorly conserved, with only two records (6 per cent of total) from a nature reserve near Karonie. The majority of other populations are from pastoral leases and continued monitoring is required. It is an attractive ornamental species popular in cultivation.



*E. kruseana* is a straggly mallee or tree easily distinguished by its mature crown of juvenile leaves, glaucous inflorescences and yellow flowers. The leaves are dull grey, orbicular and crowded in sessile pairs along the branches. The bark is smooth and grey.

Specific References: Mueller (1895), Holliday and Watton (1980), Pryor (1981), Rye and Hopper (1981), Elliot and Jones (1986).



**EUCALYPTUS KUMARLENSIS** Brooker

Number of records: 6

Population Size
<10(0) 10-20(1) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(5)

Conservation Status
Restricted to road verge (0%), Not (33%), Unspecified (67%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

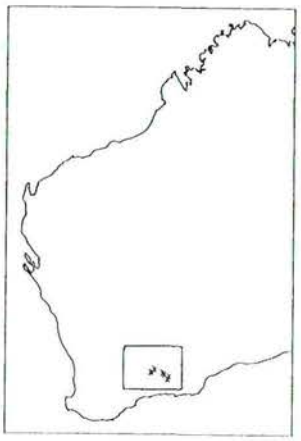
Height: 5-15 m

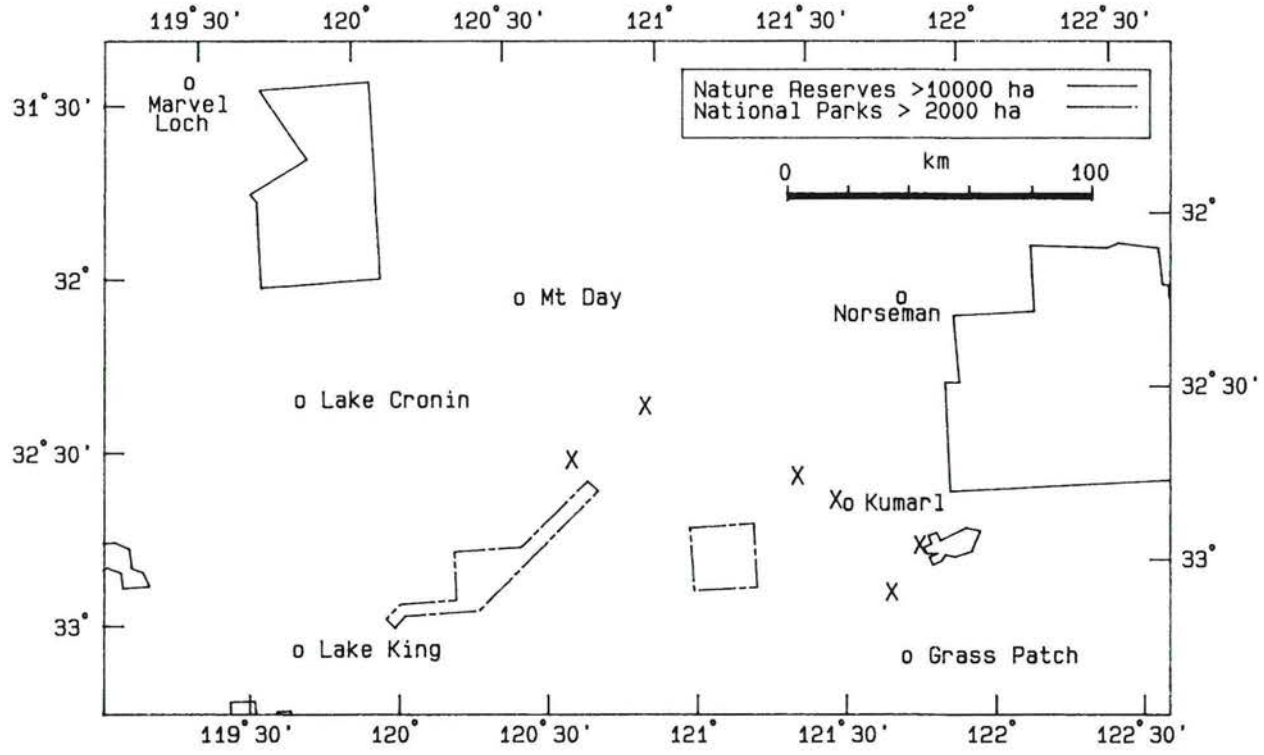
Flowering period: unknown

*Eucalyptus kumarlensis* is restricted to an area south and south-west of Norseman where it grows in woodland or tree-mallee communities over a low scrub understorey. *Eucalyptus eremophila, E. sheathiana, E.* aff. *oleosa* and *E. gracilis* are common associates. Habitat is sandy, or occasionally clayey, flat and undulating country. There are no records from conservation reserves. Size of all but one population was unspecified. It is probably more common within its range which contains large areas of poorly surveyed uncleared land.

A smooth-barked tree, or more rarely a tree-mallee, resembling Salmon Gum (*E. salmonophloia*) in overall appearance. It has narrow, glossy leaves, spindle-shaped to double-conic buds and thick-rimmed fruits. *E. salicola* is closely related but differs in its often powdery bark, orbicular, glaucous juvenile leaves and saline habitat.

Specific Reference: Brooker (1988).





**EUCALYPTUS LAMPROCALYX** Blakely

**Twin-leaved Bloodwood**

Number of records: 22

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(22)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (9%), Not (86%), Unspecified (5%)

Height: 2-6 m

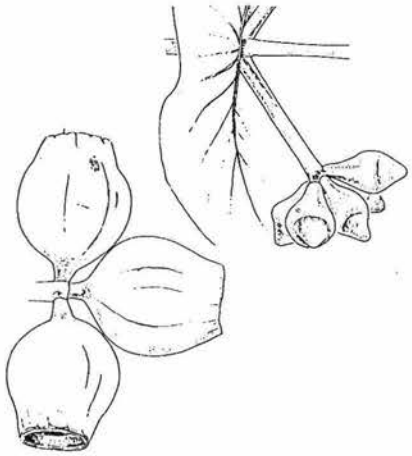
Flowering period: January, May

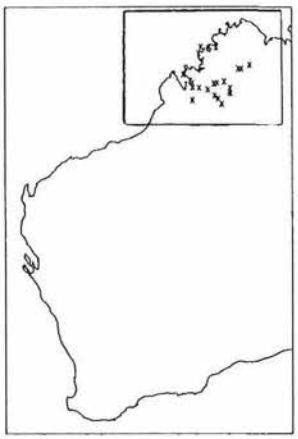
A widespread species of the Kimberley Region occurring from Mt Anderson Station in the west, north to Roe River and east to the Rust Range, including some of the coastal islands. It grows in low open woodlands on sandstone or rocky quartzite slopes and flats. A variety of eucalypt species are found in association. Of the total records, two are from Prince Regent Nature Reserve while the others are mostly from pastoral lands. Although size or extent of populations was not specified, based on the number of herbarium collections *Eucalyptus lamprocalyx* is not rare and is under no threat.

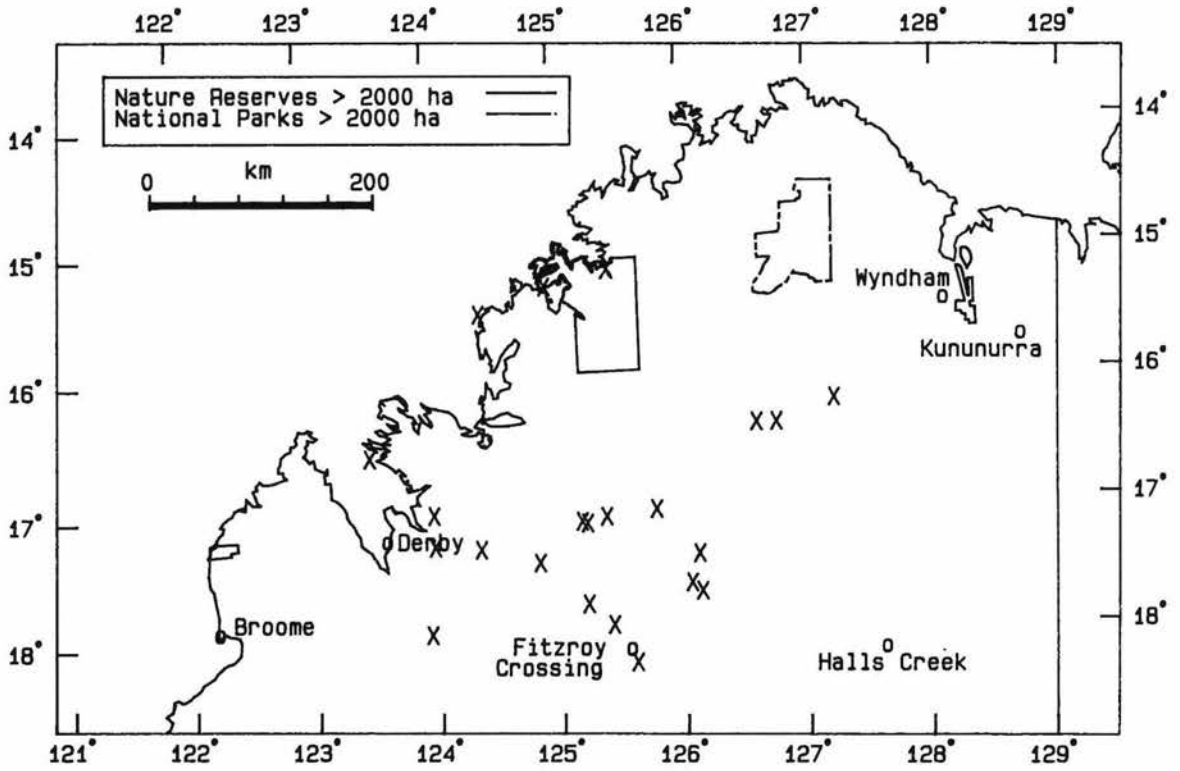
*E. lamprocalyx* is a usually spreading tree or shrub with fibrous and flaky bark. It has large, dull, grey-green leaves in fused pairs along the branches. The fruits are urn-shaped to ovoid on thick peduncles.

Specific References: Blakely (1934), Carr and Carr (1987).

Illustration by M. Risby (in Chippendale 1988).







**EUCALYPTUS LANEPOOLEI** Maiden

**Salmonbark Wandoo**

Number of records: 55

Population Size
<10(23) 10-20(7) 20-50(7) 50-100(3) 100-500(0) >500(0)
unspecified(15)

Conservation Status
Restricted to road verge (2%), Not (93%), Unspecified (5%)
In conservation reserve (11%), Not (85%), Unspecified (4%)

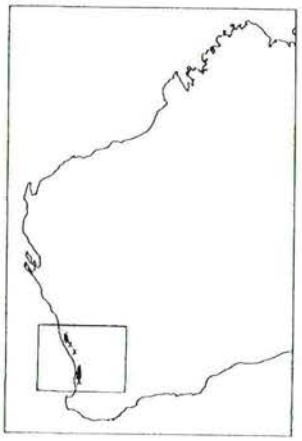
Height: 3-10 m

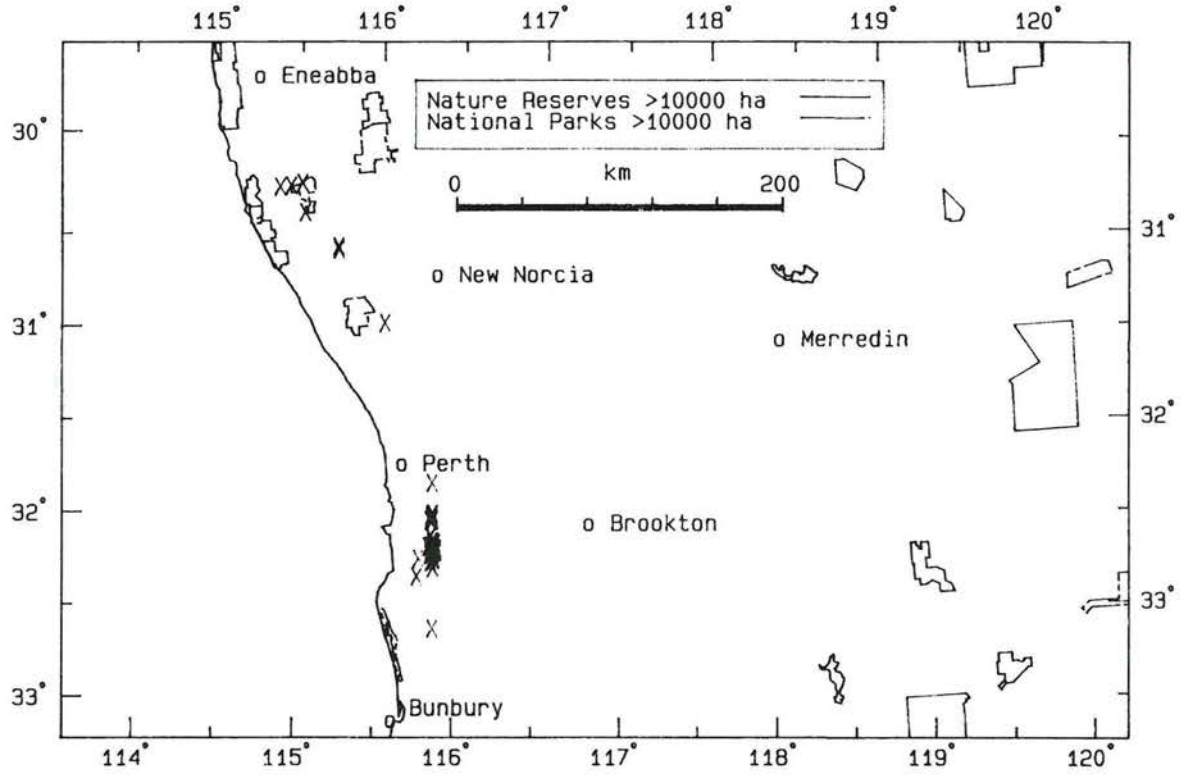
Flowering period: January - April

A species of disjunct and restricted occurrence - on the slopes and foot of the Darling Scarp from Gosnells to Waroona, and on the lateritic uplands north of Perth from west of Badgingarra to Gingin. It is found on gravelly sands and loams, sometimes overlying granite, in open low woodlands or as an emergent above heath. The majority of records are from south of Perth, many of them from cleared or grazed farmland. It occurs in Badgingarra and Serpentine National Parks, protecting populations from both ends of its range. Populations are generally small (<20 plants) with an estimated total of >1000 inidividuals. It is not under any immediate threat but monitoring is required. An old herbarium collection from Clackline (not mapped) is doubtful.

*Eucalyptus lanepoolei* is a small tree easily recognized by its bright green, slightly glossy foliage and smooth, orange bark with the old brown bark adhering in flakes. Its ovoid to globular buds with hemispherical budcaps are also distinctive.

Specific References: Maiden (1919b), Hall and Brooker (1973c), Pryor (1981), Elliot and Jones (1986).





**EUCALYPTUS** aff. **LANEPOOLEI** Maiden

Number of records: 1

Population Size
<10(1) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

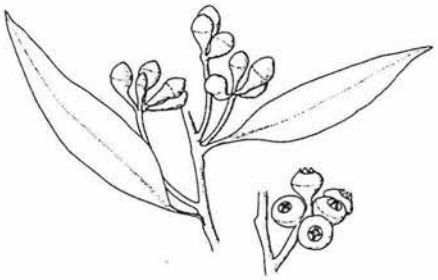
Height: 3 m

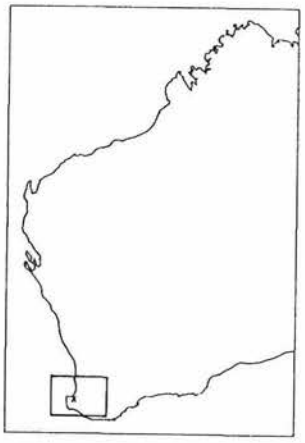
Flowering period: unknown

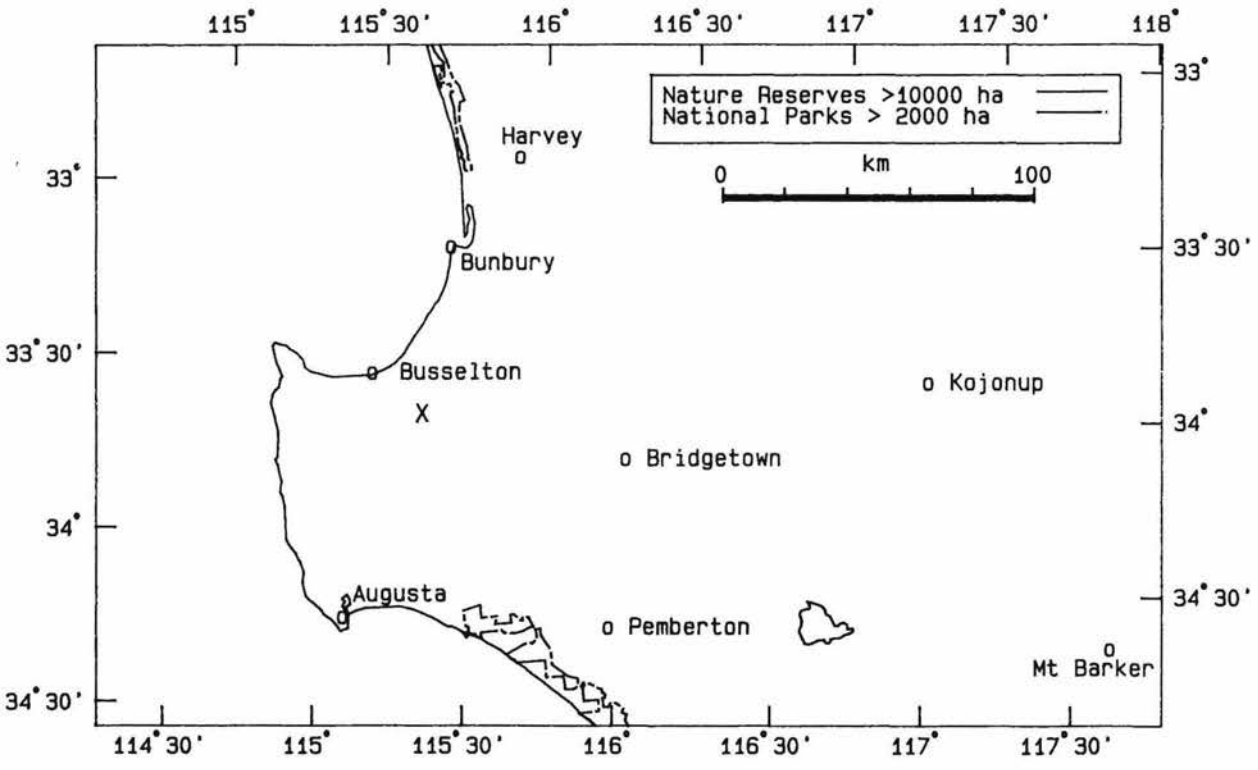
A rare taxon known from an isolated clump in State forest south-east of Busselton. It grows beside a creekline on loam over laterite in low forest of *Eucalyptus marginata* and scattered *E. calophylla*. The population occurs south of the range of typical *E. lanepoolei* and requires protection from accidental destruction. Further survey is a priority.

*E.* aff. *lanepoolei* is a straggly, small tree or mallee differing from *E. lanepoolei* in its rough, 'bloodwood' type bark to the branchlets and slightly discolorous leaves. It is probably a hybrid of *E. lanepoolei* and a recently discovered allied species.

NOTE: Recent herbarium research in 1991 has revealed a second collection of this taxon from near Denmark.







**EUCALYPTUS LATENS** Brooker

**Narrow-leaved Red Mallee**

Number of records: 10

Population Size
<10(6) 10-20(0) 20-50(1) 50-100(1) 100-500(1) >500(0) unspecified(1)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (20%), Not (80%), Unspecified (0%)

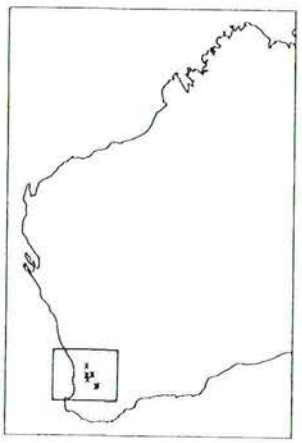
Height: 1.5-4 m

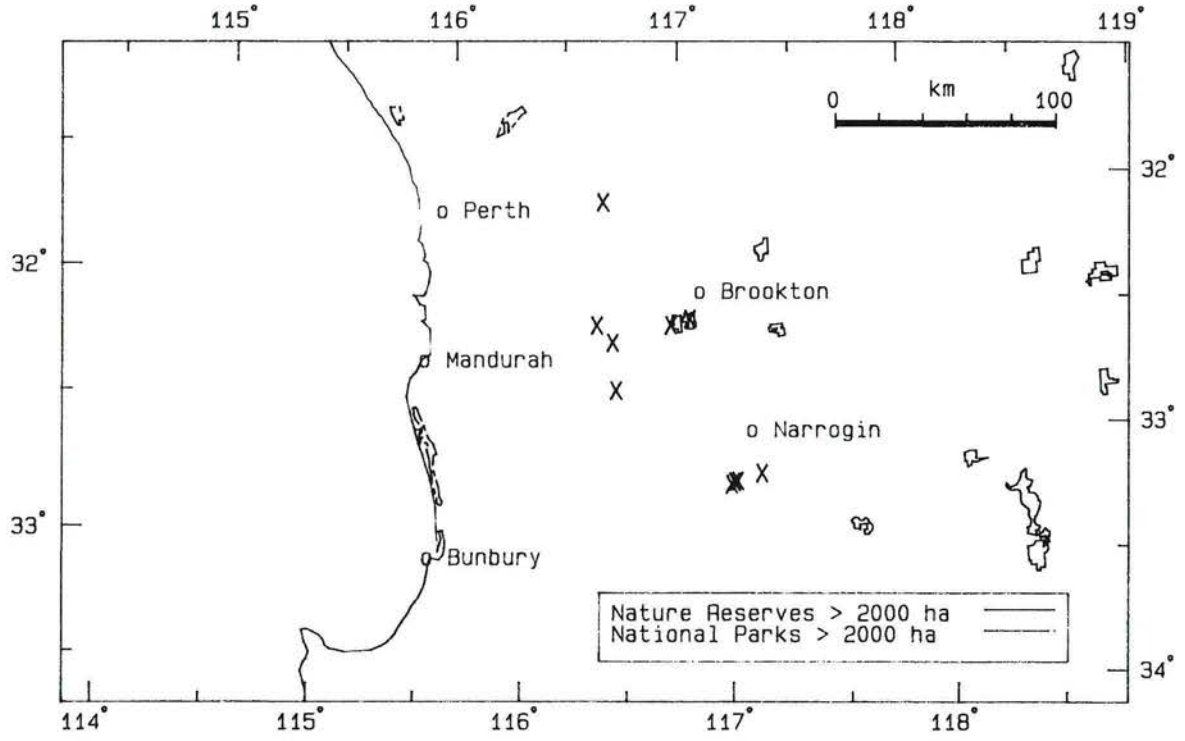
Flowering period: April - June

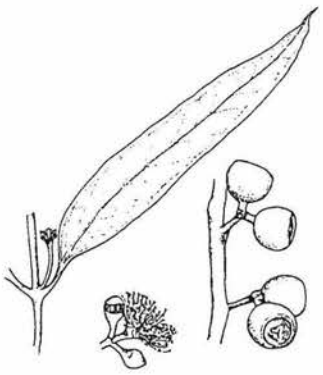
*Eucalyptus latens* has a scattered distribution over a 140 km range from east of Perth south towards Piesseville. It is most commonly found in sandy lateritic soils on gentle slopes, with the northernmost population from the slopes above sheet granite. It grows as single 'clumps' or in dense stands of several hundred stems, in patches of heath surrounded by forest and woodland of *E. calophylla, E. marginata* and *E. wandoo*. Two of the populations are from a nature reserve south-west of Brookton while the remainder are from State forest. *E. latens* was previously believed to occur only at the type locality near North Bannister as there was some doubt regarding the identification of populations to the south and east. These populations are now recognized as most closely allied to *E. latens*. Further taxonomic research on this species and related taxa is required.

*E. latens* is a thin-stemmed mallee with smooth bark and narrow, glossy leaves. It has small, spindle-shaped buds and cupular fruits. It can be distinguished from the related *E. foecunda* and *E. leptophylla* by its glaucous, oblong-linear juvenile leaves.

Specific Reference: Brooker (1988).







**EUCALYPTUS LATERITICA** Brooker & Hopper

**Laterite Mallee**

Number of records: 13

Population Size
<10(2) 10-20(1) 20-50(1) 50-100(1) 100-500(0) >500(0) unspecified(8)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (54%), Not (46%), Unspecified (0%)

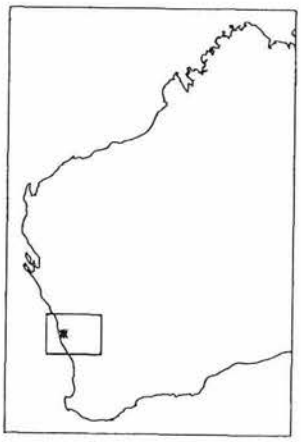
Height: 1.5-4 m

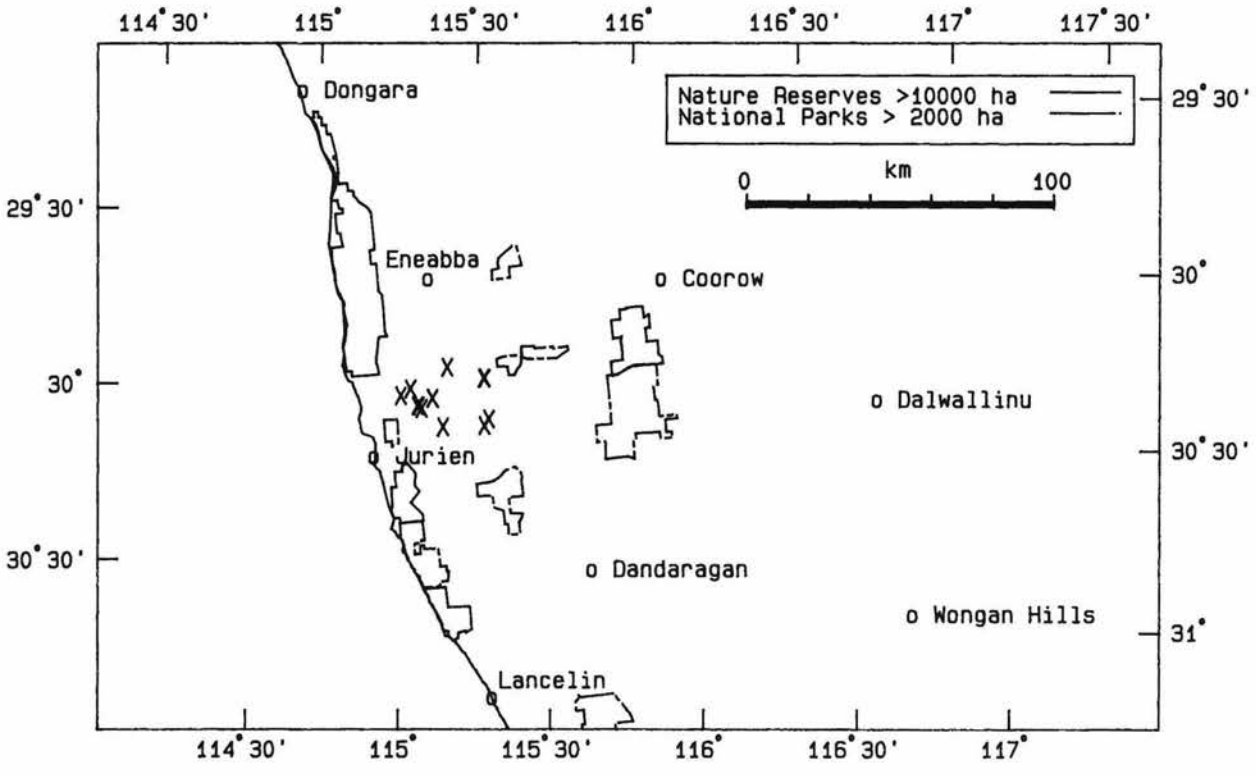
Flowering period: August - October

A species endemic to the Gairdner Range-Coomallo Hill area where it occurs as isolated populations on slopes and breakaways of dissected lateritic uplands. It is confined to sandy lateritic soils with a range and habitat matching that of *Eucalyptus suberea*. Surrounding vegetation is mallee-heath with *E. accedens, E. gittinsii* and *E. suberea* associated. Fifty-four per cent of the total records are located within the recently vested Lesueur National Park. Population size typically is very small, and clones up to 15 m across are known. Its present status is rare and it is gazetted as Declared Rare Flora [Appendix 2].

*E. lateritica* is a low mallee or tree-mallee with slightly glossy leaves and rough grey-brown bark on its lower stems. It is similar to *E. todtiana* and is distinguished by its finer bark, double-conic buds, winter flowering season and glandular, sparsely veined leaves.

Specific Reference: Brooker and Hopper (1986).





**EUCALYPTUS LEHMANNII** (Schauer) Benth. ssp. **"QUOIN HEAD"**

Number of records: 3

Population Size
<10(1) 10-20(0) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(1)

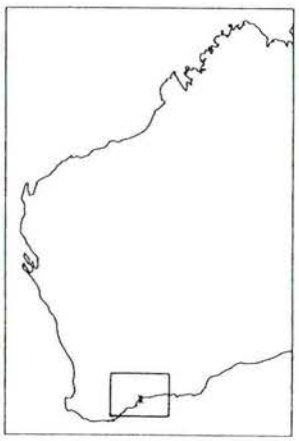
Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (100%), Not (0%), Unspecified (0%)

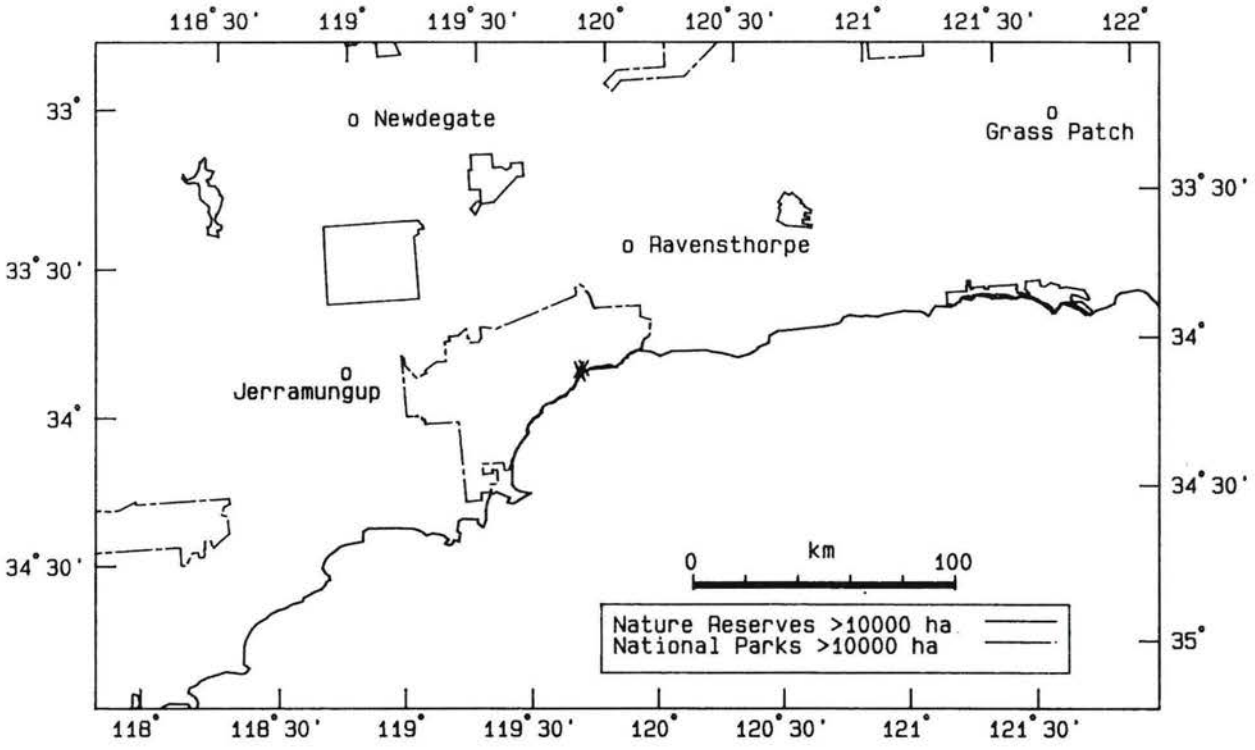
Height: 1-10 m

Flowering period: unknown

A possible new variant of *Eucalyptus lehmannii* recently discovered west of Hopetoun in the Fitzgerald River National Park. It occurs in rocky skeletal soils along creeklines near the coast, forming woodlands in the sheltered valleys and growing among low heath on exposed slopes. *E. occidentalis* and other mallee eucalypts are associated. Less than 100 plants are known from three populations over 1.5 km, although surrounding areas have not been extensively surveyed. Appropriate management of the sites and further survey of coastal habitats is required.

A very narrow-leaved form of *E. lehmannii* with smaller and finer buds and fruits. It grows as a tree to 10 m in sheltered sites while individuals on exposed slopes are to <1.5 m high. The tree forms are generally very spreading and branching low to the ground. Specimens had abundant buds and fruits in December.





**EUCALYPTUS LEPROPHLOIA** Brooker & Hopper

**Scaly Butt Mallee**

Number of records: 1

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(1) 100-500(0) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

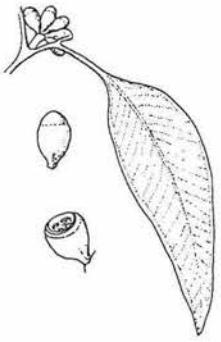
Height: 4 m

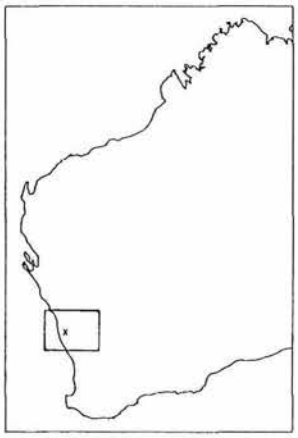
Flowering period: August - December

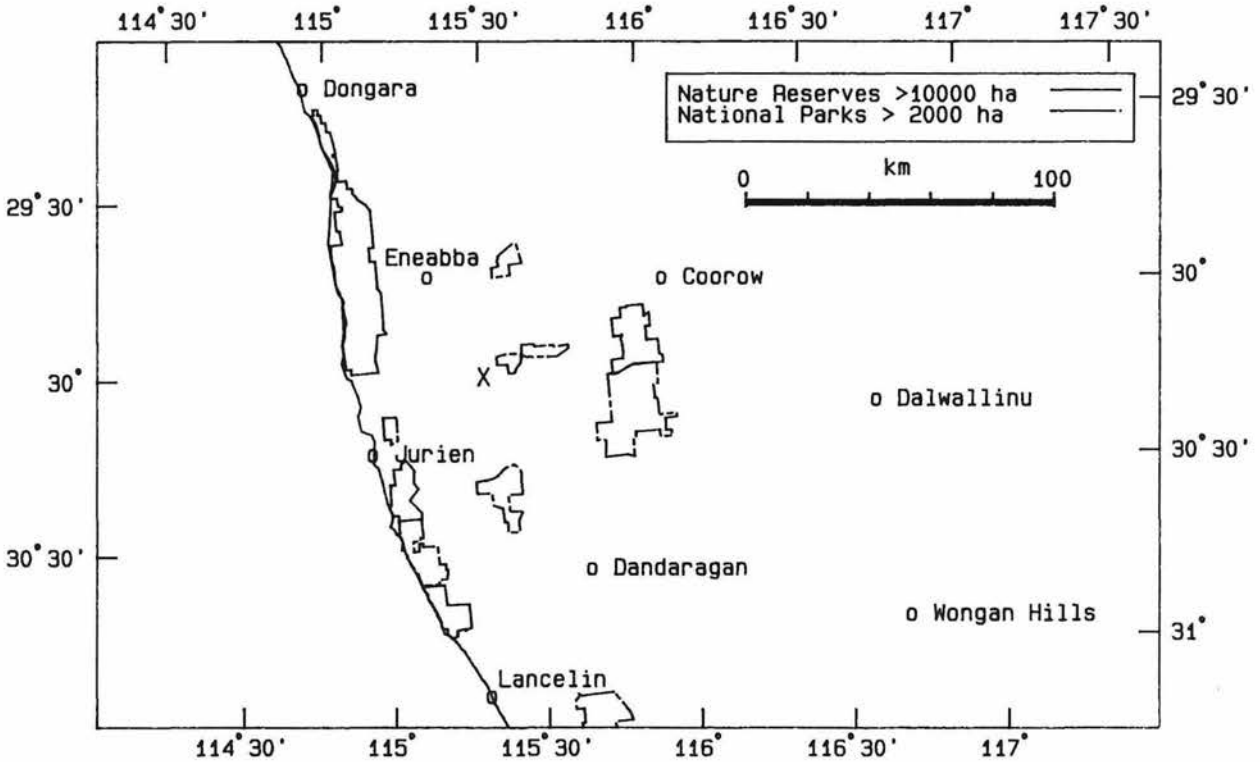
*Eucalyptus leprophloia* is confined to a single population, consisting of 60 to 70 individuals, on private property north of Coomallo Hill. It occurs in a sandy clay loam gully between two breakaways, forming an open shrub mallee over heath community with *E. gittinsii* and *E. falcata*. Survival of this species is entirely dependent on the goodwill of the landowner. It is gazetted as Declared Rare Flora [Appendix 2].

*E. leprophloia* is a thin, erect-stemmed mallee with glossy leaves and flaking, light grey bark at the base. It is related to *E. accedens* which is a tree with smooth, powdery bark and dull, blue-green leaves. It is also similar to *E. zopherophloia* which has firmly-held rough bark and narrower, dull to slightly glossy leaves.
Specific Reference: Brooker and Hopper (1993).

NOTE: Recently, three other sites have been documented between Mt Adams and Jurien.







**EUCALYPTUS LIGULATA** Brooker

**Lucky Bay Mallee**

Number of records: 23

Population Size
<10(0) 10-20(1) 20-50(2) 50-100(1) 100-500(3) >500(0)
unspecified(16)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (83%), Not (17%), Unspecified (0%)

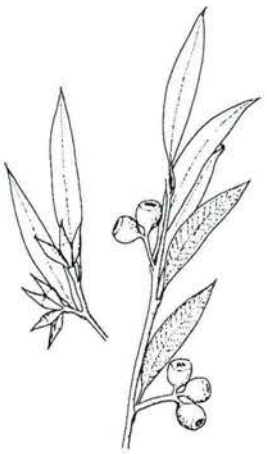
Height: 1.5-3 m

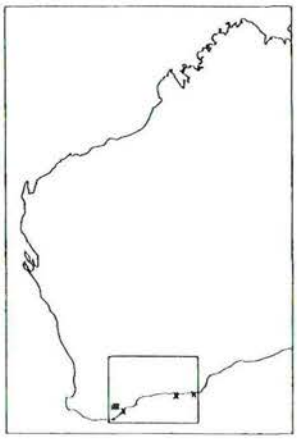
Flowering period: February - May

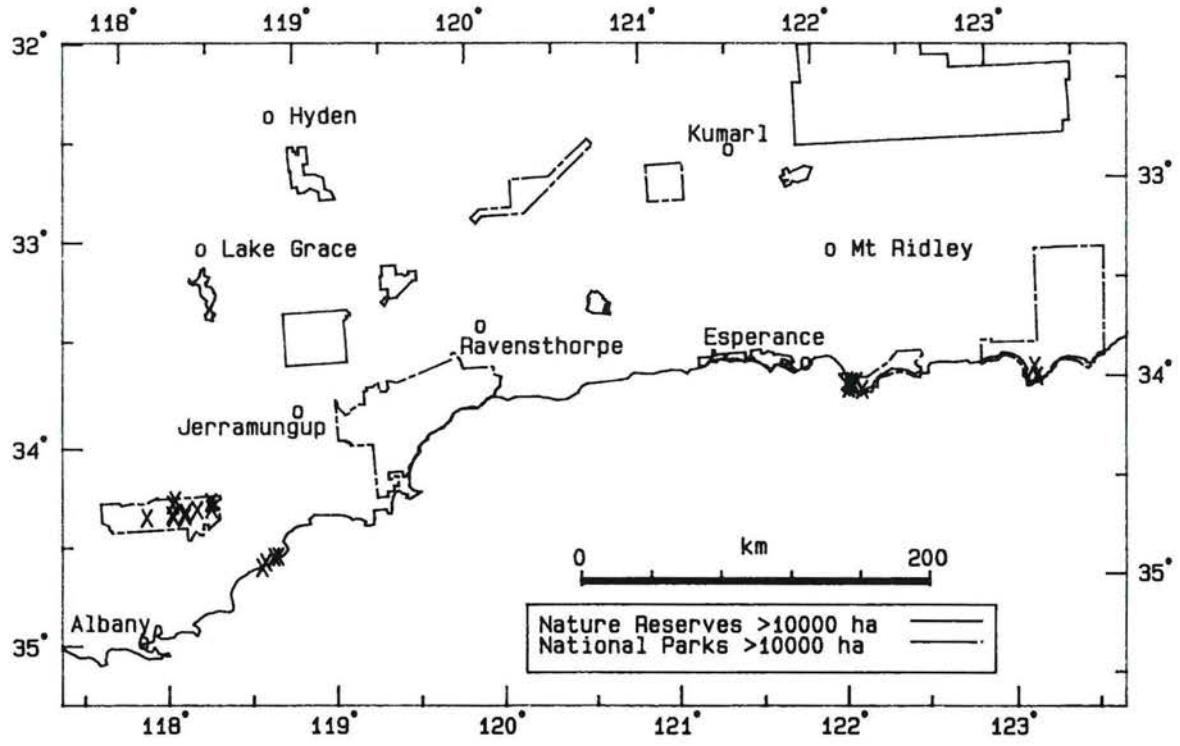
A species of widespread but disjunct distribution from the Stirling Range east to Cape Arid. In the Stirling Range it grows on stony loam slopes and hilltops in mallee associations with *Eucalyptus marginata, E. preissiana* and *E. calophylla*. The western coastal records are from sand over limestone slopes, while those in the east are from sand or loam over granite. *E. aquilina, E. angulosa* and *E. semiglobosa* occur in the surrounding mallee over dense heath. It is well represented in conservation reserves with 83 per cent of the total records from the Stirling Range, Cape Le Grand and Cape Arid National Parks.

*E. ligulata* is a profusely flowering, smooth-barked mallee with slightly glossy leaves and striate or slightly ribbed buds and fruits. It resembles *E. calcicola*, differing in its many-flowered inflorescences, narrower buds, less ribbed fruits and dull juvenile leaves.

Specific References: Brooker (1974), Brooker and Hall (1975c), Elliot and Jones (1986).







**EUCALYPTUS LITOREA** Brooker & Hopper

Number of records: 1

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0)
unspecified(1)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (50%), Not (50%), Unspecified (0%)

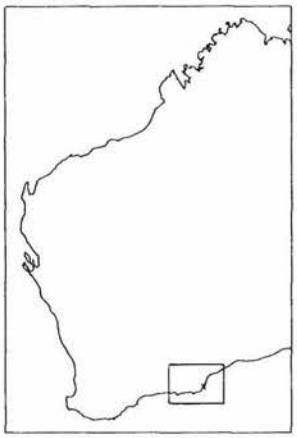
Height: 6 m

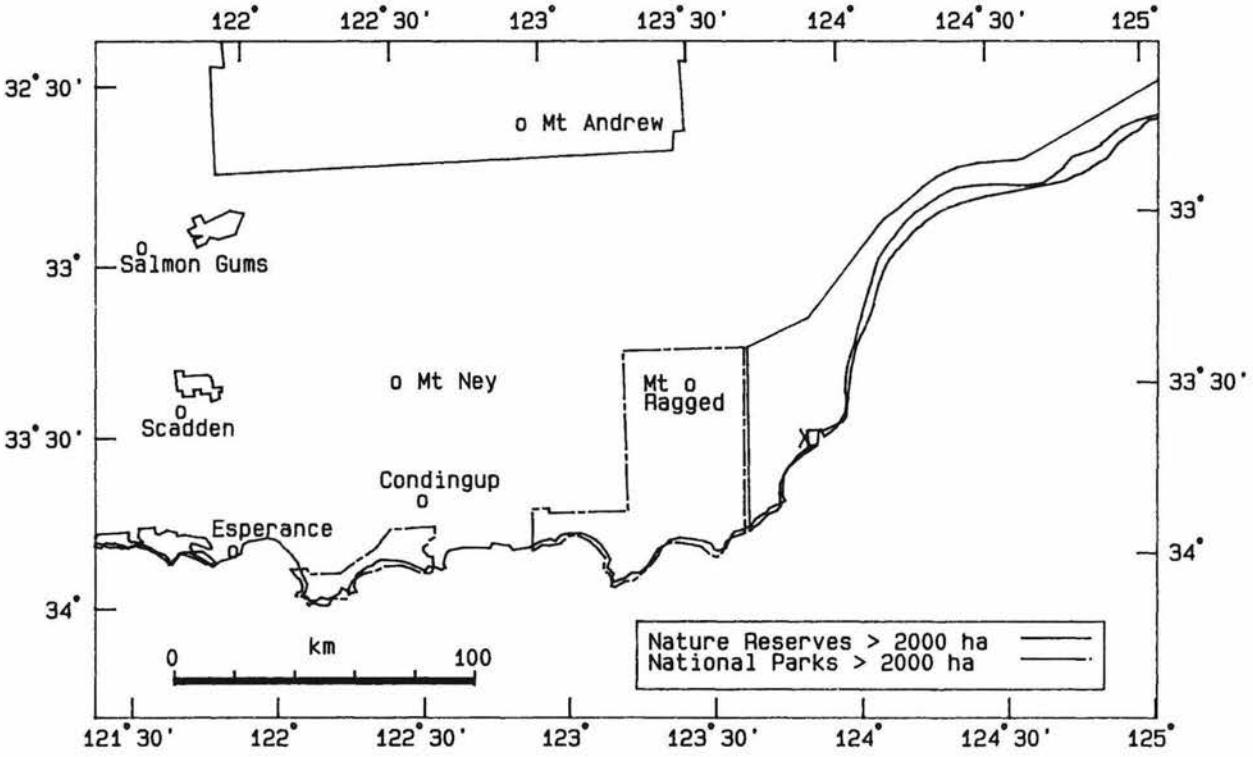
Flowering period: unknown

*Eucalyptus litorea* is known only from the margins and vicinity of a few coastal salt lakes near Israelite Bay. It is 'locally common' on land vested as townsite and nature reserve. Exact size and distribution of populations has not been documented. The area is remote and inadequately surveyed and further searching in Cape Arid National Park and Nuytsland Nature Reserve is required before its conservation status can be assessed. It may be of value in the reclamation of salt-affected areas.

*Eucalyptus litorea* is a tall, robust mallee closely related to *E. famelica* and *E. rigens*. It has rough, grey bark over most of the stems, slightly glossy leaves and sometimes ribbed buds and fruits.

Specific Reference: Brooker and Hopper (1989).





**EUCALYPTUS** aff. **LONGICORNIS** (F. Muell.) F. Muell. ex Maiden

Number of records: 9

Population Size
<10(2) 10-20(0) 20-50(1) 50-100(0) 100-500(1) >500(0) unspecified(5)

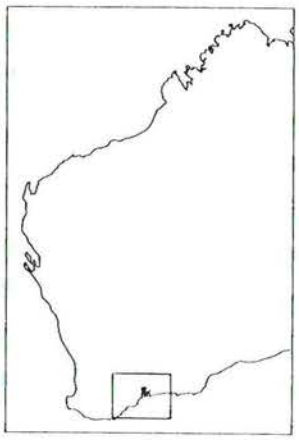
Conservation Status
Restricted to road verge (11%), Not (56%), Unspecified (33%)
In conservation reserve (11%), Not (89%), Unspecified (0%)

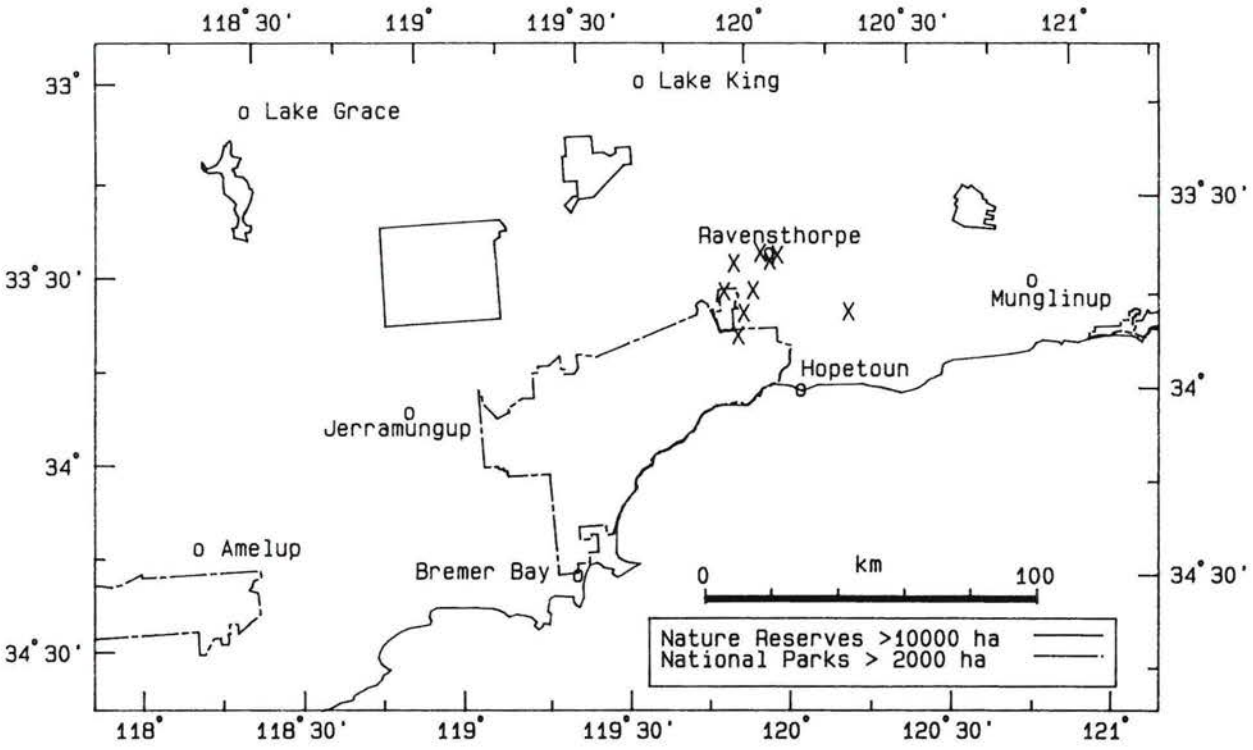
Height: 2-7 m

Flowering period: unknown

*Eucalyptus* aff. *longicornis* is restricted to an area south of Ravensthorpe over a range of almost 40 km. It grows in mallee and woodland communities with *E. annulata, E. brachycalyx, E. conglobata* and *E. occidentalis*. Its habitat is loamy and clayey soils on flats, slopes and hilltops. The isolated record south-east of Kundip is from a calcareous ridge. One population of two individuals was recorded from the Fitzgerald River National Park, with the remainder occurring on private property and road verge. Seven new records were made during the course of the survey which suggests that intensive fieldwork may find this taxon to be more common in the area.

*E.* aff. *longicornis* is a tree-mallee with glossy, green leaves and a stocking of rough, fibrous bark. The bark above is smooth, olive or grey-brown and shedding in ribbons. *E. longicornis* differs in being a tree with longer budcaps.





**EUCALYPTUS MACRANDRA** F. Muell. ex Benth.

**River Yate**

Number of records: 29

Population Size
<10(2) 10-20(2) 20-50(2) 50-100(2) 100-500(2) >500(2)
unspecified(17)

Conservation Status
Restricted to road verge (0%), Not (93%), Unspecified (7%)
In conservation reserve (72%), Not (24%), Unspecified (4%)

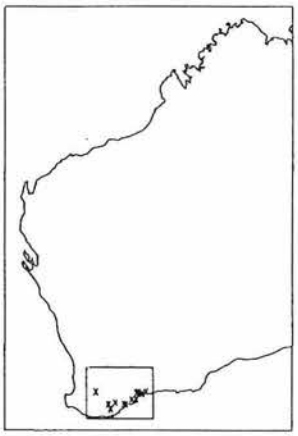
Height: 1.5-8 m

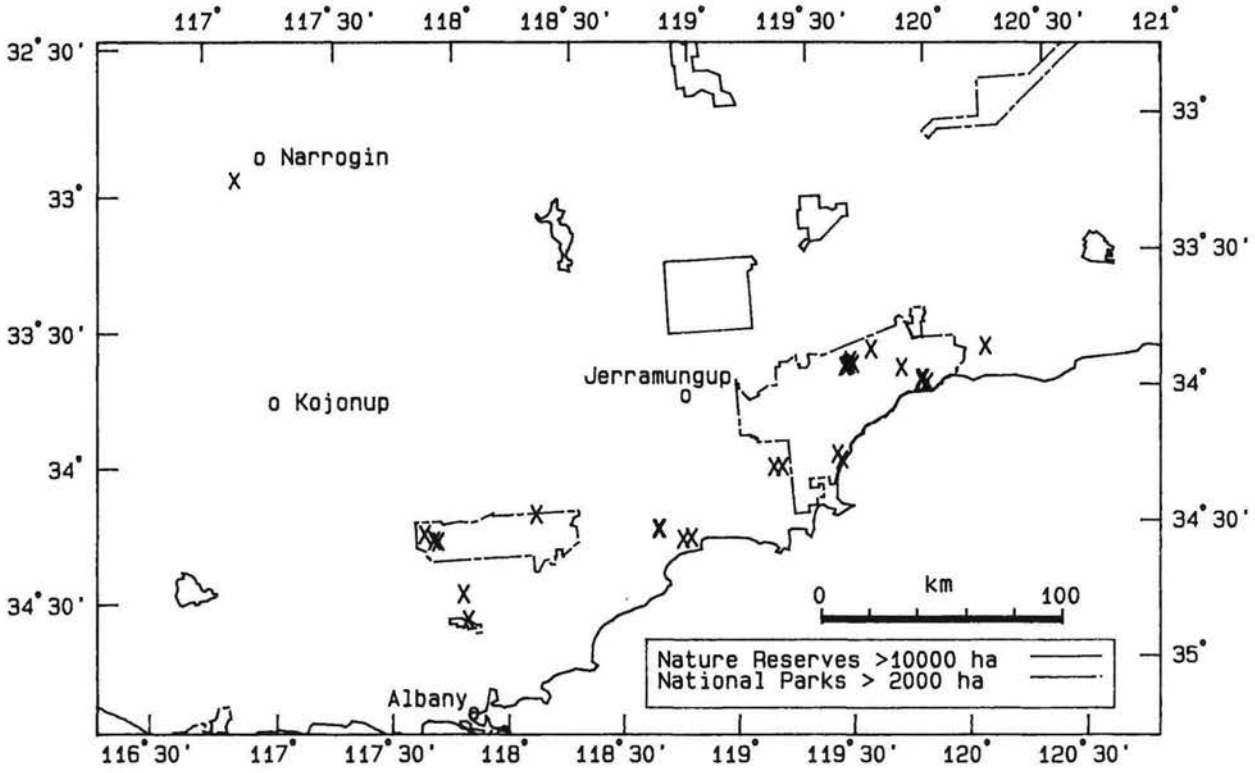
Flowering period: December - April

*Eucalyptus macrandra* occurs from the Stirling Range east to near Hopetoun, with a disjunct population south-west of Narrogin. It is usually associated with watercourses, growing in mixed soils of clay, loam and sand, often over granite. It forms mallee-heath or low woodland communities with other eucalypt species including *E. occidentalis, E. phaenophylla, E. 'petila'* and *E. marginata.* Nineteen new records were made during the survey, with the discovery of a population in Borgey State Forest near Narrogin extending its range by over 160 km. Of the total records, 72 per cent are from the Fitzgerald River, Stirling Range and Porongurup National Parks and a nature reserve near Boxwood Hill. Mass hybridization with *E. 'petila'* has been recorded in the Fitzgerald River National Park. Possible hybrids with *E. occidentalis* were also observed.

*E. macrandra* is a smooth barked mallee or rarely a small tree recorded to 8 m in height but usually growing to 4-5 m. It has glossy leaves, narrow, horn-shaped budcaps and lemon-yellow flowers. It is closely related to *E. 'olivacea'*, differing in its smaller leaves, buds and fruits.

Specific References: Bentham (1867), Holliday and Watton (1980), Elliot and Jones (1986).





**EUCALYPTUS MACROCARPA** Hook. ssp. **ELACHANTHA**
Brooker & Hopper

**Small-leaved Mottlecah**

Number of records: 39

Population Size
<10(11) 10-20(7) 20-50(7) 50-100(4) 100-500(4) >500(0)
unspecified(6)

Conservation Status
Restricted to road verge (23%), Not (67%), Unspecified (10%)
In conservation reserve (8%), Not (92%), Unspecified (0%)

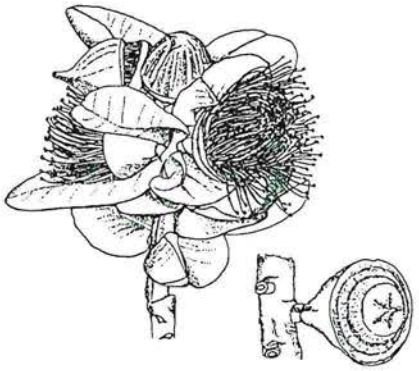
Height: 1-2 m

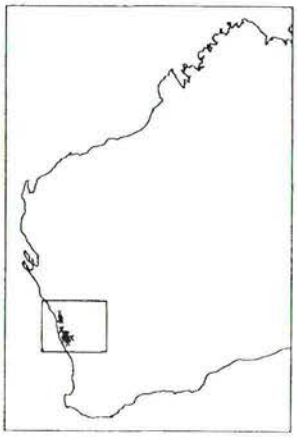
Flowering period: April - May, August - September

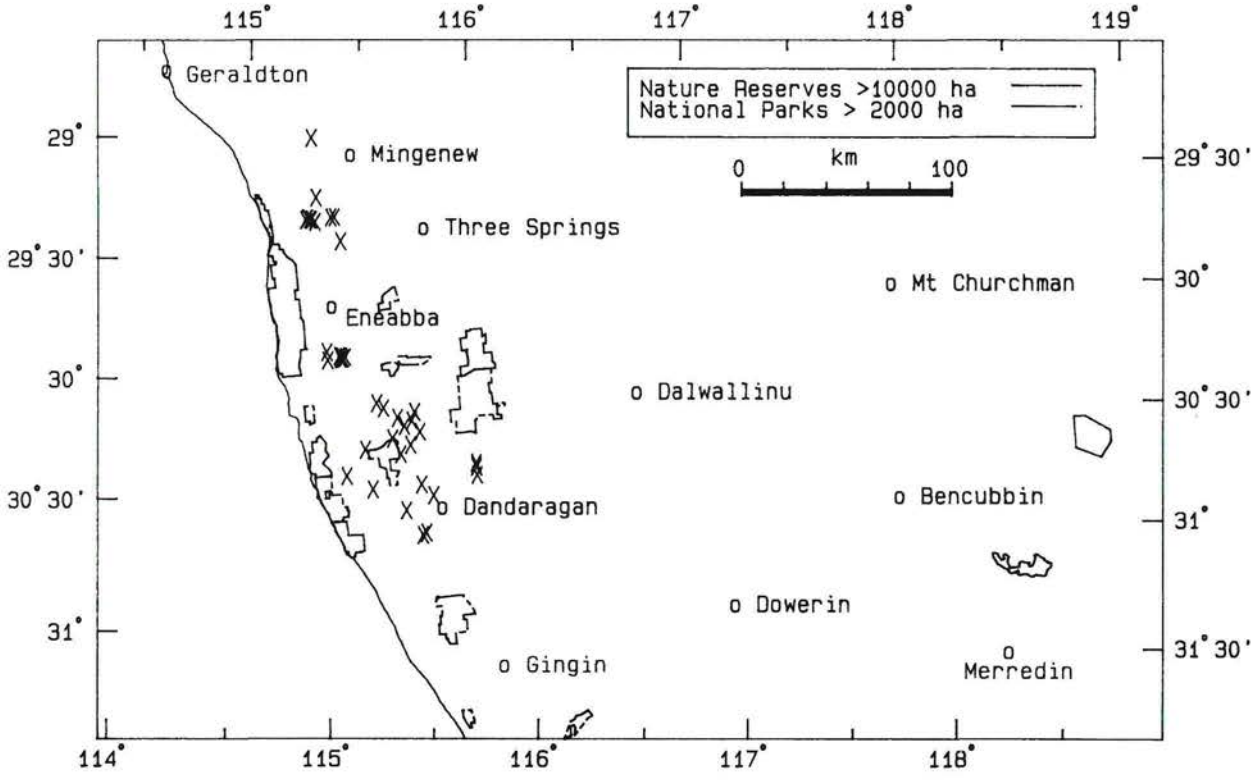
A subspecies of *Eucalyptus macrocarpa* occurring over a 200 km range from south-east of Geraldton to near Yandin Hill. It grows emergent from dense low heath on the sandy lateritic soils of the undulating northern sandplains. Only a few populations of ssp. *macrocarpa*, which is widely distributed throughout the wheatbelt, occur within its range. It is poorly reserved with two records, totalling <40 individuals, in conservation areas. One population of about 70 plants occurs in a Shire reserve for recreation, camping and conservation of flora. Other populations are from private property, road verge and vacant Crown land. Monitoring of populations, particularly with regard to further clearing, is required. More secure reservation of this subspecies would be desirable.

*E. macrocarpa* ssp. *elachantha* is a sprawling mallee with dull, grey leaves, large red flowers and glaucous buds, fruits and branchlets. It differs from ssp. *macrocarpa* in its lower habit (up to 2.5 m) and usually smaller leaves, buds and fruits. It may also have short pedicels and peduncles which are absent in ssp. *macrocarpa*.

Specific Reference: Brooker and Hopper (1993).







**EUCALYPTUS MEGACORNUTA** Gardner

**Warted Yate**

Number of records: 16

Population Size
<10(1) 10-20(0) 20-50(1) 50-100(0) 100-500(1) >500(0)
unspecified(13)

Conservation Status
Restricted to road verge (0%), Not (88%), Unspecified (12%)
In conservation reserve (31%), Not (69%), Unspecified (0%)

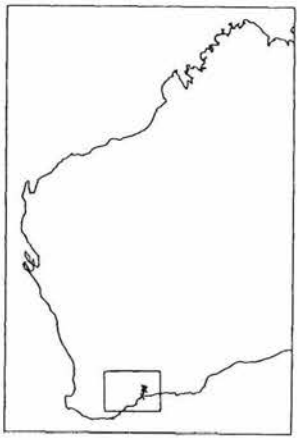
Height: 6-8 m

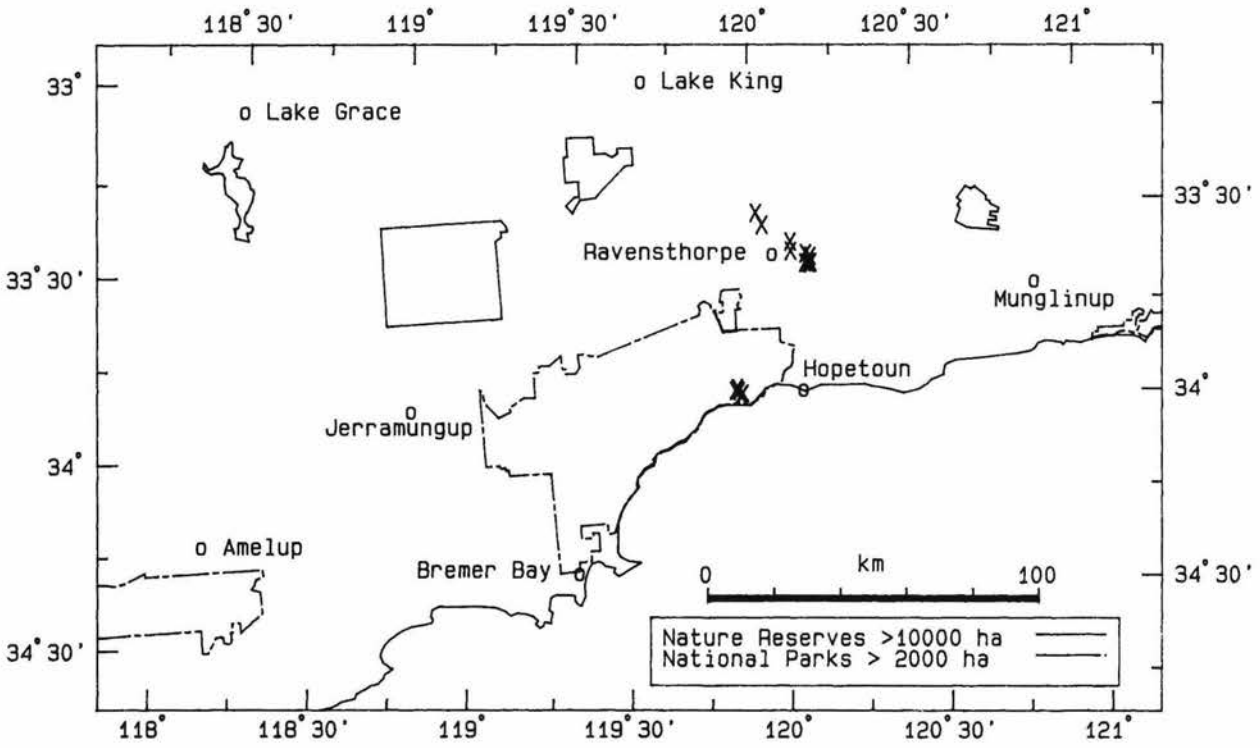
Flowering period: July - December

*Eucalyptus megacornuta* is known from a few localities to the north and east of Ravensthorpe and in the Whoogarup Range of the Fitzgerald River National Park. It occurs on low hills and slopes, often above creeklines, on rocky soils of loam, laterite and quartzite. It forms low forest or woodland communities with other eucalypt species including *E. lehmannii, E. occidentalis* and *E. macrandra*. Of the total records 31 per cent are from the national park. The populations from near Ravensthorpe occur on common reserve, vacant Crown land and private property. Some of these populations may be under threat from mining activities. Acquisition of land as a reserve in the Ravensthorpe region would greatly improve its conservation status. Further survey in the less accessible areas of the Ravensthorpe Range and national park are required. It has been widely cultivated.

*E. megacornuta* is a small, smooth-barked tree or mallet with a sparse crown of glossy leaves. It has pendulous, elongated buds, yellow-green flowers and woody, bell-shaped fruits. It differs from closely related species, *E. burdettiana, E. newbeyi* and *E. talyuberlup*, in its prominently warty operculum.

Specific References: Gardner (1942), Holliday and Watton (1980), Pryor (1981), Bennett (1982), Elliot and Jones (1986).





**EUCALYPTUS MELANOPHITRA** Brooker & Hopper

Number of records: 10

Population Size
<10(0) 10-20(1) 20-50(1) 50-100(0) 100-500(2) >500(1) unspecified(5)

Conservation Status
Restricted to road verge (0%), Not (90%), Unspecified (10%)
In conservation reserve (30%), Not (70%), Unspecified (0%)

Height: 4.5-12 m

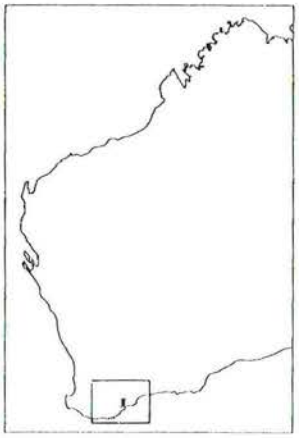
Flowering period: February

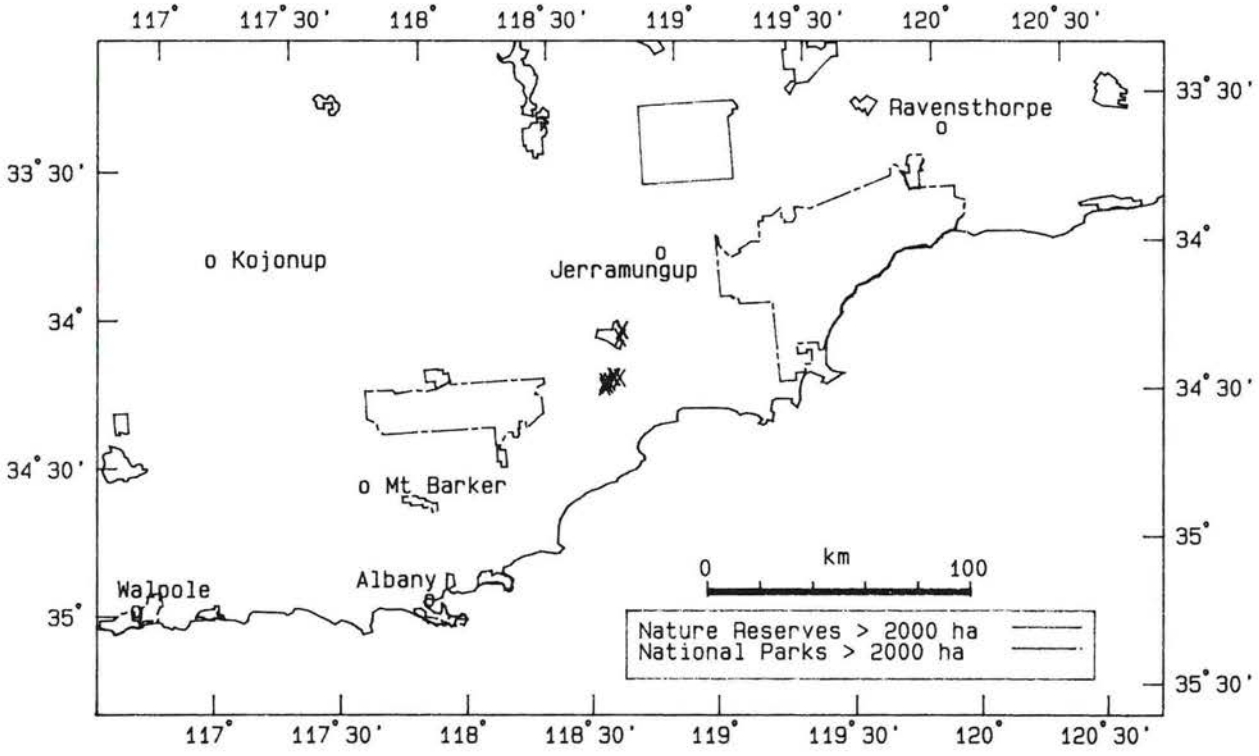
*Eucalyptus melanophitra* is known from several popoulations over a range of *ca* 20 km in the lower Corackerup Creek and Pallinup River areas north of Boxwood Hill. It usually occurs on or near stony breakaways, in loamy and clayey soils, where it forms low woodlands or forests with *E. platypus, E. 'redacta'* and *E. transcontinentalis*. At one site it was recorded from river flats with *E. rudis* and *Allocasuarina* sp. It is abundant in the localized populations, three of which (30 per cent of total records) occur in a nature reserve. Although possibly more widespread in the reserve and private bushland, it is not likely to be common in the well surveyed and developed region. Collection of seed and protection of the populations from accidental destruction is required.

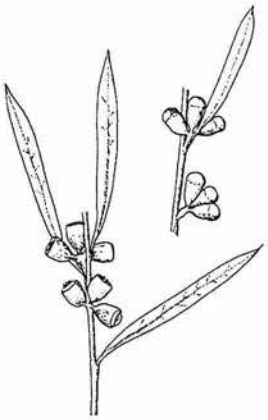
*E. melanophitra* is allied to the more widespread *E. xanthonema* (Appendix 1), but differing in its mallet or small tree form, rough basal bark, broader leaves and breakaway habitat. It has dull, green leaves and spindle-shaped buds with horn-shaped budcaps often narrower than the hypanthium.

Specific Reference: Brooker and Hopper (1991).

NOTE: It was recently found near the western boundary of the Fitzgerald River National Park.







**EUCALYPTUS MERRICKIAE** Maiden & Blakely

Number of records: 20

Population Size
<10(3) 10-20(2) 20-50(3) 50-100(3) 100-500(0) >500(0) unspecified(9)

Conservation Status
Restricted to road verge (15%), Not (50%), Unspecified (35%)
In conservation reserve (10%), Not (90%), Unspecified (0%)

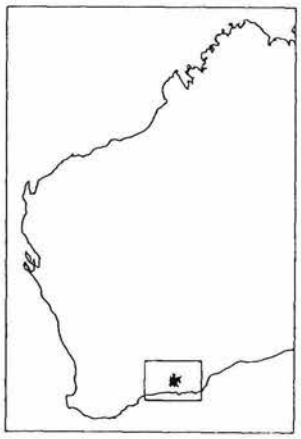
Height: 1.3-3.5 m

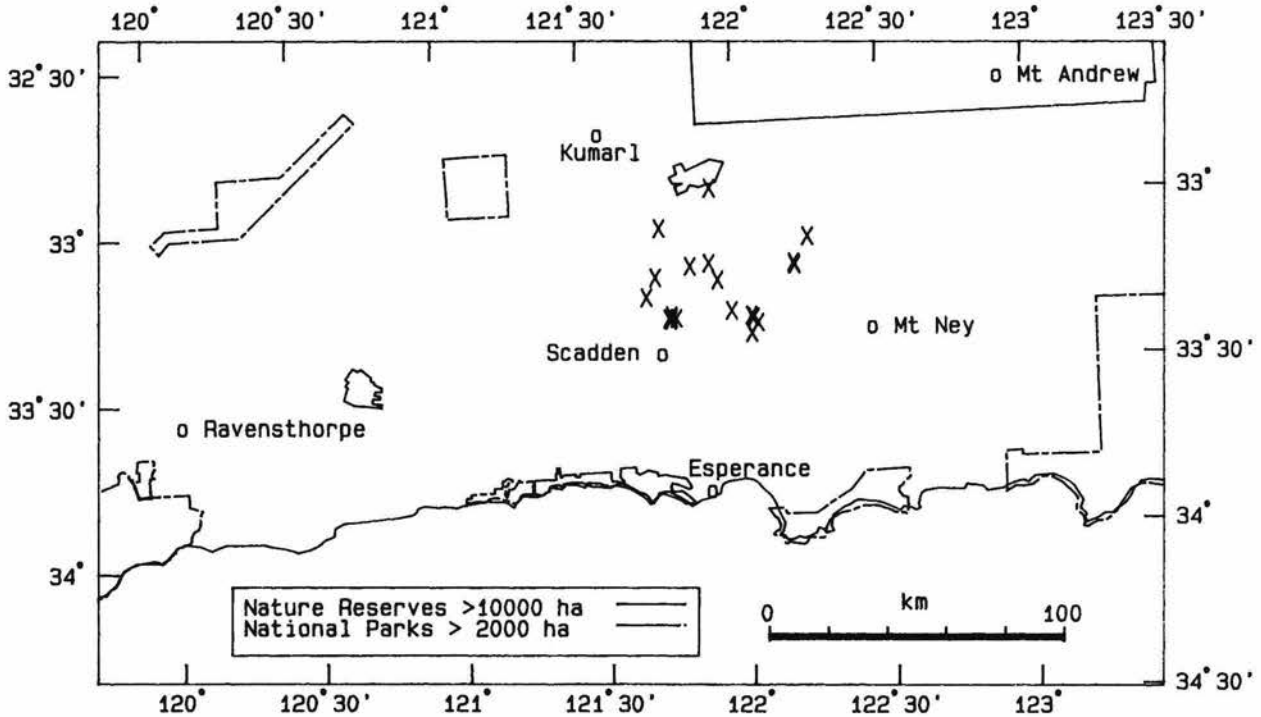
Flowering period: August - December

*Eucalyptus merrickiae* is restricted to a range of approximately 60 km in the area north of Esperance between Scadden, Dowak and Sheoak Hill. It grows near salt lakes in sandy or sandy clay soils on low-lying flats or gradual slopes. The surrounding vegetation is mallee or mallee-heath with *E. eremophila, E. halophila* and *E. kessellii* most commonly associated. It is confined to agricultural areas, with only two populations (of < 200 plants) occurring in conservation reserves. Other records are from private property, road verge and vacant Crown land. Recent surveys have resulted in ten new records but further survey, particularly in the north-east of its range, is required. *E. merrickiae* is gazetted as Declared Rare Flora [Appendix 2].

*E. merrickiae* is a densely branched, spreading mallee with rough, grey bark and a dense crown of narrow leaves. It resembles *E. leptocalyx, E. scyphocalyx* and *E. platycorys*, differing from them in its narrower leaves, three-flowered inflorescences, shorter peduncles and smaller buds and fruits.

Specific References: Maiden and Blakely (1925), Elliot and Jones (1986).





**EUCALYPTUS MICROSCHEMA** Brooker & Hopper

Number of records: 12

Population Size
<10(0) 10-20(0) 20-50(5) 50-100(1) 100-500(2) >500(1) unspecified(3)

Conservation Status
Restricted to road verge (0%), Not (75%), Unspecified (25%)
In conservation reserve (25%), Not (75%), Unspecified (0%)

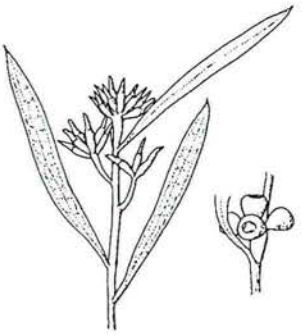
Height: 1-2 m

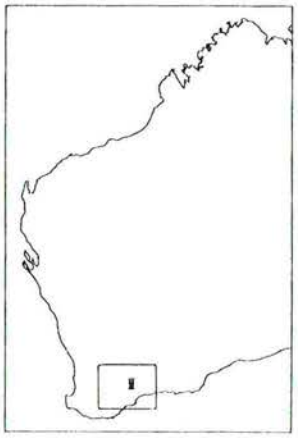
Flowering period: February - May

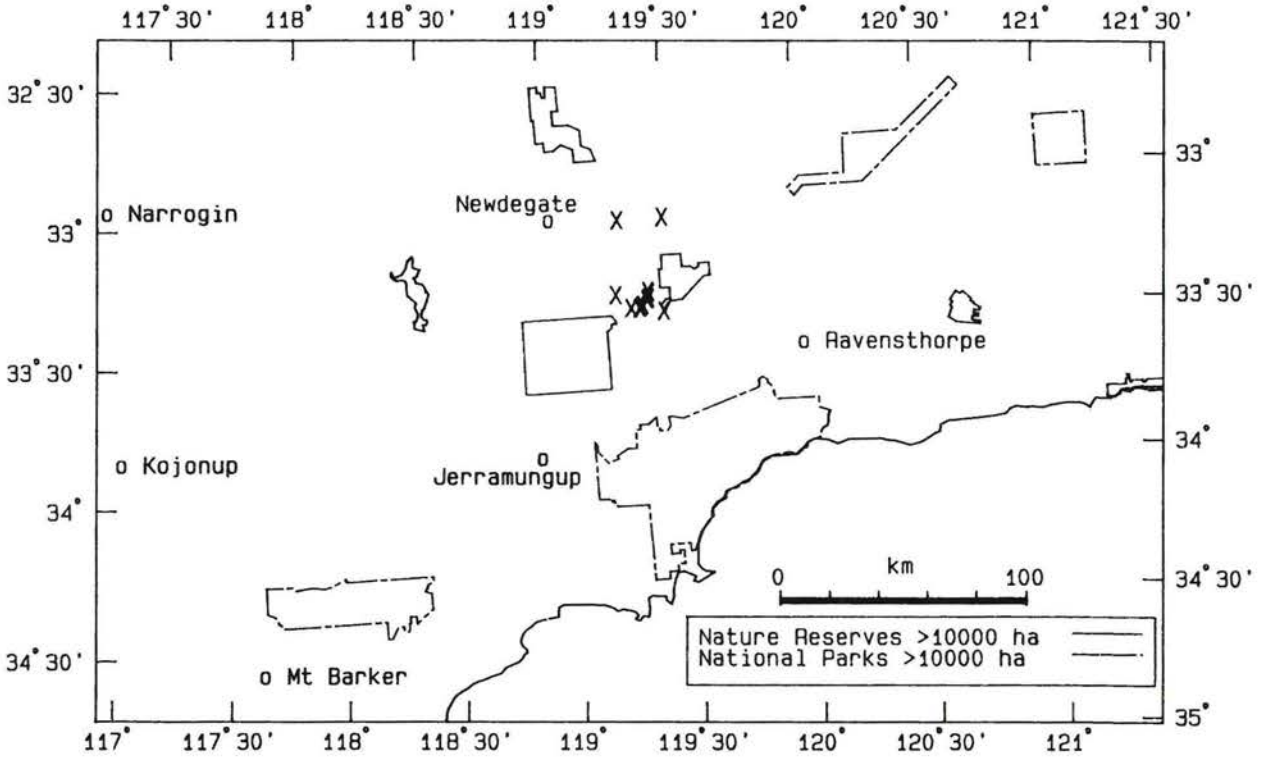
A southern wheatbelt species occurring east and south-east of Newdegate. It grows emergent from low heath on sandy plains, slopes and low hilltops, often in association with *Eucalyptus tetragona, E. albida* and *E. eremophila*. The populations range in size from a few to several hundred individuals, with 25 per cent of the total records from two conservation reserves. Its distribution is within areas being cleared for agriculture and it has been inadequately surveyed. Monitoring of known sites and further survey is required.

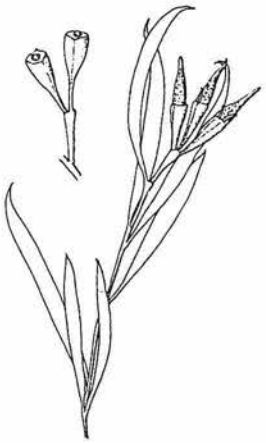
*E. microschema* is a shrubby, smooth-stemmed mallee easily distinguished from surrounding vegetation by its dense, erect foliage. Its leaves are narrow, grey-green, maturing to glossy on the older branchlets. It is closely related to *E. subangusta* which is a larger mallee with dull leaves held at various angles.

Specific Reference: Brooker and Hopper (1991).









**EUCALYPTUS 'MIMICA'** Brooker & Hopper ined.

Number of records: 5

Population Size
<10(0) 10-20(0) 20-50(3) 50-100(0) 100-500(1) >500(0) unspecified(1)

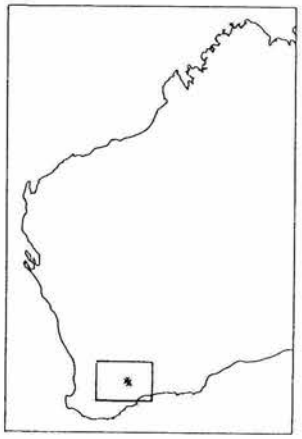
Conservation Status
Restricted to road verge (40%), Not (60%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

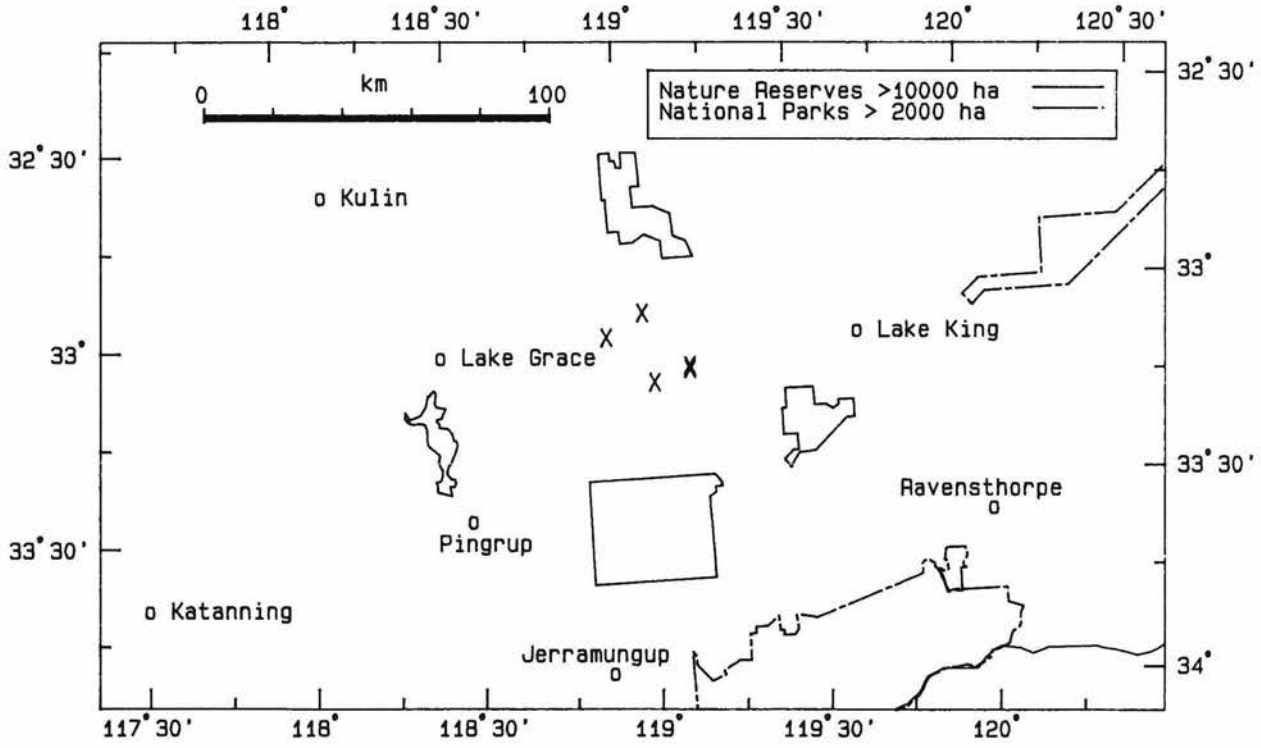
Height: 4-7 m

Flowering period: unknown

*Eucalyptus 'mimica'* is known from a few localities in the Newdegate area where it grows on sandy or clayey soils on flat, often salt-affected country. It forms open mallee or woodland communities in association with *E. calycogona* and *E. sargentii*, with an understorey of *Melaleuca* and *Acacia* species. All collections are from road verge and private land. There is considerable intergradation between *E. 'mimica'* and *E. suggrandis*, making positive identification and survey work difficult. More intensive surveys are required before conservation status can be assessed.

*E. 'mimica'* is a mallee with smooth stems and a terminal canopy of narrow, erect leaves. Its buds and fruits are square in cross-section with persistent sepals on the bud from the shed outer operculum. It resembles *E. steedmanii*, differing in its mallee habit, erect buds and fruits and narrower, beaked inner operculum . The closely related *E. 'continens'* which occurs nearby retains its outer operculum until flowering.





**EUCALYPTUS MISELLA** L. Johnson & K. Hill

Number of records: 5

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(5)

Conservation Status
Restricted to road verge (0%), Not (40%), Unspecified (60%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

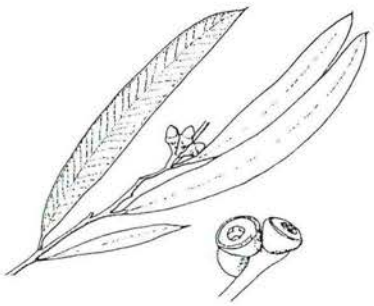
Height: 1.4-3 m

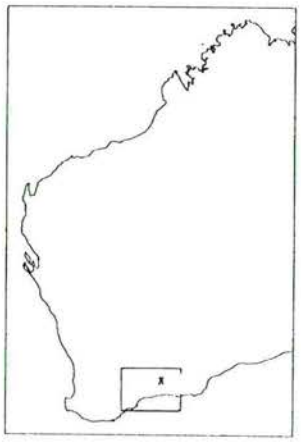
Flowering period: August - October

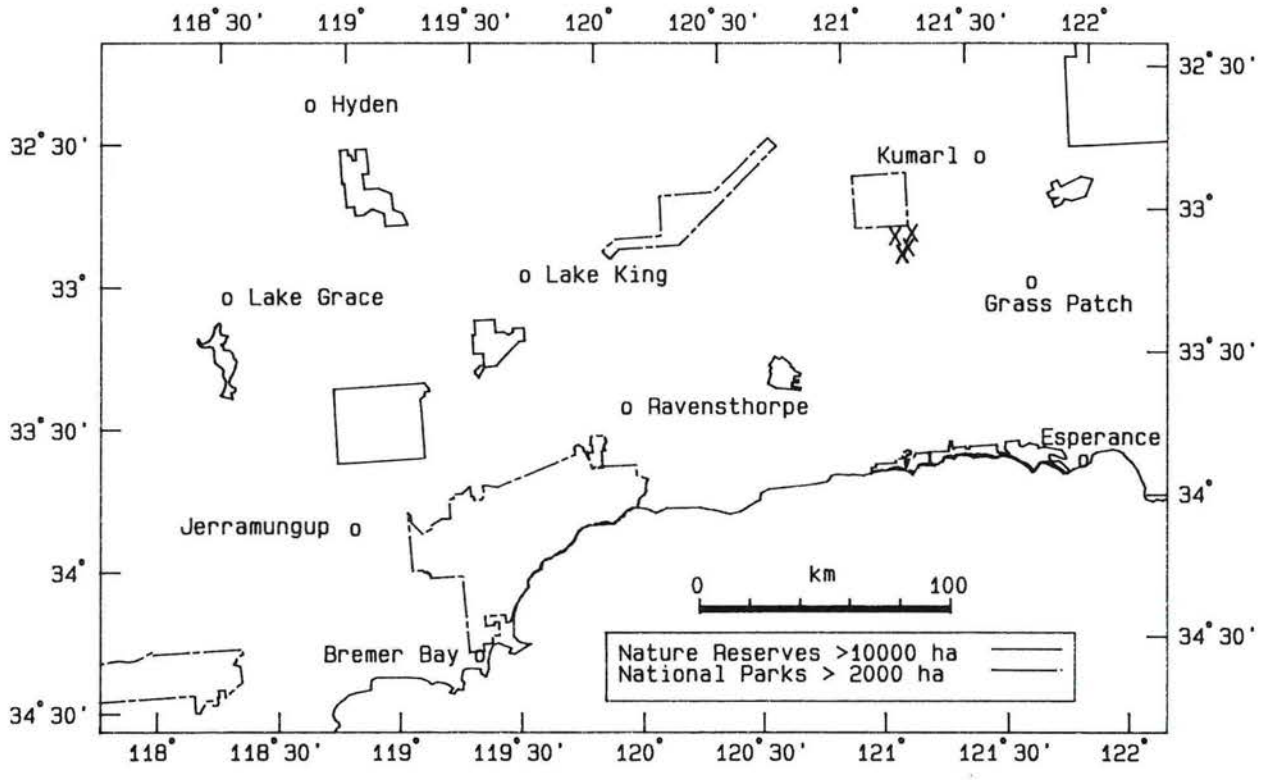
Recorded from a small area south of Peak Charles National Park where it grows on sandy flats and gradual slopes. The associated vegetation is open shrub-mallee over heath with *Eucalyptus tetragona* and *E. incrassata*. It is not known from any conservation reserves and existing populations require monitoring with regard to further clearing. The closely related *E. foliosa* occurs in salty areas around Gibson and Truslove north of Esperance, and may easily be mistaken for *E. misella*.

*E. misella* is a low, dense mallee with smooth bark and erect, narrow leaves that mature to glossy green. Its buds and fruits are crowded in clusters of up to seven. It is similar to *E. angustissima*, differing in its wider leaves, longer peduncles and enclosed valves. *E. foliosa* differs in its greener, narrower leaves, slightly smaller fruits and saline habitat.

Specific References: Burgman (1985a), Hill and Johnson (1992).







**EUCALYPTUS MOOREANA** W. Fitzg. ex Maiden

**Moore's Gum**

Number of records: 8

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(8)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

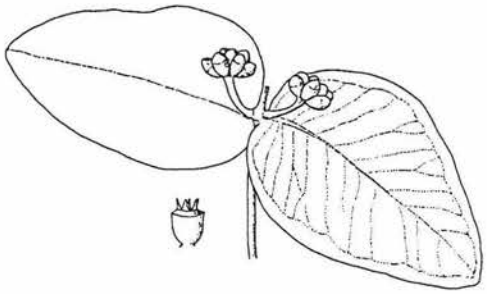
Height: 3-4 m

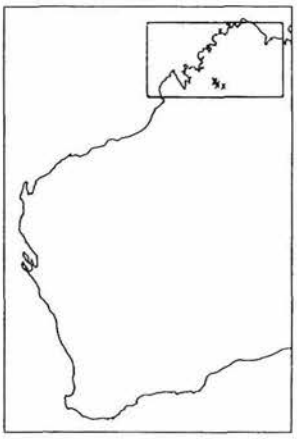
Flowering period: May, August - October

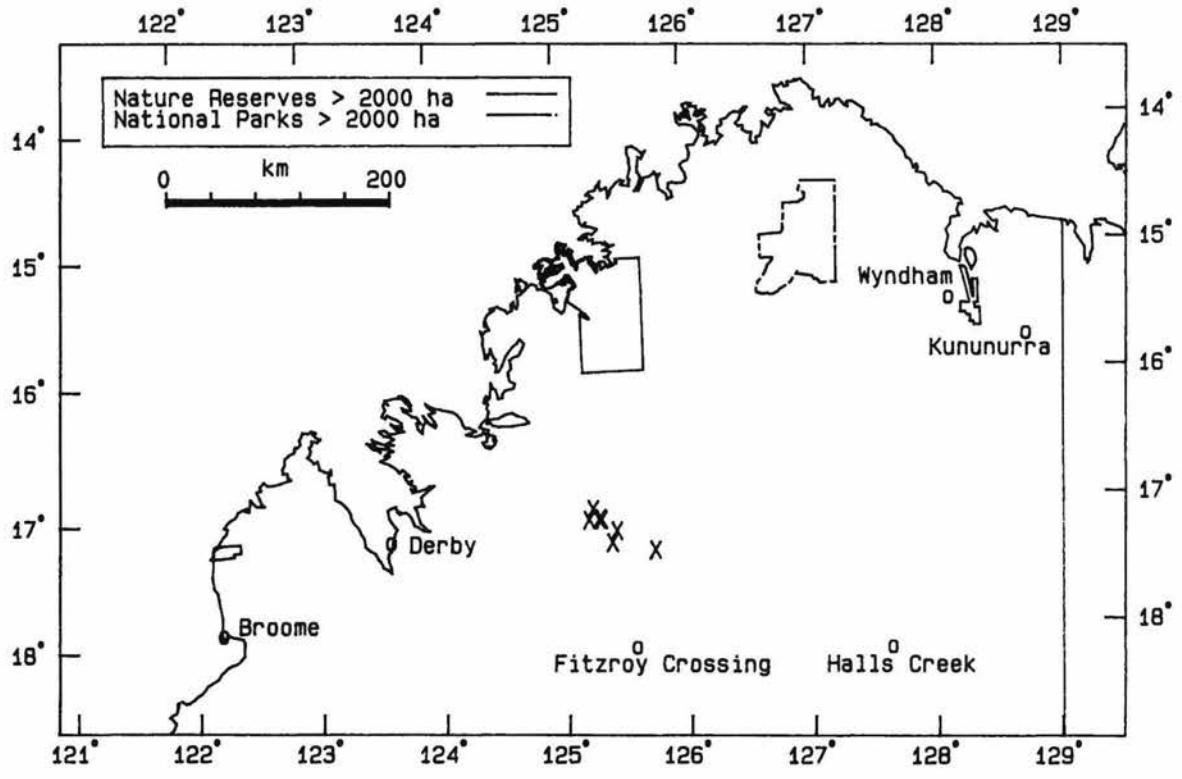
*Eucalyptus mooreana* occurs over a 70 km range where it is confined to the summits and slopes of the King Leopold and Lady Forrest Ranges north of Fitzroy Crossing. It grows among rocky sandstone, quartzite or granite in low open shrubland. *E. dichromophloia* and *E. miniata* have been recorded in association. There are several thousand plants over the various sites which occur on two pastoral stations. Too frequent burning is a potential threat and reservation of this species to ensure its long-term survival would be desirable. It is gazetted as Declared Rare Flora [Appendix 2].

*E. mooreana* is a small tree characterized by its usually crooked trunk, smooth white bark and opposite, sessile, often joined leaves. The branchlets, foliage and inflorescences are glaucous.

Specific References: Maiden (1914), Elliot and Jones (1986).







**EUCALYPTUS NEWBEYI** D.J. Carr & S.G.M. Carr

**Beaufort Inlet Mallee**

Number of records: 5

Population Size
<10(1) 10-20(0) 20-50(0) 50-100(0) 100-500(3) >500(0)
unspecified(1)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (40%), Not (60%), Unspecified (0%)

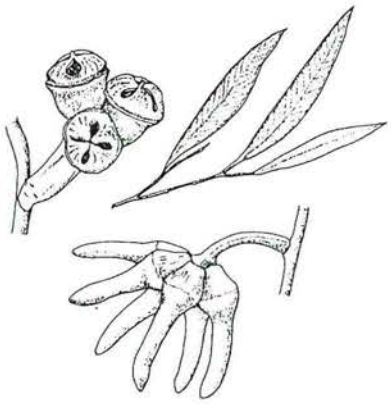
Height: 3.5-7 m

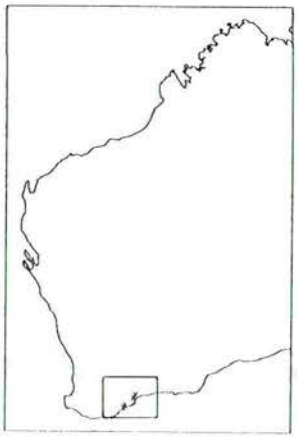
Flowering period: September - February

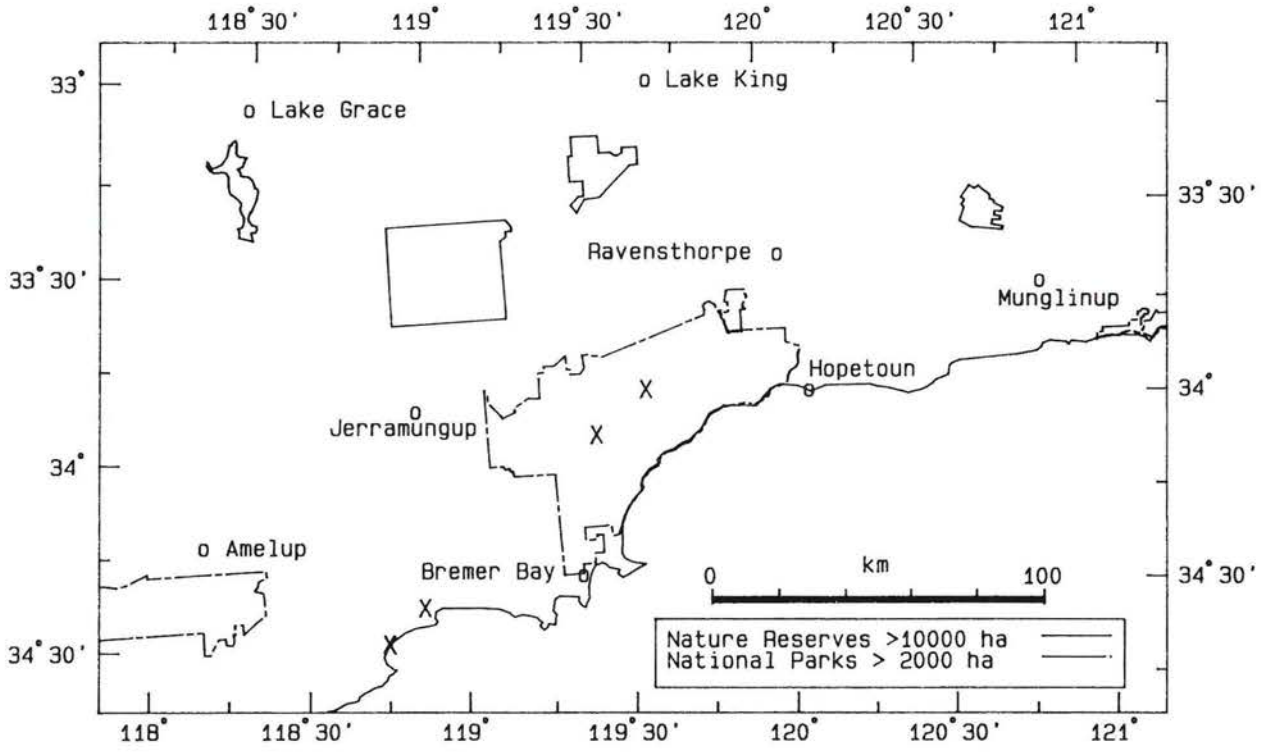
*Eucalyptus newbeyi* is recorded from a few sites in the Fitzgerald River National Park, near Beaufort Inlet and at Swan Gully north of Cape Riche. It forms dense forest or woodland communities on spongolitic loam slopes and cliffs, usually above watercourses. *E. lehmannii, E. falcata, E. preissiana* and *E. angulosa* are common associates. One of the records in the national park was from stony clay foothills and consisted of two individuals plus suspected hybrids with *E. lehmannii*. It is relatively abundant at the southern coastal localities (>500 plants in three populations) which are on land reserved for government requirements, common and recreational purposes. Further populations may occur in the national park and uncleared areas where access is difficult. Close liaison with landowners and careful management is essential. Acquisition of the land supporting large populations would be desirable.

*E. newbeyi* is a small tree with smooth, mottled bark and small, dark green leaves. It is related to *E. burdettiana, E. megacornuta* and *E. talyuberlup*, differing from the two former species in its smooth budcaps and from *E. talyuberlup* in its wider fruits and fewer-flowered inflorescences.

Specific References: Carr and Carr (1980a), Elliot and Jones (1986).







**EUCALYPTUS NIGRIFUNDA** Brooker & Hopper

**Desert Wandoo**

Number of records: 12

Population Size
<10(1) 10-20(2) 20-50(4) 50-100(3) 100-500(1) >500(0) unspecified(1)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

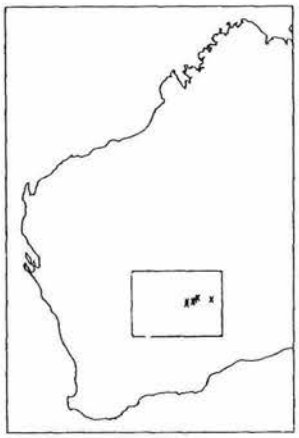
Height: 5-7 m

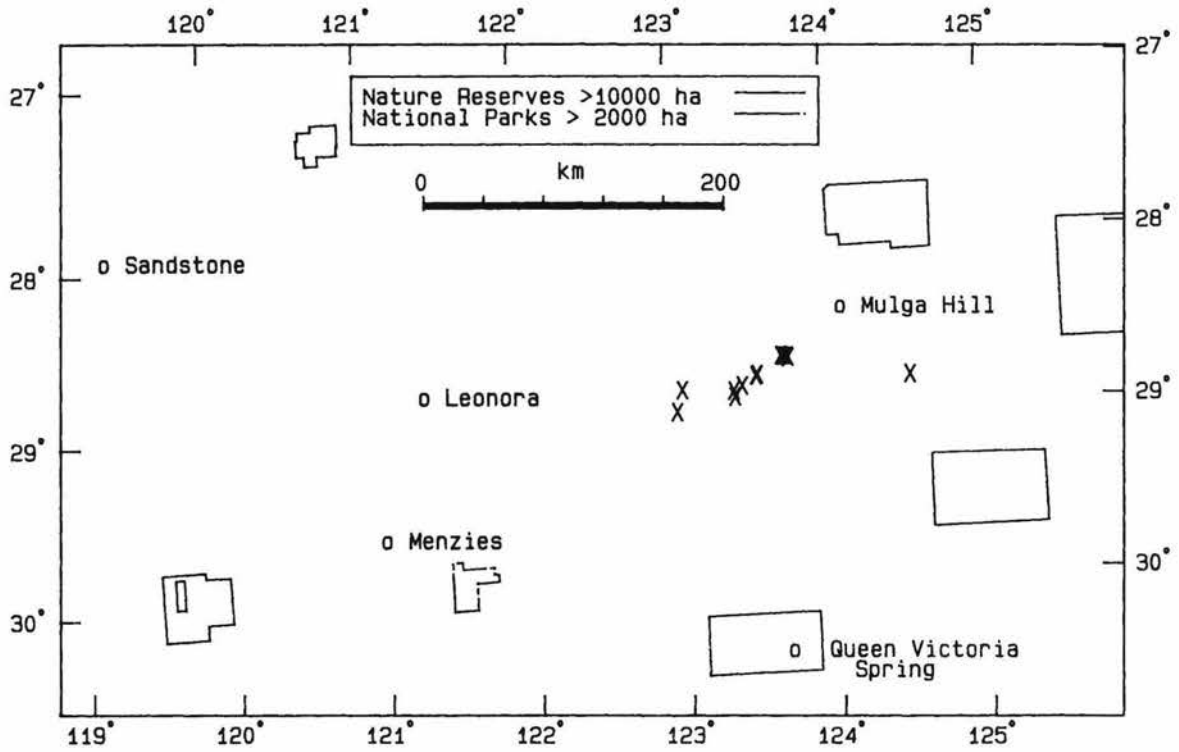
Flowering period: unknown

A remote species of the Lake Minigwal-Rason Lake area in the Great Victoria Desert. The populations are from lateritic breakaways and adjacent clay flats and sandplains where they form low woodlands over spinifex (*Triodia* sp.), saltbush (*Atriplex* sp.) and *Acacia* scrub. *Eucalyptus gongylocarpa* and *E. youngiana* are often associated. Disjunct collections over 200 km to the west near Lake Barlee are believed to be intergrades with *E. capillosa* as they lack the black butt that characterizes *E. nigrifunda* (Brooker and Hopper 1991). Occasional individuals of the typical form have been observed without rough bark (Kealley, personal communication). All populations are from vacant Crown land and pastoral leases, some of them covered by mining tenements. The survey has extended the distribution in its area of occurrence but further work in the geographically remote and poorly surveyed region is required. It is not under any immediate threat but acquisition of land reserved for nature conservation would be desirable.

*E. nigrifunda* is a small tree allied to *E. wandoo* and *E. capillosa* but differing in its usually rough, dark basal bark and smaller leaves, buds and fruits.

Specific Reference: Brooker and Hopper (1991).





**EUCALYPTUS "NUTANS"**

**Red-flowered Moort**

Number of records: 24

Population Size
<10(1) 10-20(0) 20-50(1) 50-100(0) 100-500(1) >500(3) unspecified(18)

Conservation Status
Restricted to road verge (4%), Not (75%), Unspecified (21%)
In conservation reserve (12.5%), Not (87.5%), Unspecified (0%)

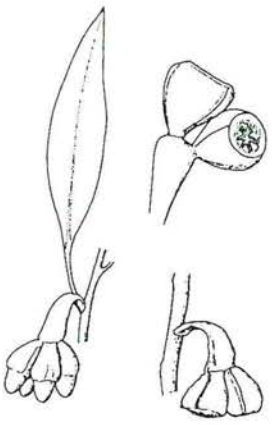
Height: 0.75-7 m

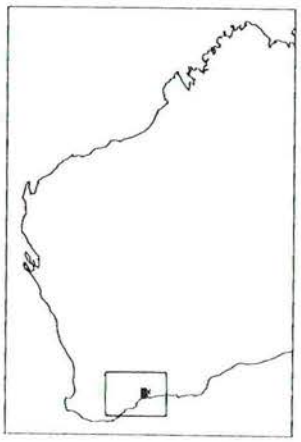
Flowering period: September - December

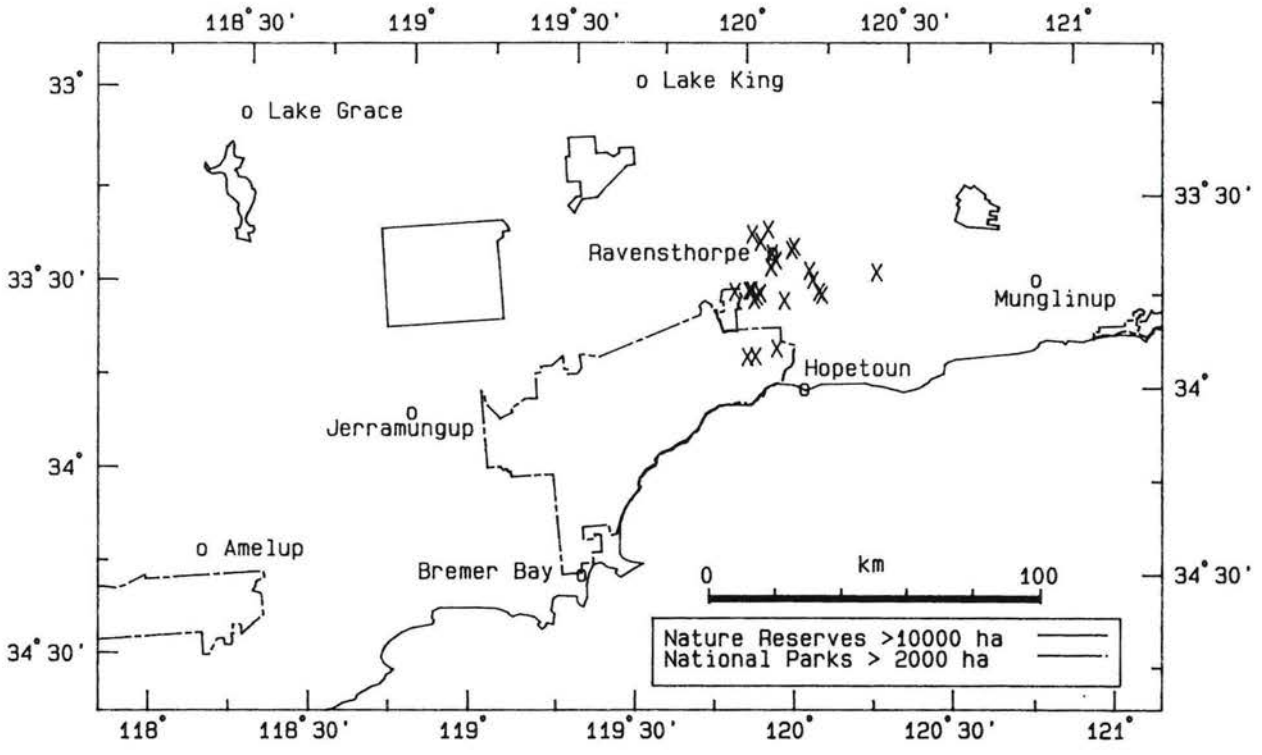
An undescribed species to which the name *"nutans"* has been applied for many years (Chippendale 1973; Kelly 1983). It is restricted to the Ravensthorpe-Hopetoun area where it is found on rocky granite or gravel slopes and flats. Soils are of clay, loam and sand. Surrounding vegetation is mallee-heath or woodland with *Eucalyptus annulata, E. flocktoniae* and *E. clivicola* commonly associated. It is abundant in the Annie Peak area of the Fitzgerald River National Park. Other records are from private property, vacant Crown land and various reserves, including timber and proposed conservation reserves. It is under no immediate threat although acquisition of land supporting large populations in the Ravensthorpe area would be desirable.

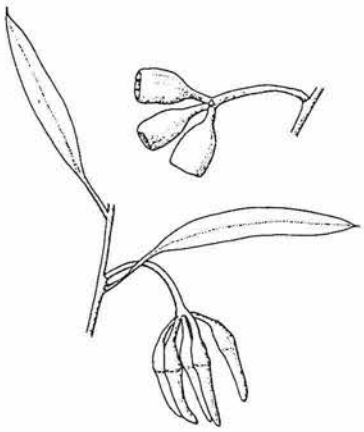
*E. "nutans"* is a mallee or small tree with smooth, sometimes slightly fluted trunks. It is similar to *E. platypus* but has shorter buds, narrower leaves in a more terminal canopy and sometimes red flowers. It differs from *E.* aff. *platypus* in its smooth budcaps and elliptical to lanceolate leaves.

Specific References: Holliday and Watton (1980), Elliot and Jones (1986).









**EUCALYPTUS OCCIDENTALIS** Endl. var. **STENANTHA** Diels ex Maiden

Number of records: 23

Population Size
<10(1) 10-20(4) 20-50(3) 50-100(1) 100-500(2) >500(0) unspecified(12)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (22%), Not (74%), Unspecified (4%)

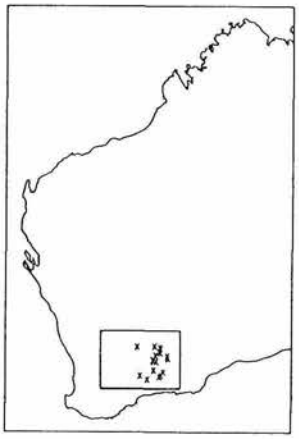
Height: 2-8 m

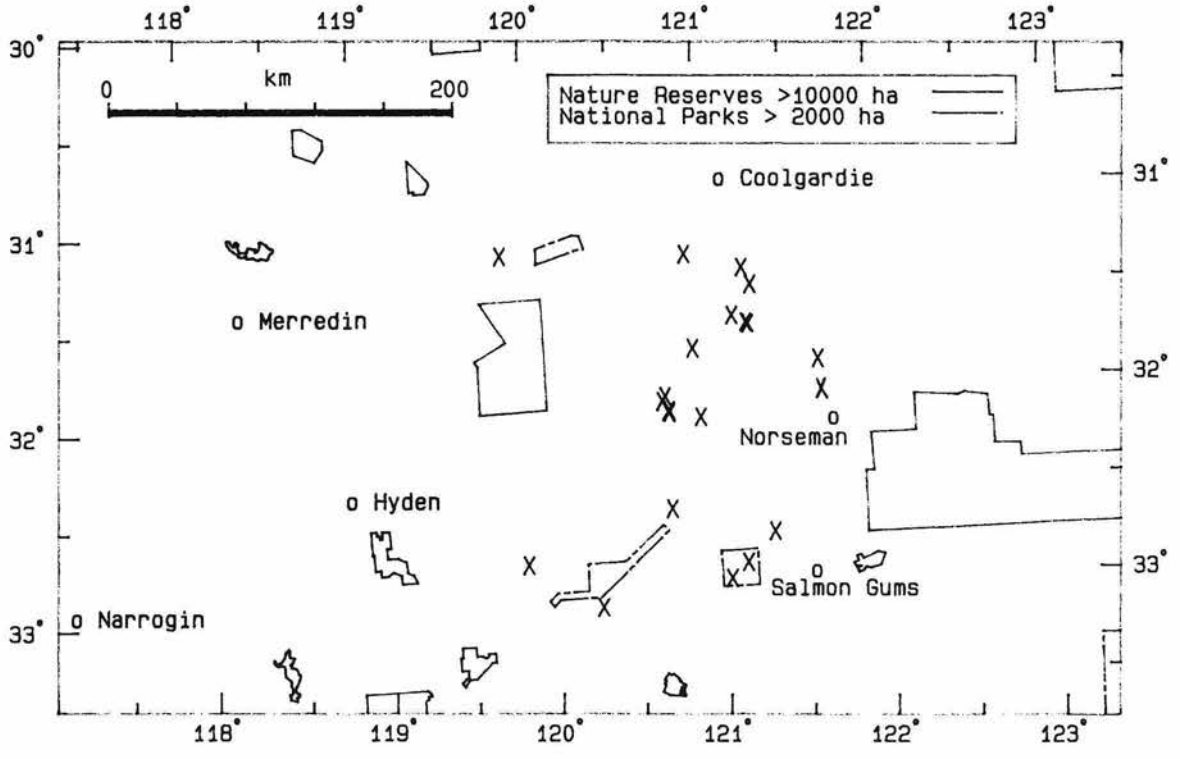
Flowering period: March - May, August - October

*Eucalyptus occidentalis* var. *stenantha* has a scattered and widespread distribution from Karalee Rock, east to Norseman and south toward Swallow Rock. It grows in loamy soils bordering granite outcrops or on adjacent flats and slopes. It forms mallee or woodland communities over thickets of *Acacia, Allocasuarina* and *Melaleuca* species. It is most commonly associated with *E. loxophleba* ssp. *lissophloia* and *E. eremophila*. Of the total records, 22 per cent are from Peak Charles National Park and two nature reserves. The remaining records are mostly from vacant Crown land. Recent surveys have found *E. occidentalis* var. *stenantha* to be more common than previously documented (only nine records prior to 1987), particularly in the north east of its range between Norseman and Coolgardie. It is relatively well protected by its preference for granite rocks which are generally of little agricultural or mineral value.

*E. occidentalis* var. *stenantha* is a mallee or small tree with dark, rough bark at the base. It differs from the typical variety in its lower stature, cylindrical fruits, elongated buds and granite rock habitat.

Specific Reference: Maiden (1903-1933).





**EUCALYPTUS 'OLIVACEA'** Brooker & Hopper ined.

**Granite Mallee**

Number of records: 5

Population Size
<10(2) 10-20(0) 20-50(2) 50-100(0) 100-500(1) >500(0) unspecified(0)

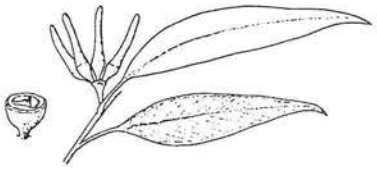
Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (80%), Not (20%), Unspecified (0%)

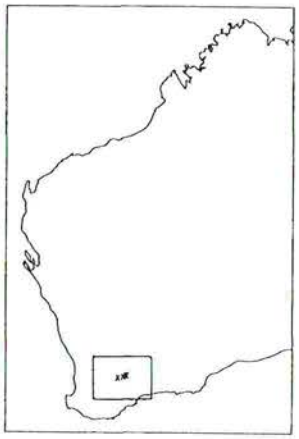
Height: 3-7 m

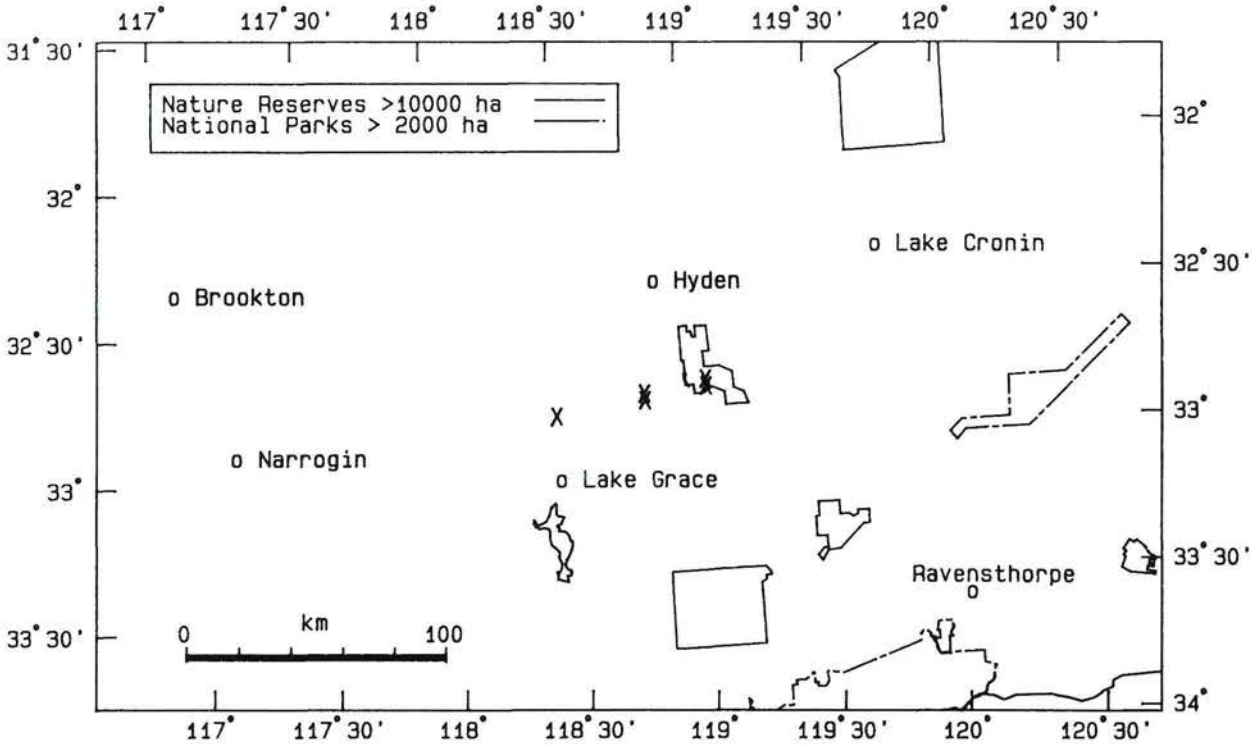
Flowering period: November - December

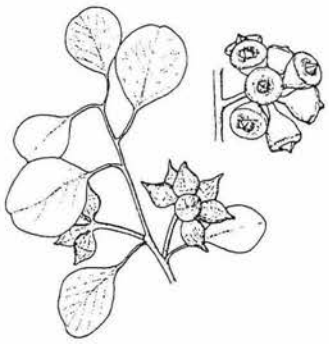
A rare and restricted species known from several populations at five localities between Hyden and Lake Grace. It grows emergent from lithic heath and thickets of *Acacia lasiocalyx*, *Hakea petiolaris* and *Leptospermum erubescens*, in usually sandy soils on granite breakaways and outcrop margins. *Eucalyptus loxophleba* ssp. *gratiae* is often associated. Of the few hundred plants recorded the majority are from two nature reserves, with only one small population on private property. A single hybrid specimen of *E. 'olivacea'* x *E.* aff. *occidentalis* has been observed at the western site. Careful management, particularly with regard to fire regimes, is essential. Seed collection and cultivation is required. It is gazetted as Declared Rare Flora [Appendix 2].

*E. 'olivacea'* is an erect, smooth-stemmed mallee allied to *E. macrandra* but with broader, olive-green leaves and larger buds and fruits. The buds are elongated with a narrow horn-shaped budcap and the fruits are cupular to cylindrical.









**EUCALYPTUS ORBIFOLIA** F. Muell.

**Round-leaved Mallee**

Number of records: 36

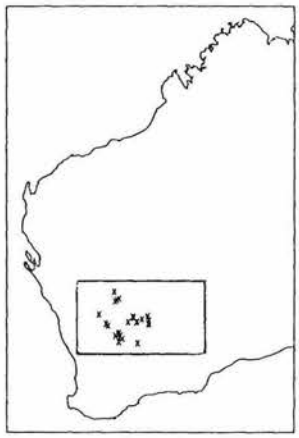
Population Size
<10(6) 10-20(7) 20-50(5) 50-100(2) 100-500(4) >500(0)
unspecified(12)

Conservation Status
Restricted to road verge (0%), Not (97%), Unspecified (3%)
In conservation reserve (25%), Not (67%), Unspecified (8%)

Height: 2-8 m

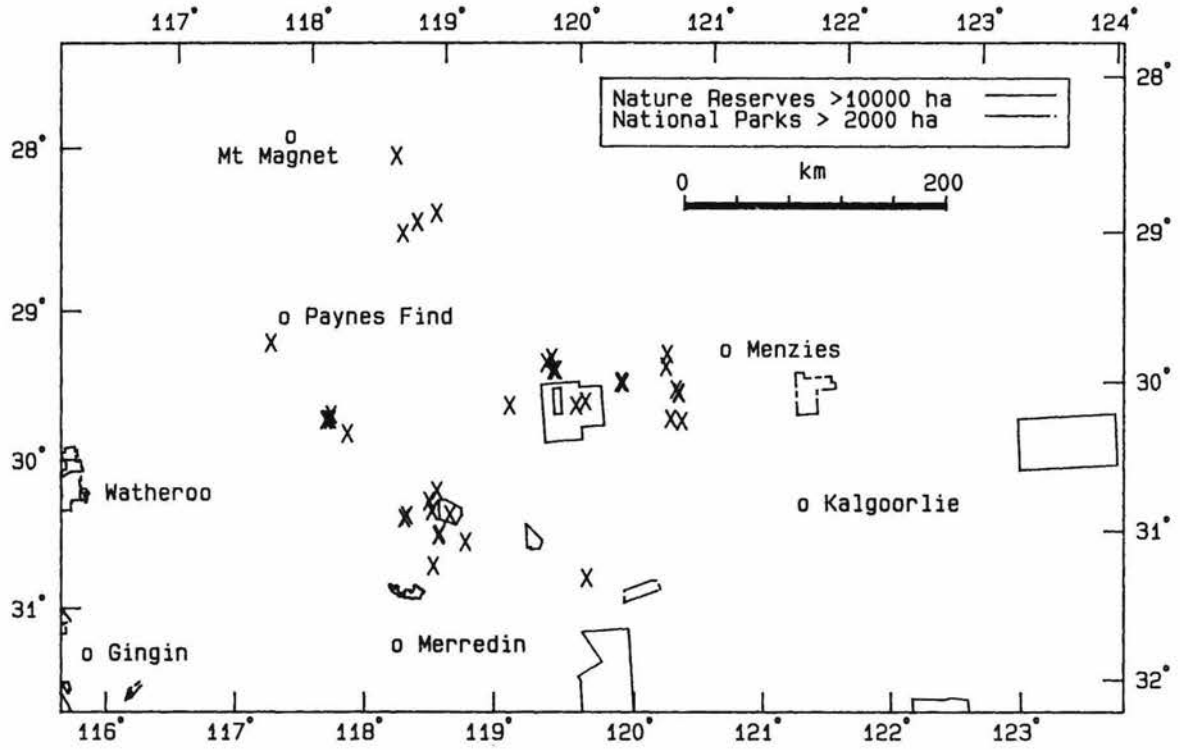
Flowering period: April, July - November

A widespread and scattered species recorded from Sandstone south and east towards Southern Cross and Menzies. It grows in rocky loam soils associated with granite outcrops, occasional populations occurring on sands and clays. It is commonly found with *Eucalyptus petraea,* or more rarely *E. crucis* ssp. *lanceolata,* as an emergent above scrub and thicket of various *Acacia* species, *Kunzea pulchella* and *Allocasuarina campestris*. The majority of populations are from pastoral lands. Twenty-five per cent of the total records are from seven nature reserves occurring mostly in the south of its range. Collections near Rason Lake previously assigned to *E. orbifolia* are, after recent surveys in the area, confirmed to be *E. websteriana* (Kealley, personal communication). A population near Mt Churchman is recognized as a distinct subspecies or species differing in its conical operculum.



*E. orbifolia* is a striking mallee, or less frequently a tree, characterized by its almost round, grey-green leaves with notched apices. Like many other granite species it has minniritchi bark and intensely glaucous inflorescences and branchlets. It is similar to *E. websteriana* which has previously been regarded as a subspecies of *E. orbifolia*.

Specific References: Mueller (1865-66), Holliday and Watton (1980), Jessop (1985), Elliot and Jones (1986).



**EUCALYPTUS ORNATA** Crisp

**Silver Mallet**

Number of records: 25

Population Size
<10(1) 10-20(0) 20-50(2) 50-100(1) 100-500(7) >500(5) unspecified(9)

Conservation Status
Restricted to road verge (4%), Not (80%), Unspecified (16%)
In conservation reserve (76%), Not (24%), Unspecified (0%)

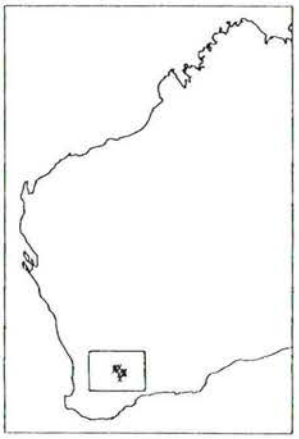
Height: 7-10 m

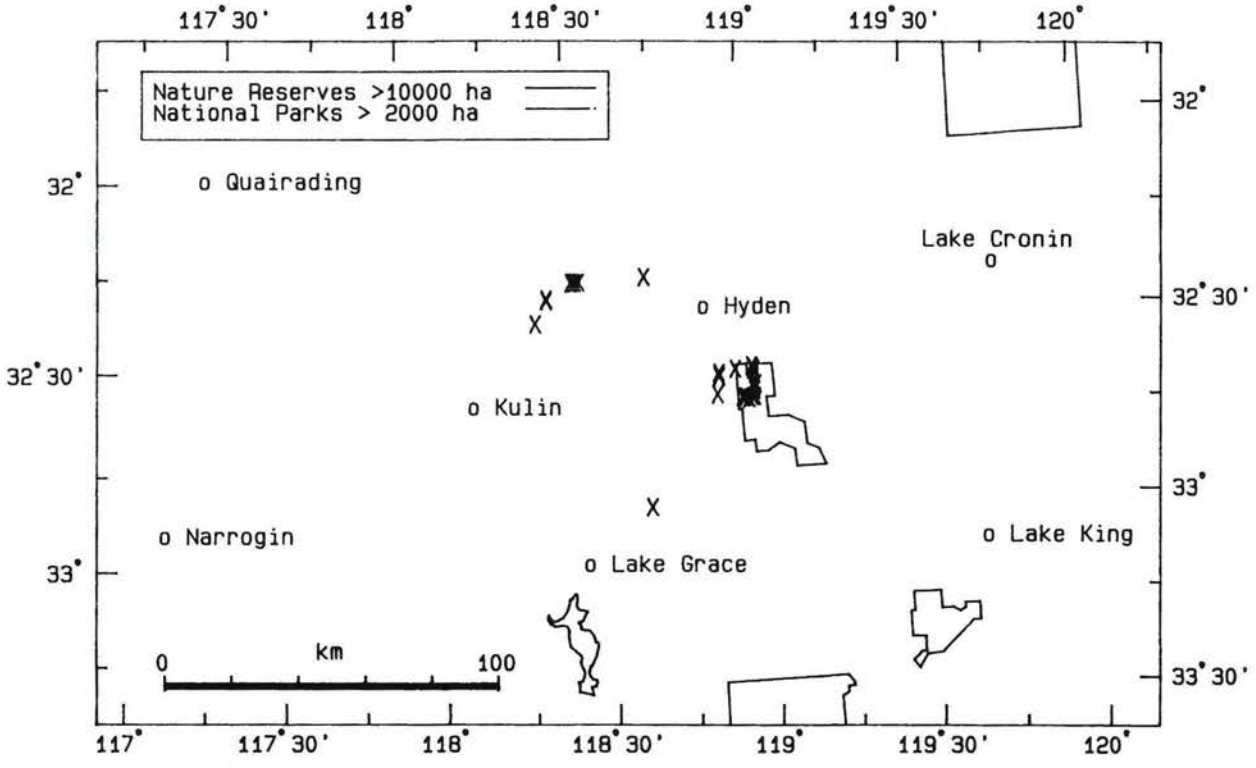
Flowering period: unknown

*Eucalyptus ornata* is restricted to a 70 km range in the eastern wheatbelt between Kondinin, Lake Grace and Holt Rock. It occurs on gravelly low hilltops and slopes, forming woodland communities over shrubland and heath. *E. gardneri* is almost always in association. It is well conserved with 76 per cent of the records from four nature reserves. The remaining populations are from private property and road verge. Twenty-three new records were made during the survey, including first collections from two nature reserves west of Hyden. It is extensive at many of the sites and more populations are likely to occur in unsurveyed, less accessible parts of the reserves.

*E. ornata* is a mallet with smooth, grey and silver bark and an open crown of glossy leaves. It is characterized by its very ornate buds and fruits on down-curved peduncles. It is related to the widespread *E. argyphea* which may be ribbed in the bud and fruit but lacks the prominent knuckle-like projections of *E. ornata*. Intergradation between the two species has been observed.

Specific References: Crisp (1984), Elliot and Jones (1986).





**EUCALYPTUS OVULARIS** Maiden & Blakely

Number of records: 12

Population Size
<10(0) 10-20(1) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(11)

Conservation Status
Restricted to road verge (0%), Not (75%), Unspecified (25%)
In conservation reserve (17%), Not (83%), Unspecified (0%)

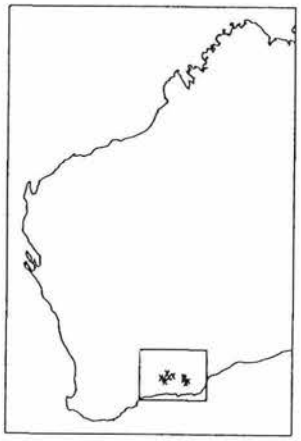
Height: 3-9 m

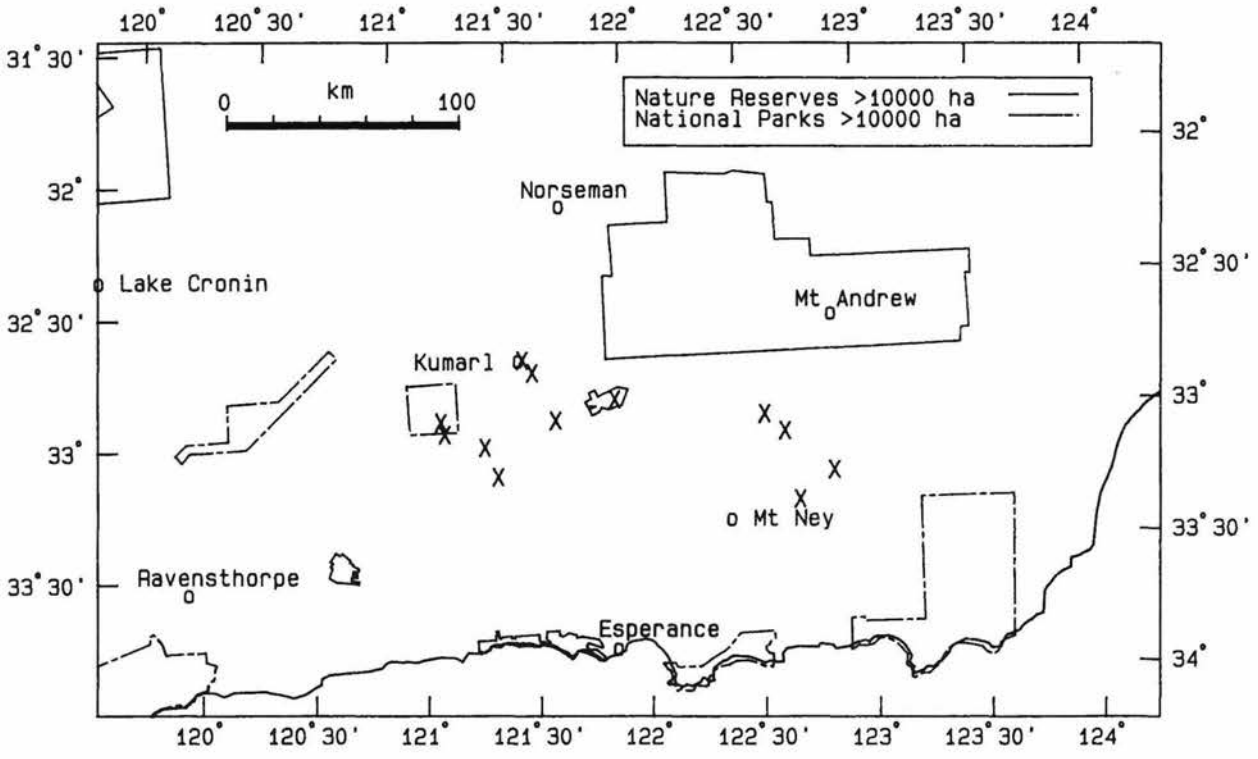
Flowering period: September - April

A species of scattered and uncommon occurrence north of Esperance from Peak Charles to near Clyde Hill. It grows in sandy and clayey soils on flat and gently undulating terrain, forming shrub and tree-mallee communities over low scrub and heath. Much of its distribution intersects proposed and existing agricultural land. Two populations (17 per cent of total records) in Peak Charles National Park and a nature reserve near Salmon Gums are the only records from conservation reserves. There has been some confusion regarding the identity of *Eucalyptus ovularis* and related species, previous references having cited it from a much wider range (Chippendale 1973, Burgman 1985a). Further surveys in the areas east and west of the Coolgardie-Esperance Highway are required.

*E. ovularis* is a mallee, or rarely a tree, with rough bark on the lower trunk or smooth bark throughout. It has narrow, glossy leaves and in overall appearance resembles a number of other species (e.g. *E. myriadena, E. brachycorys* and *E. aequioperta*). It can be distinguished by its ovoid buds that are widest toward the base and its ovoid to urn-shaped fruits.

Specific References: Maiden and Blakely (1925), Brooker (1981), Elliot and Jones (1986).





**EUCALYPTUS PENDENS** Brooker

**Badgingarra Mallee**

Number of records: 24

Population Size
<10(8) 10-20(0) 20-50(5) 50-100(0) 100-500(4) >500(0) unspecified(7)

Conservation Status
Restricted to road verge (0%), Not (83%), Unspecified (17%)
In conservation reserve (21%), Not (79%), Unspecified (0%)

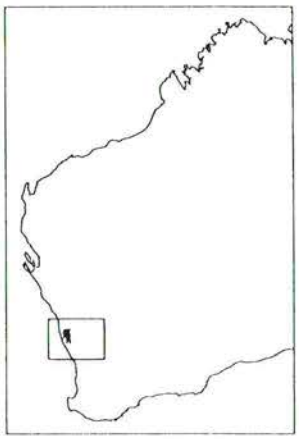
Height: 1-6 m

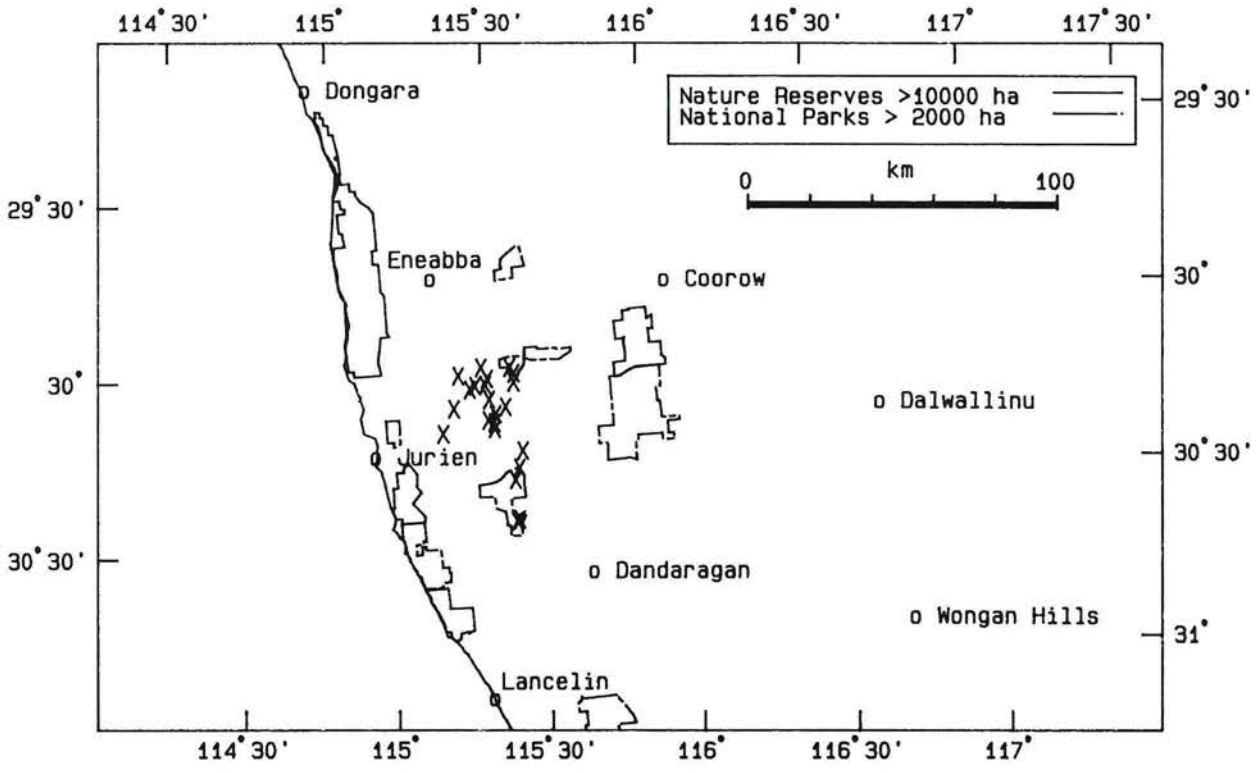
Flowering period: August - November

*Eucalyptus pendens* occurs as scattered individuals or in large extensive stands between Badgingarra National Park and Warradarge Hill. It is conspicuously emergent above low heath on sandy laterite slopes, plateaus and breakaways. Of the total records 21 per cent occur in the Badgingarra and Alexander Morrison National Parks. The majority of populations are from private property on sites not cleared for agriculture. A few significant populations are from proposed national park. The protection of most large populations is dependent on the continued good will of private landowners.

*E. pendens* is a slender 'whipstick' mallee with thin stems, sparse foliage and pendulous, glaucous branches. It is closely related to *E. sepulcralis* from the south coast, differing in its shorter buds, cupular fruits and many-flowered inflorescences.

Specific References: Brooker (1972), Brooker and Hall (1975d), Lievense (1981), Pryor (1981), Rye and Hopper (1981) Elliot and Jones (1986).





**EUCALYPTUS 'PETILA'** Brooker & Hopper ined.

Number of records: 6

Population Size
<10(0) 10-20(1) 20-50(2) 50-100(1) 100-500(2) >500(0) unspecified(0)

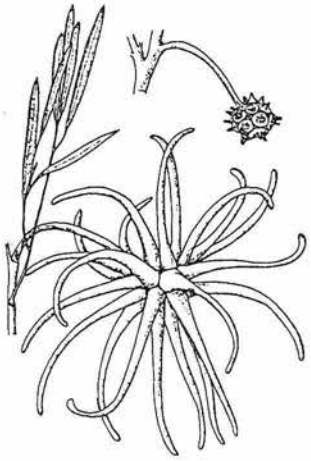
Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (100%), Not (0%), Unspecified (0%)

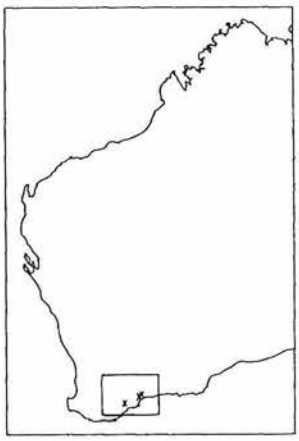
Height: 1.5-3 m

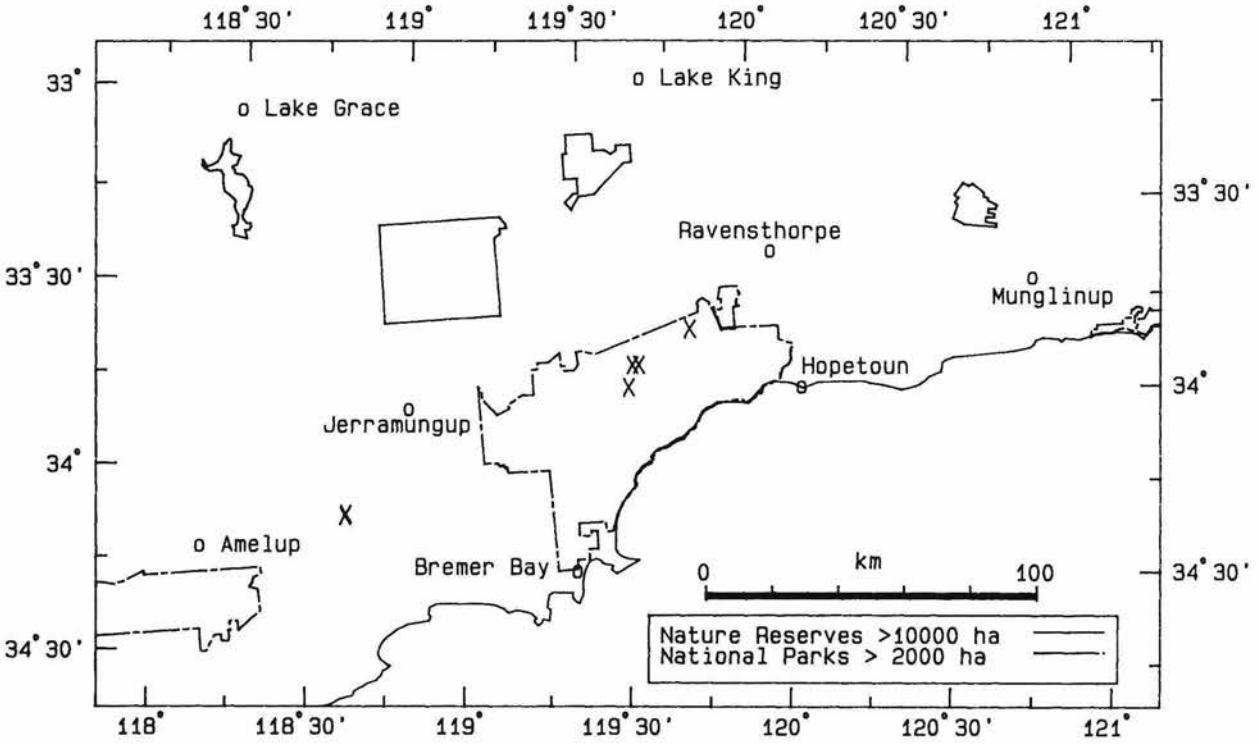
Flowering period: January

An undescribed species allied to *Eucalyptus lehmannii* and known from several sites in the Fitzgerald River National Park and in a nature reserve north of Boxwood Hill. In the national park it grows on gradual slopes, often above creeklines, on sand, clay and rocky quartzite. North of Boxwood Hill it occurs on a granitic stony hill. Surrounding vegetation is dense heath with other emergent eucalypt species including *E. macrandra, E.* aff. *occidentalis, E. xanthonema* and *E. micranthera*. Mass hybridization with *E. macrandra* was recorded in the park. *E. 'petila'* was previously known from a single locality, with recent survey work resulting in five new collections. Further populations are expected to occur in more inaccessible areas. It is a very attractive species with considerable horticultural potential.

*E. 'petila'* is a thin-stemmed, upright or spreading mallee with a terminal canopy of erect, glossy leaves. The bark is smooth, grey over pale brown, with some persistent ribbons and flakes. It differs from *E. lehmannii* in its narrower leaves and long tapering budcaps that are often hooked and swollen at the apex.







**EUCALYPTUS PETRENSIS** Brooker & Hopper

Number of records: 18

Population Size
<10(5) 10-20(2) 20-50(3) 50-100(1) 100-500(4) >500(2) unspecified(1)

Conservation Status
Restricted to road verge (6%), Not (94%), Unspecified (0%)
In conservation reserve (17%), Not (83%), Unspecified (0%)

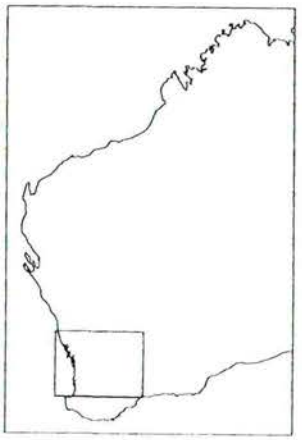
Height: 1.5-4 m

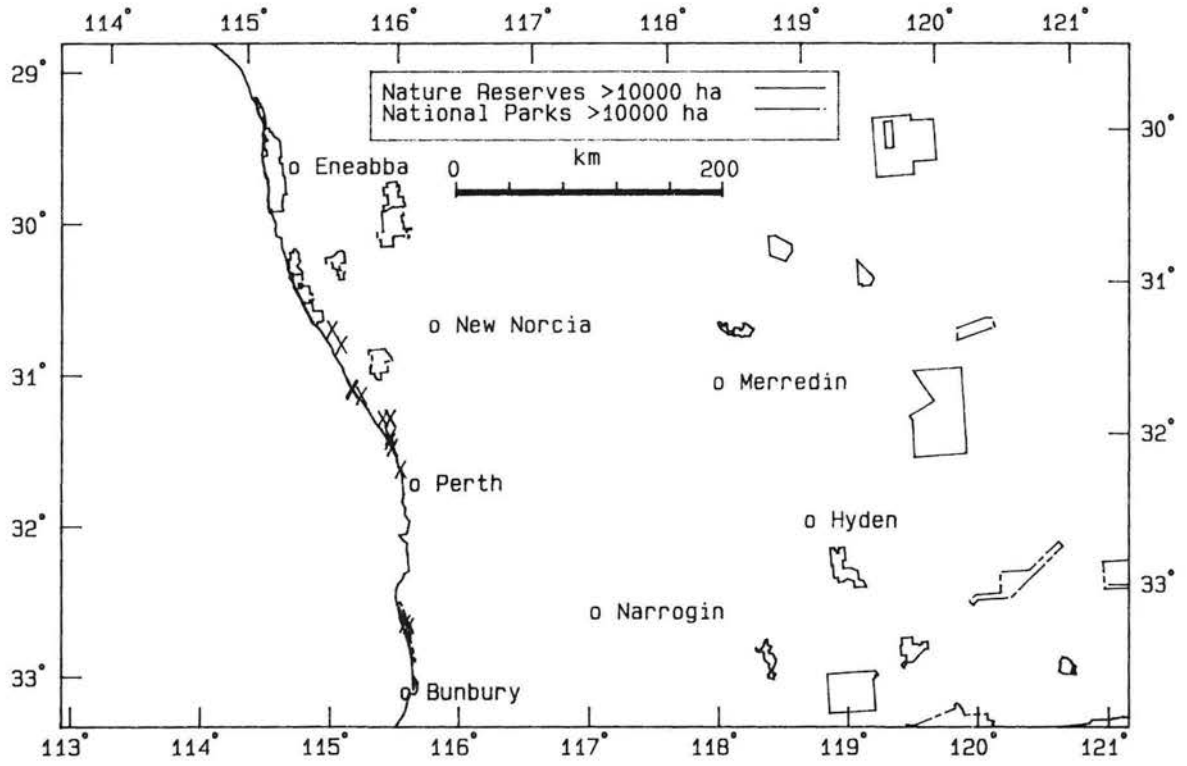
Flowering period: July

*Eucalyptus petrensis* is restricted to coastal dunes and ridges from Wedge Island south to Preston Beach, a range of *ca* 240 km. It grows in usually shallow sand over limestone, in pure stands or in association with other coastal species, *E. foecunda* and *E. decipiens*. Surrounding vegetation is heath dominated by *Dryandra sessilis, Melaleuca huegelii, Acacia pulchella* and *Hakea trifurcata*. Three populations (17 per cent of total records) are in Yanchep and Yalgorup National Parks and two populations are in State forest. One population of 20 to 50 plants survives in remnant vegetation of a suburban yard and road verge. Several populations occur in the vicinity of limestone quarries, while expansion of the metropolitan area along the coast threatens at least one population north of Perth. There were fifteen new records made since the commencement of the survey, with additional populations likely to be found in both of the national parks and areas in the north of its range.

*E. petrensis* is a straggly mallee with smooth stems and grey-green leaves. It is related to *E. falcata*, differing in its more effuse habit, stouter, erect peduncles and limestone habitat. It is also similar to *E. decipiens* which has rough bark and sessile buds and fruits.

Specific Reference: Brooker and Hopper (1993).





**EUCALYPTUS PHYLACIS** L. Johnson & K. Hill

**Meelup Mallee**

Number of records: 1

Population Size
<10(0) 10-20(1) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

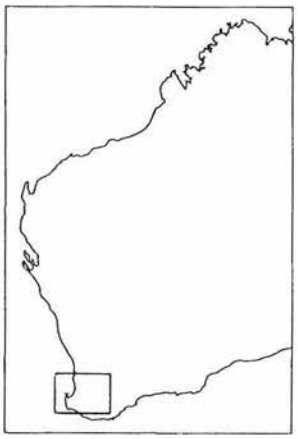
Height: 5 m

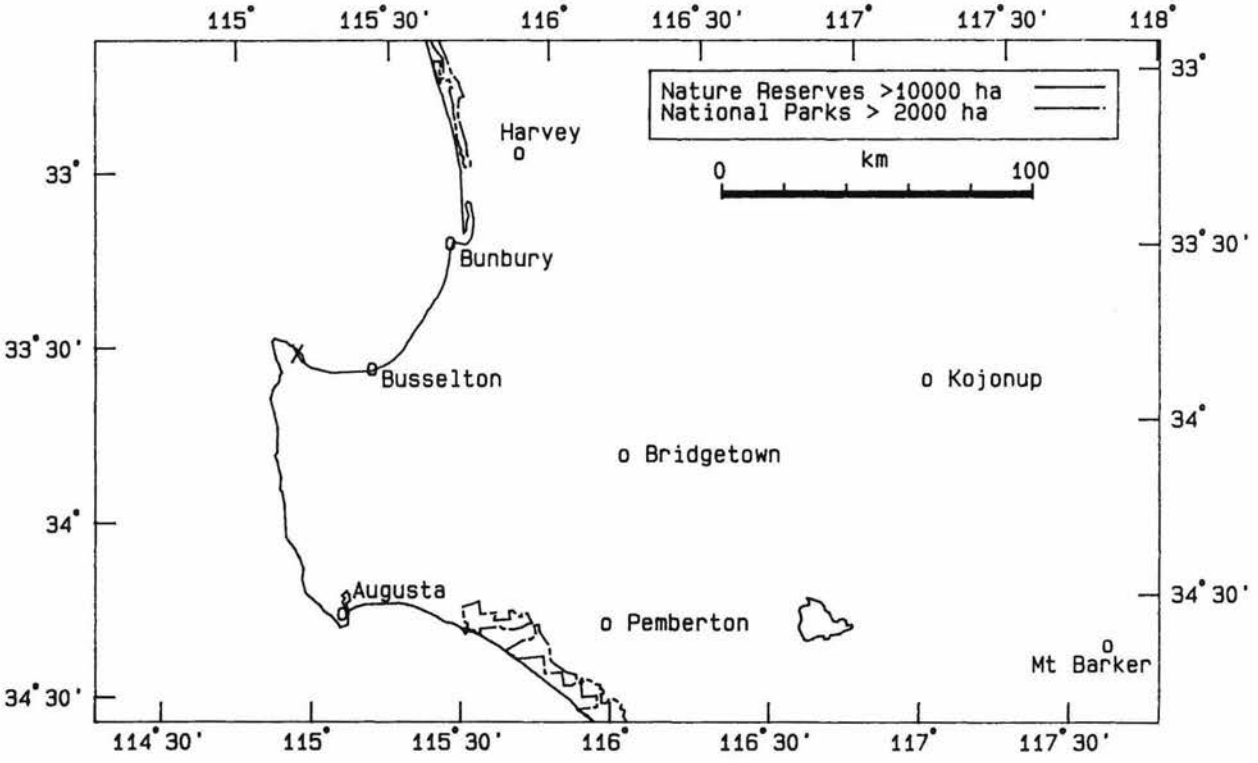
Flowering period: February - March

A very rare species known from only one population of 19 plants on shire road verge and parkland north-west of Dunsborough. It grows at the ecotone of heath and *Eucalyptus calophylla-E. marginata* forest on a loamy granite ridge overlooking the coast. Road maintenance operations and uncontrolled fire are potential threats. Collection of seed and cultivation is required. It is gazetted as Declared Rare Flora [Appendix 2].

*E. phylacis* is a thick-trunked mallee or small tree closely allied to *E. decipiens*. It differs in its rough, fibrous over corky bark and larger buds and fruits.

Specific Reference: Hill and Johnson (1992).





**EUCALYPTUS PILBARENSIS** Brooker & Edgecombe

Number of records: 5

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(5)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (20%), Not (80%), Unspecified (0%)

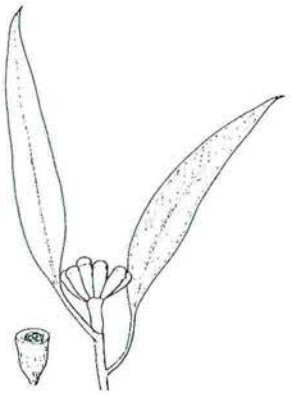
Height: 3-4 m

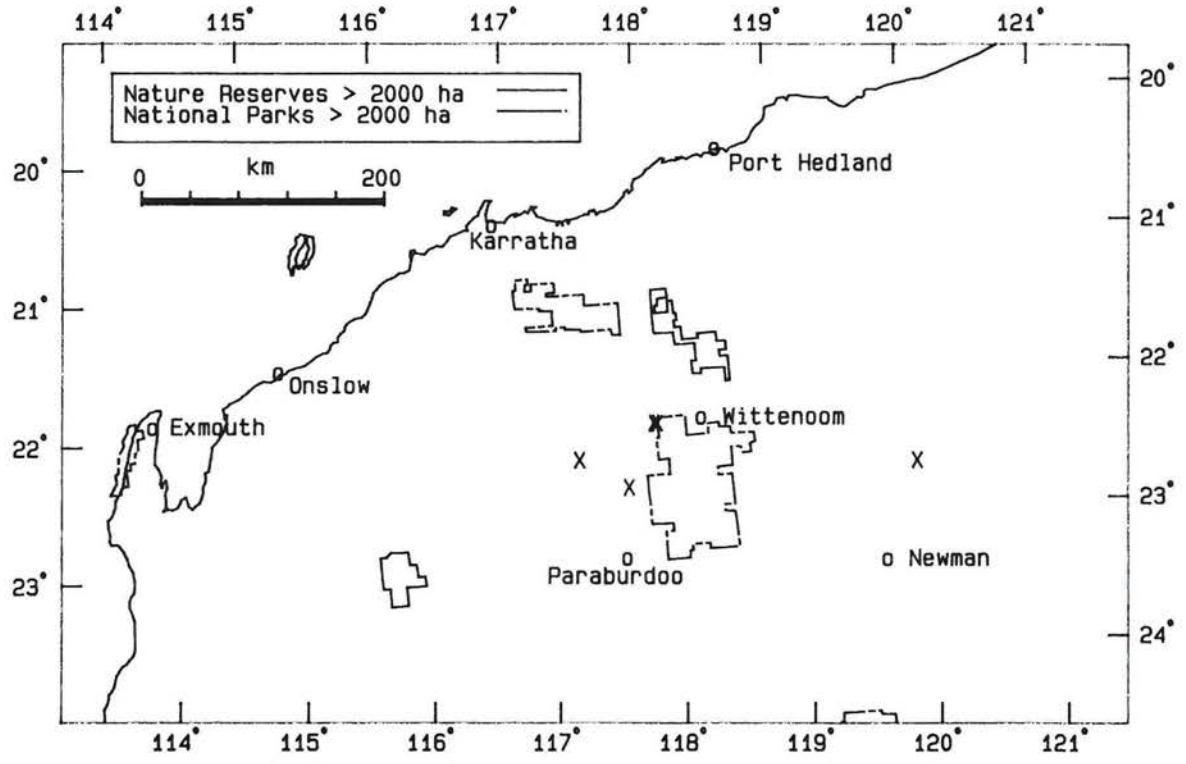
Flowering period: July

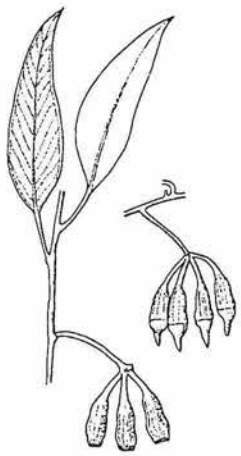
*Eucalyptus pilbarensis* has been recorded from a few scattered localities in the Hamersley Range and to the east near Roy Hill. It occurs in small populations (Brooker and Edgecombe 1986) on rocky screes and hilltops in association with a variety of species including *E. ferriticola, E. leucophloia, E. kingsmillii, Triodia* sp. and *Cassia* sp. The population near Hamersley Gorge is the only record from a conservation reserve. There has been little survey for this species and more populations are likely to occur in its geographically remote range.

*E. pilbarensis* is a small mallee allied to the widespread *E. trivalvis*. It can be distinguished by its moderately glossy leaves, always smooth bark and sessile or shortly pedicellate buds and fruits. The buds are broadly fusiform to club-shaped and the fruits conical to cylindrical.

Specific Reference: Brooker and Edgecombe (1986).







**EUCALYPTUS PIMPINIANA** Maiden

**Pimpin Mallee**

Number of records: 22

Population Size
<10(0) 10-20(0) 20-50(7) 50-100(5) 100-500(7) >500(2)
unspecified(1)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (9%), Not (91%), Unspecified (0%)

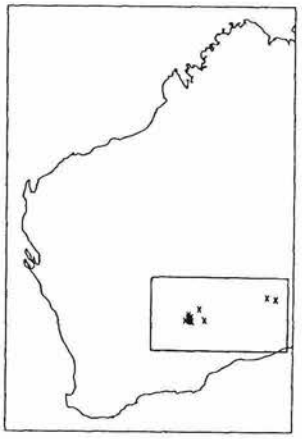
Height: 1-2 m

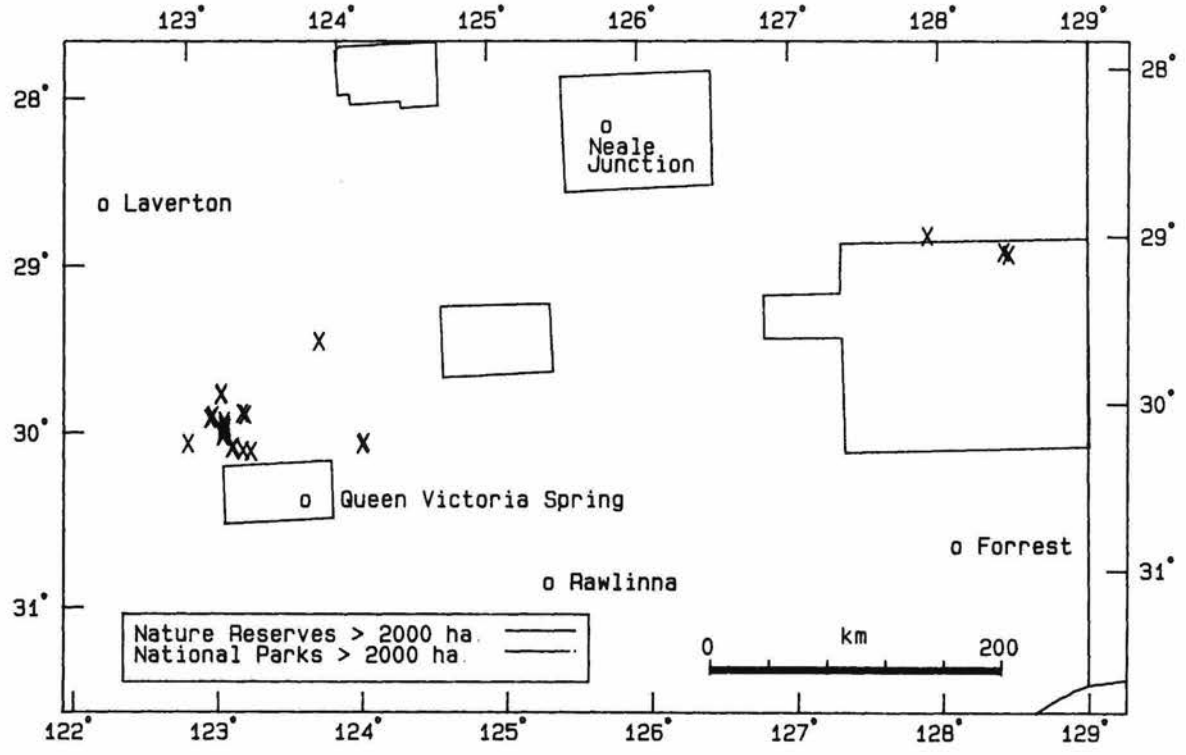
Flowering period: May - October

In Western Australia previously known from only three populations south of Lake Minigwal, but with recent surveys extending its range in this area and east to the Great Victoria Desert Nature Reserve near the State border. It continues into western South Australia where it has a scattered distribution north of the Nullarbor Plain. Populations were recorded from sandy plain and dune country, in mallee over scrub and spinifex (*Triodia* sp.). Commonly associated species include *Eucalyptus gongylocarpa, E. platycorys, Callitris columellaris* and various *Acacia* species. Discovery of new populations in the west of its range has been facilitated by increased access. It is relatively well protected given its remote occurrence and additional populations are likely to be found in vast unsurveyed areas of the region. Resprouting from the lignotuber has been reported after fire.

*E. pimpiniana* is a distinctive species of low straggly habit with dull, grey leaves, smooth stems and pendulous buds and fruits. The leaves are thick, lanceolate to elliptical and with numerous oil glands. The buds and fruits are elongated and often ribbed.

Specific References: Maiden (1903-1933), Doran and Brooker (1979), Jessop (1985), Elliot and Jones (1986).





**EUCALYPTUS** aff. **PLATYPUS** Hook.

Number of records: 4

Population Size
<10(0) 10-20(1) 20-50(0) 50-100(1) 100-500(0) >500(0) unspecified(2)

Conservation Status
Restricted to road verge (0%), Not (75%), Unspecified (25%)
In conservation reserve (75%), Not (25%), Unspecified (0%)

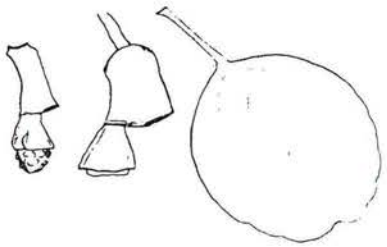
Height: 3.5 m

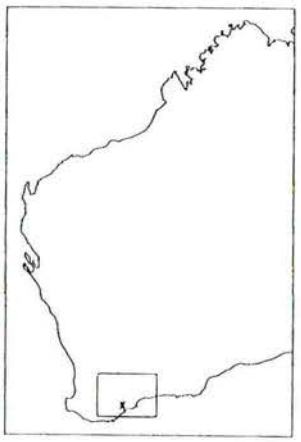
Flowering period: June

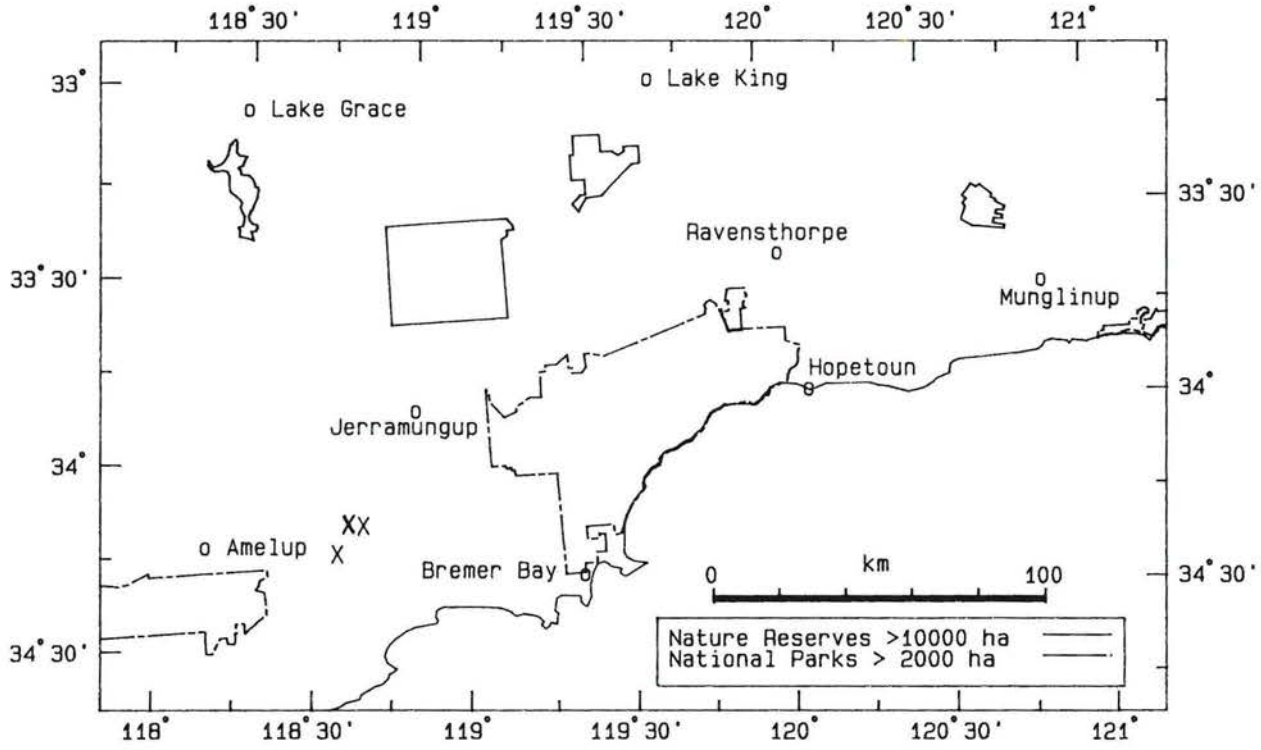
A recently discovered taxon found at four sites in the Corackerup Creek area near Boxwood Hill. It grows on stony granitic loam slopes in low forest or shrub-mallee with *Eucalyptus pluricaulis* ssp. *porphyrea*, *E. annulata* and *E. phaenophylla*. Three of the populations occur, at least partly, in a nature reserve. Surveys have been limited and its conservation status can not be accurately assessed.

*E.* aff. *platypus* is an erect 'marlock' tree with smooth bark and glossy, dark green, ovoid leaves. It has prominently winged buds and fruits, warty opercula and pinkish red stamens. It resembles *E. platypus* in overall appearance but has a more open and terminal canopy.

Illustration by S.D.Hopper.







**EUCALYPTUS POLITA** Brooker & Hopper

Number of records: 13

Population Size
<10(0) 10-20(0) 20-50(2) 50-100(0) 100-500(2) >500(1) unspecified(8)

Conservation Status
Restricted to road verge (0%), Not (85%), Unspecified (15%)
In conservation reserve (8%), Not (92%), Unspecified (0%)

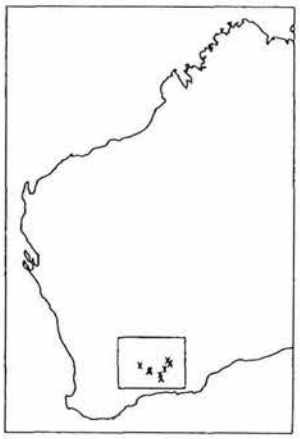
Height: 5-10 m

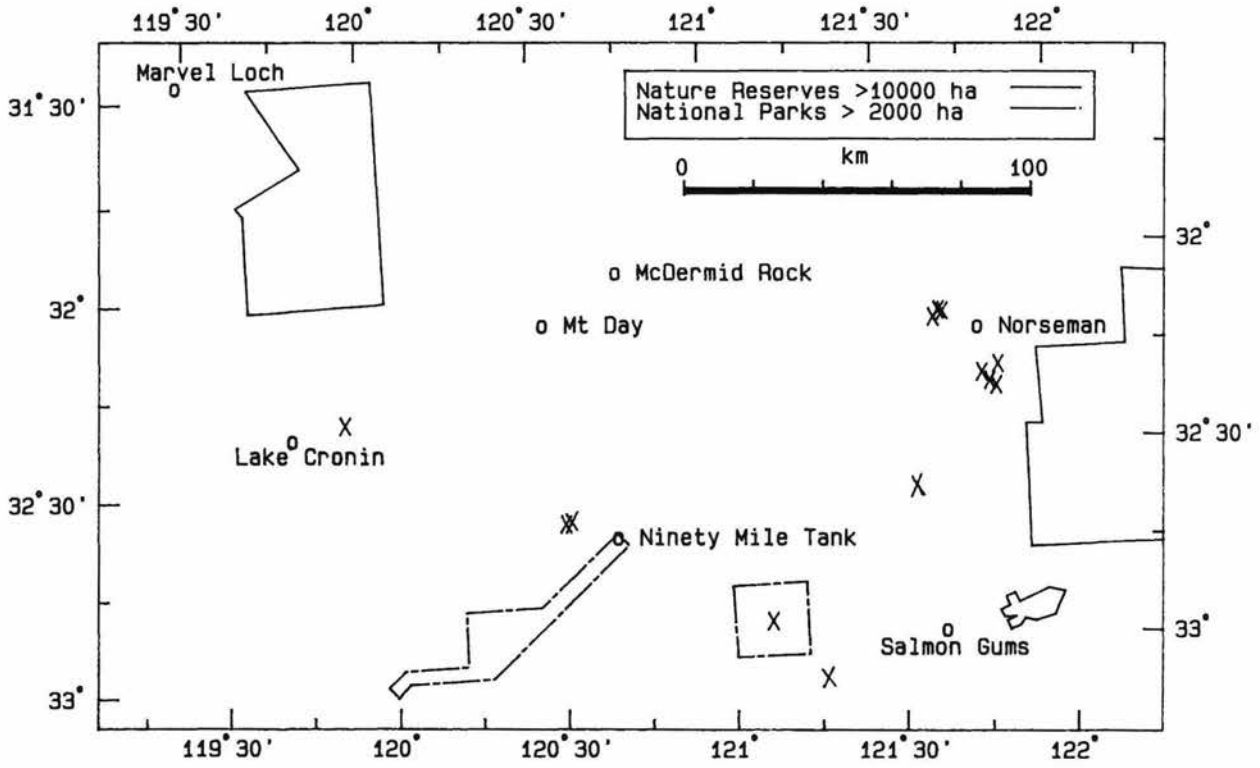
Flowering period: unknown

*Eucalyptus polita* has a distribution concentrated in the Norseman area with scattered populations west to Lake Cronin and south to near Peak Eleanora. It most commonly occurs on loamy flats but has also been recorded from sandy and clayey soils. The surrounding vegetation is open woodland over scrub with *E. brockwayi, E. dundasii, E. salmonophloia* and *E. flocktoniae*. There is a single collection from Peak Charles National Park where it was recorded as 'very common'. It is abundant in several populations in a timber reserve near Norseman. All other records are from vacant Crown land.

*E. polita* is a small tree, or sometimes a mallee, with smooth bark and slightly glaucous branchlets. The leaves are narrow and dull to slightly glossy. A collection from south of Frank Hann National Park (not mapped) was similar to *E. polita* but had longer, narrower leaves and more conical budcaps.

Specific Reference: Brooker and Hopper (1993).





**EUCALYPTUS PROMINENS** Brooker

**Cape Range Mallee**

Number of records: 19

Population Size
<10(0) 10-20(0) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(18)

Conservation Status
Restricted to road verge (0%), Not (84%), Unspecified (16%)
In conservation reserve (26%), Not (74%), Unspecified (0%)

Height: 1-4 m

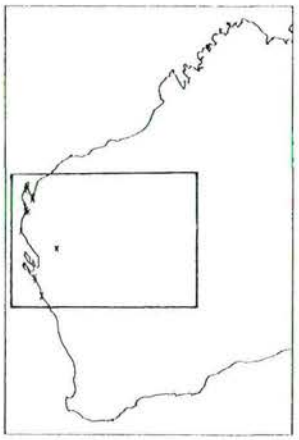
Flowering period: April - October

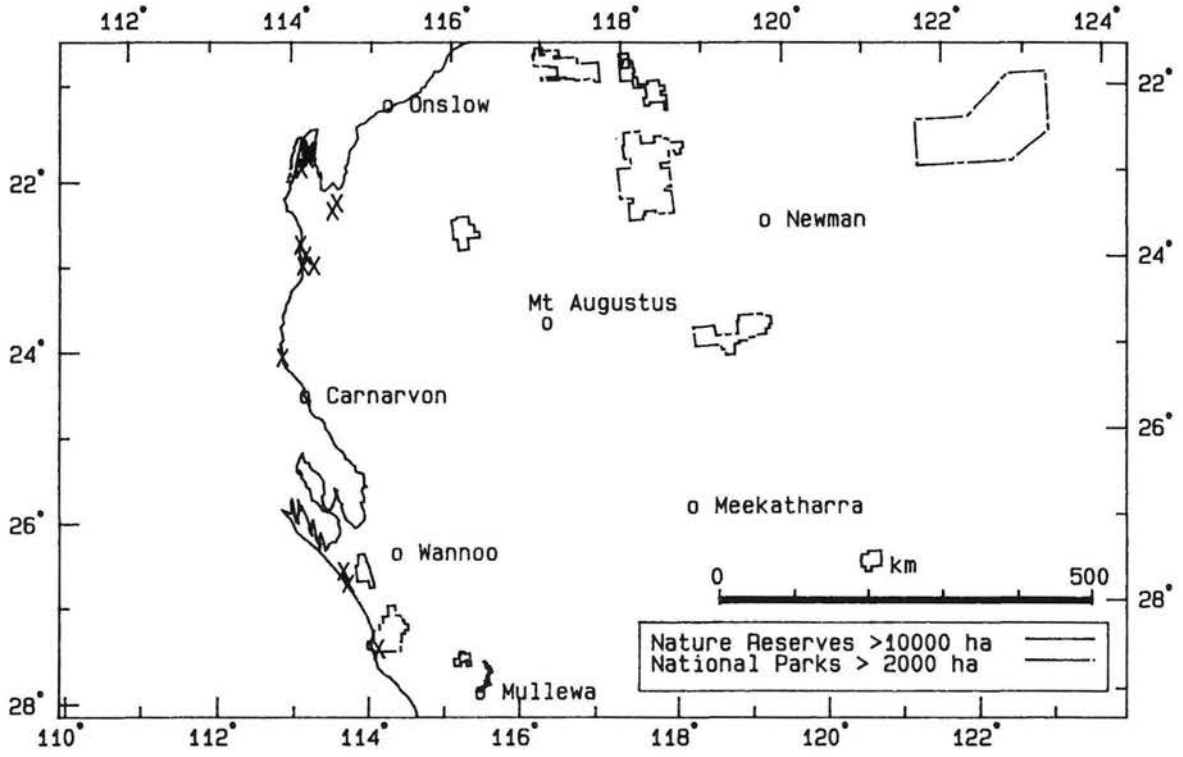
A species of coastal and subcoastal distribution from Exmouth south to Kalbarri. In the north it grows on the rocky limestone slopes and hilltops of the Cape Range, while further south it occurs in undulating country on sand and outcropping limestone. It is most abundant in the Cape Range region with 20 per cent of total records from the national park. The recently discovered population in Kalbarri National Park extended its range southward by over 80 km. The remaining populations are from pastoral leases. Its conservation status is relatively secure although protection from fire and grazing in some areas may be necessary.

*Eucalyptus prominens* is a sprawling mallee or small tree with smooth bark that is sometimes fibrous and grey at the base. The leaves are narrow and glossy green. It is distinguished from the related *E. trivalvis* and *E. pilbarensis* by its conical fruits with prominently exserted valves.

Specific References: Brooker (1976a), Hall and Brooker (1977d), Elliot and Jones (1986).

Illustration by G. Moss (in Brooker 1976a).





**EUCALYPTUS PRUINIRAMIS** L. Johnson & K. Hill

**Jingymia Gum**

Number of records: 4

Population Size
<10(3) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(1)

Conservation Status
Restricted to road verge (25%), Not (75%), Unspecified (0%)
In conservation reserve (25%), Not (75%), Unspecified (0%)

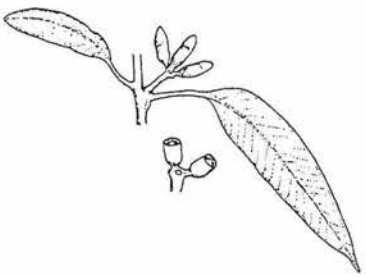
Height: 2.5-5 m

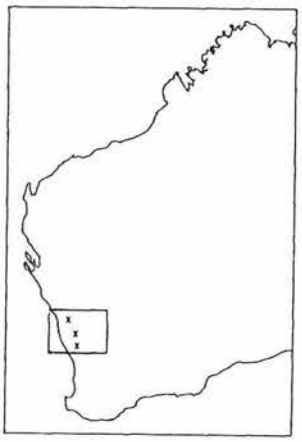
Flowering period: January

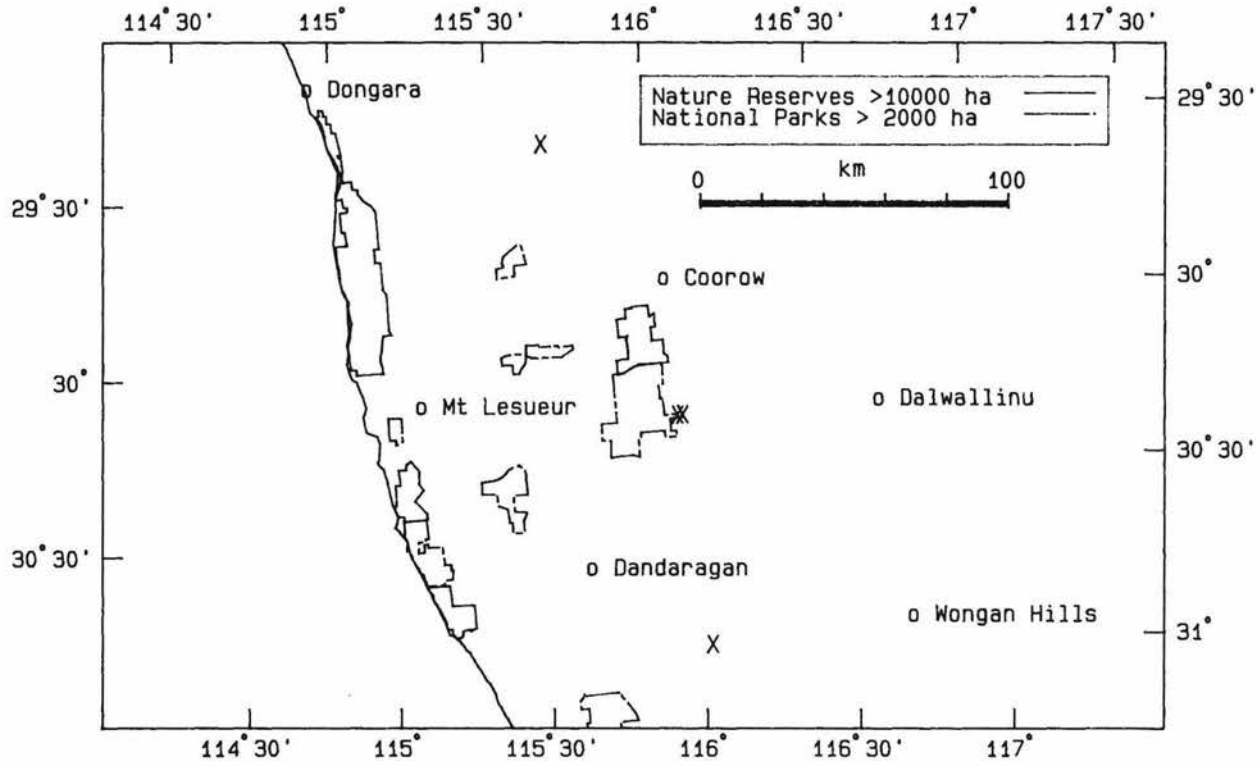
A species of scattered and rare occurrence, known from only four populations near Watheroo, Three Springs and Mogumber. It grows on loamy or clayey soils, often with gravel and quartz, in open woodland or emergent from scrub of *Melaleuca* and *Allocasuarina* species. *Eucalyptus accedens, E. eudesmioides, E. wandoo* and *E. drummondii* have been recorded in association. One population is from a national park while the others are restricted to road verge and private property. The three recently surveyed sites have a total of <30 individuals. Close liaison with the landowners, seed collection and cultivation is required. It is gazetted as Declared Rare Flora [Appendix 2].

*E. pruiniramis* is a straggly tree or mallee with dull leaves and glaucous branchlets. The tree forms have a stocking of rough, grey bark on the lower trunk while mallees are smooth throughout. It is closely related to *E. accedens*, differing in its rough bark, slightly larger buds and glaucous buds, fruits and branchlets.

Specific Reference: Hill and Johnson (1992).







**EUCALYPTUS PTEROCARPA** C. Gardner ex P. Lang

Number of records: 5

Population Size
<10(0) 10-20(0) 20-50(2) 50-100(0) 100-500(1) >500(0) unspecified(2)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

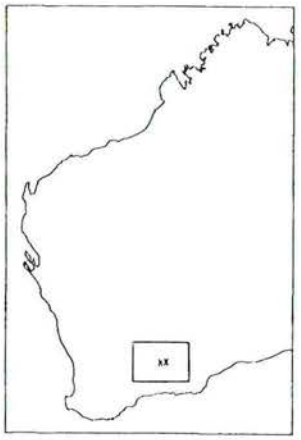
Height: 5-15 m

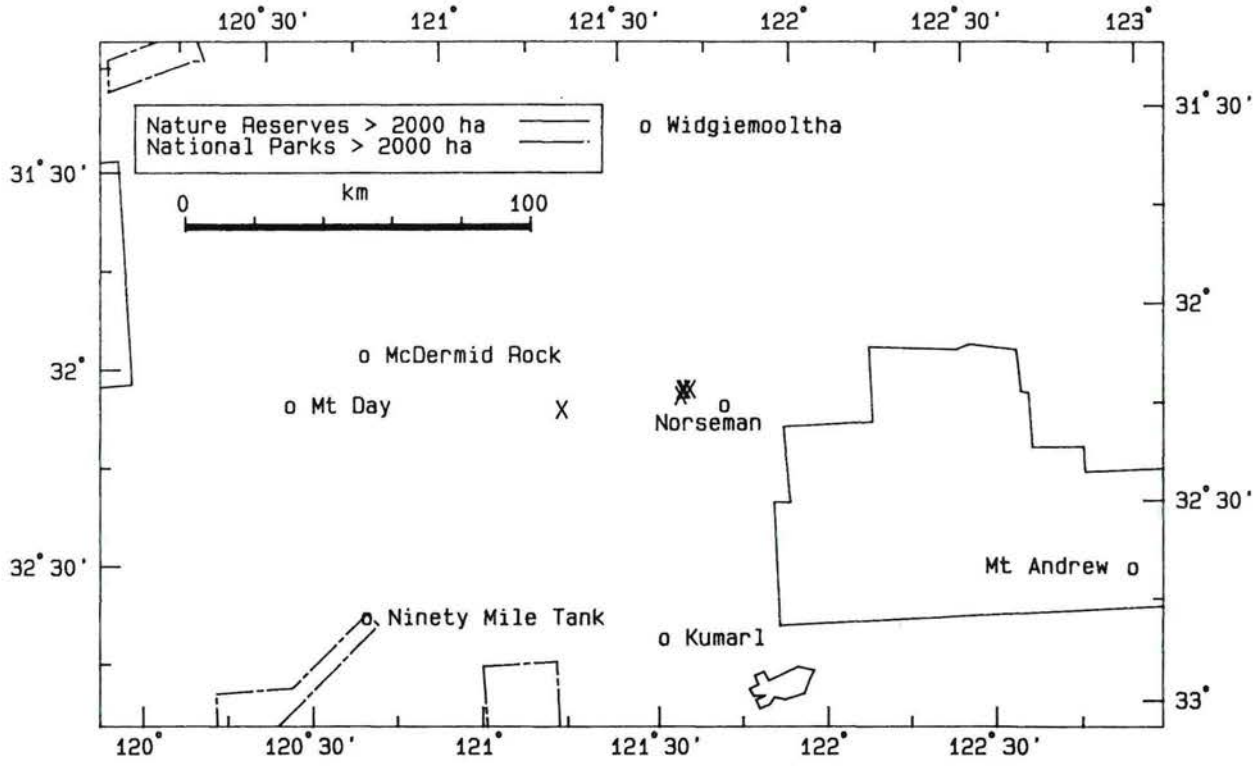
Flowering period: September - November

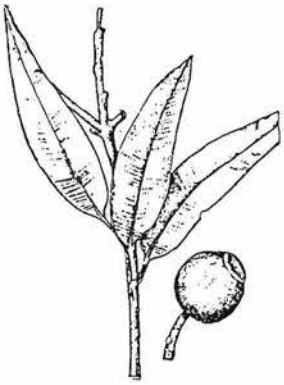
A restricted species known from a few populations north-west of Norseman, and a recently discovered population to the west at Bronzite Ridge. It grows in low woodlands on rocky loam or clay with *Eucalyptus brockwayi, E. polita, E. lesouefii, E. dundasii* and *E. calycogona*. All the records are from vacant Crown land. The discovery of a population west of the previous recorded distribution highlights the need for further survey. Acquistion of land as a nature reserve would be desirable.

*E. pterocarpa* is an erect tree with smooth, greyish bark and glossy, bright green leaves. It is allied to *E. lesouefii*, differing in its smooth bark, larger fruits and non-glaucous branchlets.

Specific References: Elliot and Jones (1986), Lang (1988).







**EUCALYPTUS PYROPHORA** Benth.

Number of records: 8

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(8)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (37.5%), Not (62.5%), Unspecified (0%)

Height: 6-12 m

Flowering period: November

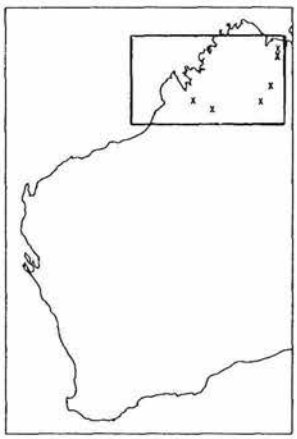
There has been considerable confusion regarding the nomenclature of *Eucalyptus pyrophora, E. cliftoniana* and *E. pontis*. Chippendale (1988) includes *E. cliftoniana* as a synonym of *E. pyrophora* and this is followed here.

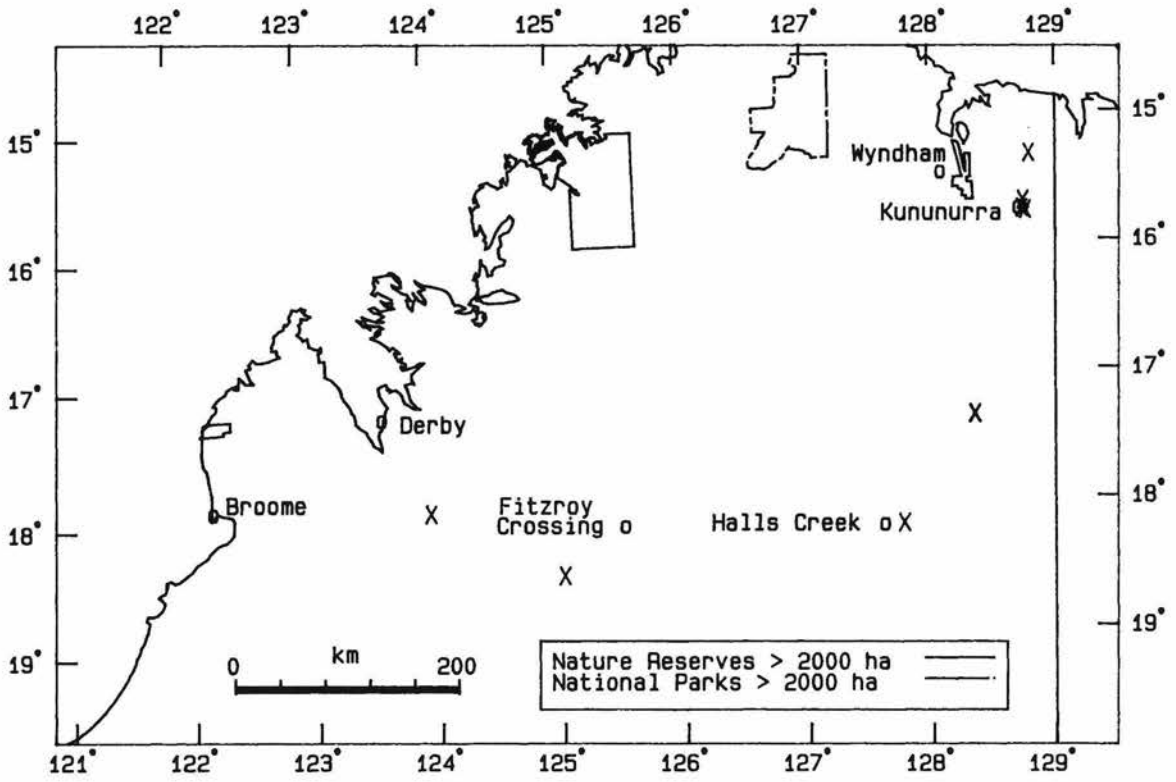
An uncommon species recorded from the Grant Range south of Derby to the Weaber Range near Kununurra, and extending into the north-western Northern Territory. It grows on rocky sandstone cliffs and hilltops, with a collection south-west of Fitzroy Crossing from loam. Associated species are *Eucalyptus brachyandra, E. brevifolia, E. tectifica* and *E. confertiflora*. Of the total records, 37.5 per cent have been recorded from the Purnululu (Bungle Bungle) and Hidden Valley National Parks. The other collections are from pastoral lands. Although not common, this species is poorly collected and probably more abundant than herbarium records indicate. A collection from Hidden Valley possibly belongs to *E. pontis*.

*E. pyrophora* is a tree or shrub with globular to ovoid fruits usually lacking the short 'neck' typical of bloodwood species. *E. pontis*, a recently described species, is closely allied to *E. pyrophora*. The differences between the two taxa are minimal and further research is necessary.

Specific References: Bentham (1867), Carr and Carr (1985, 1987), Elliot and Jones (1986).

Illustration by C.A. Gardner (in Gardner 1979).





**EUCALYPTUS RAMELIANA** F. Muell.

**Ramel's Mallee**

Number of records: 1

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0)
unspecified(1)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

Height: 2 m

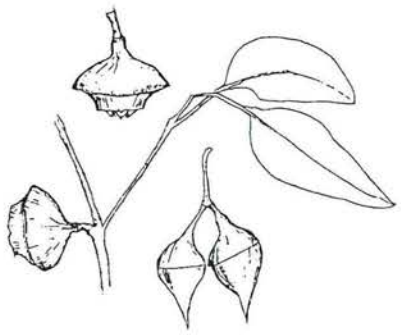
Flowering period: June - August

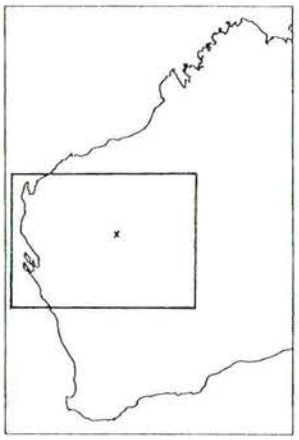
Until recently *Eucalyptus rameliana* was known only from the type collection made in the 1870s 'beyond the Alfred and Marie Range' in the Gibson Desert. It was rediscovered south-east of Newman in 1991. It grows as a stunted mallee 1-2 m tall on red sand dunes with scattered *E. chippendalei* and *E. oldfieldii*. About eight populations have been found, the largest numbering a few hundred plants. Possible sightings further north have been made. Further searching in this remote region is required. It is gazetted as Declared Rare Flora [Appendix 2].

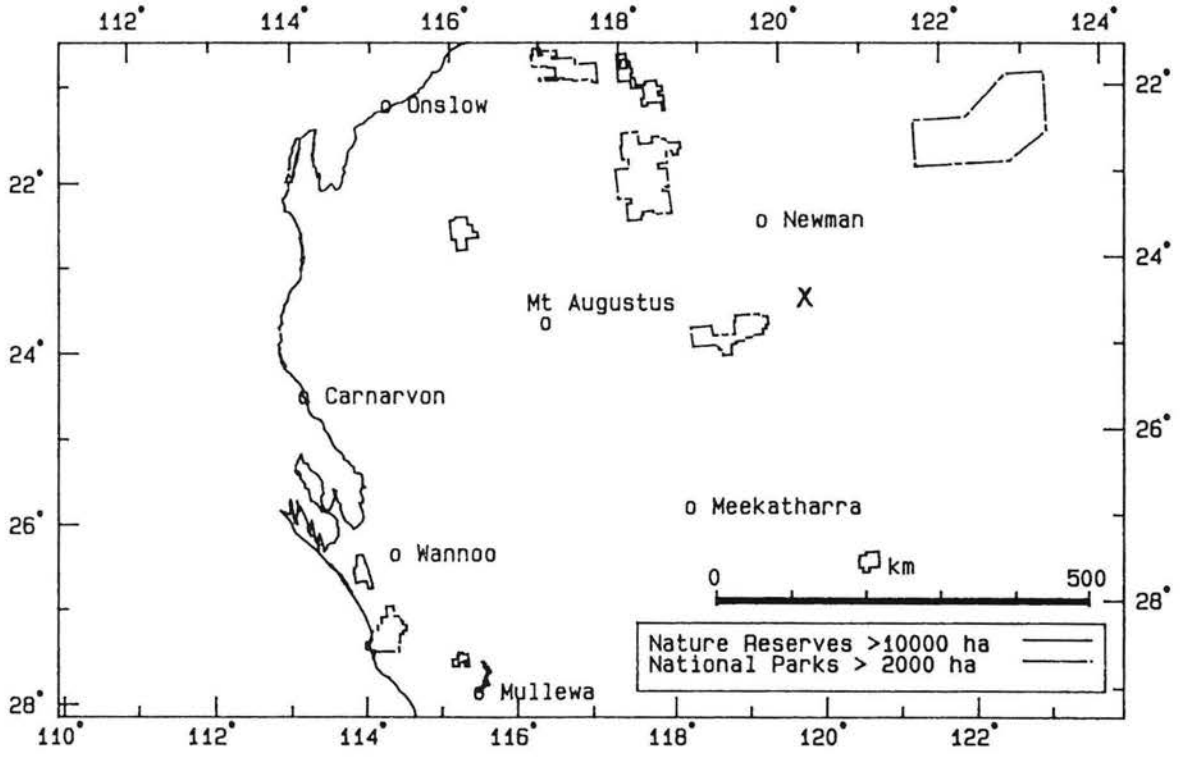
*E. rameliana* is a mallee related to large single-flowered species such as *E. rhodantha* and *E. macrocarpa*. It has large, green to slightly glaucous leaves and globular buds with a beaked operculum. The flowers are pale pink.

Specific References: Mueller (1876-77), Jessop (1985), Elliot and Jones (1986), Hopper (1992).

Illustration by S.D. Hopper.







**EUCALYPTUS 'RECONDITA'** Brooker & Hopper ined.

Number of records: 17

Population Size

<10(0) 10-20(1) 20-50(0) 50-100(2) 100-500(0) >500(0) unspecified(14)

Conservation Status

Restricted to road verge (0%), Not (47%), Unspecified (53%)

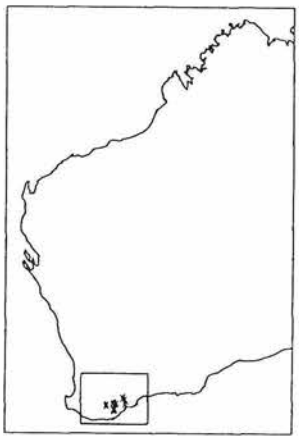
In conservation reserve (24%), Not (76%), Unspecified (0%)

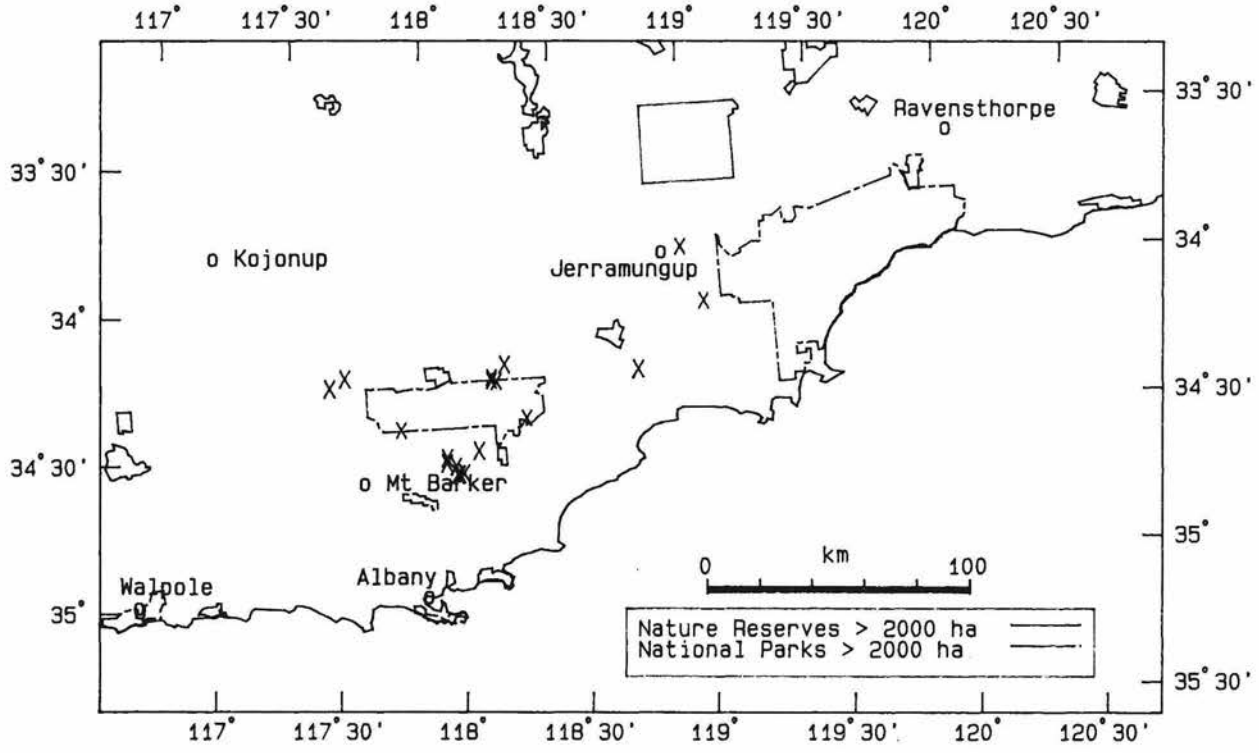
Height: 1.5-3.5 m

Flowering period: February - May, November

*Eucalyptus 'recondita'* has a scattered distribution from Cranbrook east to the Gairdner River, with a number of recent collections from the Kalgan River area south of the Stirling Range. Habitat was recorded as clay depressions, breakaways or creeklines. The population east of Jerramungup was from a stony, sandy loam slope. Associated species included *E. occidentalis, E. incrassata* and *E. conglobata*. Little site information was specified for the populations but some are probably restricted to road verge and remnant vegetation on private property. Of the total records 24 per cent are from the Stirling Range National Park. Protection of populations at these sites is a priority.

*E. 'recondita'* is a small mallee with smooth, thin stems and glossy leaves. It is similar to *E. "nutans"*, differing in its white flowers, level to protruding valves and buds that are rounded in cross-section. *E. platypus* is also similar but has a winged hypanthium and elongated operculum with erect stamens.





**EUCALYPTUS 'REDACTA'** Brooker & Hopper ined.

Number of records: 21

Population Size
<10(2) 10-20(0) 20-50(1) 50-100(1) 100-500(5) >500(2) unspecified(10)

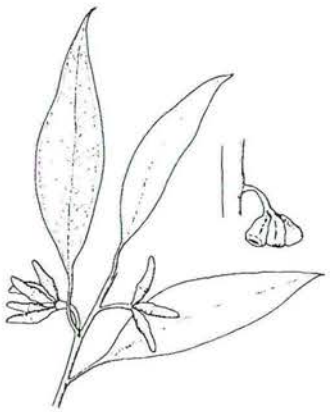
Conservation Status
Restricted to road verge (5%), Not (81%), Unspecified (14%)
In conservation reserve (33%), Not (67%), Unspecified (0%)

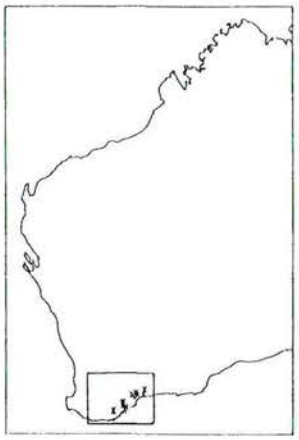
Height: 2-10 m

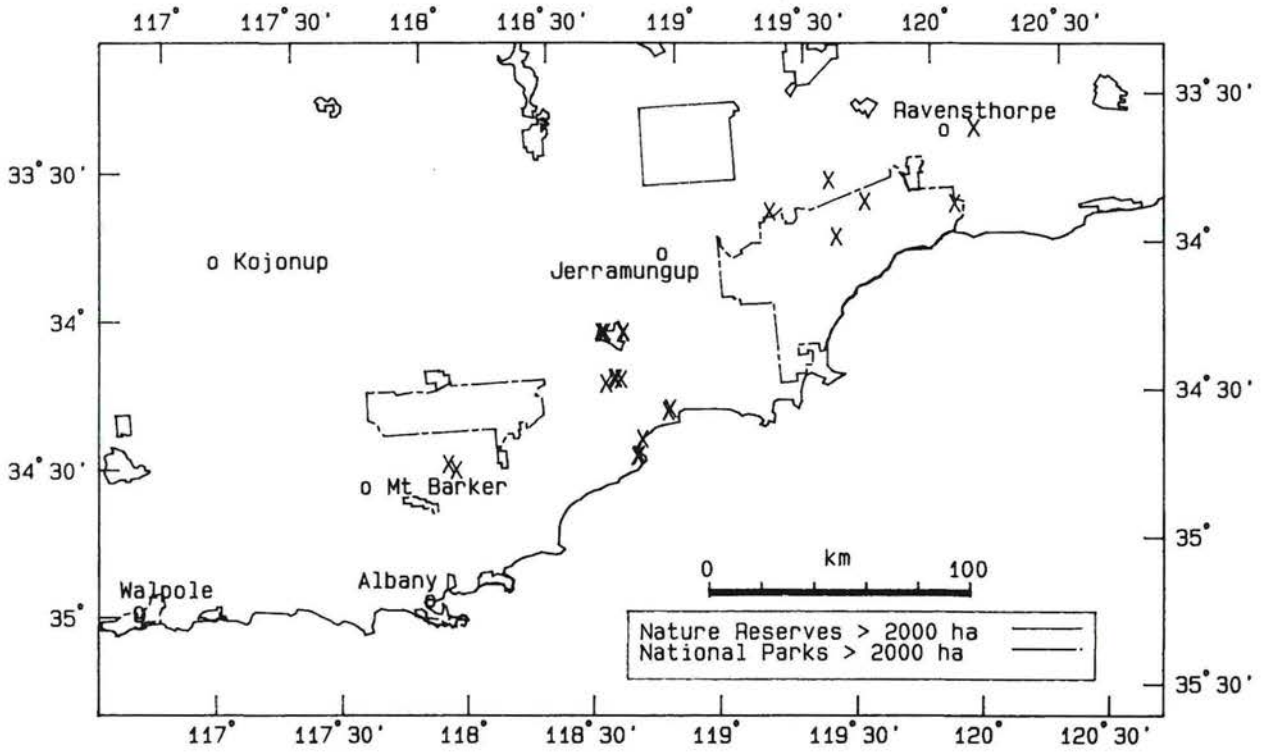
Flowering period: November - January

Prior to the survey, *Eucalyptus 'redacta'* was known from several populations in the Kamballup-Beaufort Inlet-Corackerup Creek area, a range of *ca* 85 km. It has since been found east to near Mt Desmond, extending its range to *ca* 240 km. It grows in clay and loam soils on breakaways and slopes of quartz and spongolite, often above creeklines. It forms low forest or woodland communities, most commonly in association with *E. melanophitra, E. occidentalis, E. platypus* and *E. argyphea*. Of the total records, 33 per cent are from Fitzgerald River National Park and the Corackerup Nature Reserve to the west. Other populations occur in a variety of reserves (recreation, common, water and government) and on private property. A hybrid population with *E. rudis* was observed south of the Stirling Range. *E. 'redacta'* is probably more abundant within its range, particularly in coastal areas with limited access.

*E. 'redacta'* is a slender mallet or mallee with smooth, mottled bark and glossy leaves. It is allied to the brown mallet, *E. astringens*, which has larger buds and fruits and flakes of curled bark remaining attached on the trunk. *E. occidentalis* is also similar but is generally a rough-barked tree confined to wet depressions.







**EUCALYPTUS RHODANTHA** Blakely & Steedman var. **PETIOLARIS** Blakely & Steedman

Number of records: 2

Population Size
<10(2) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

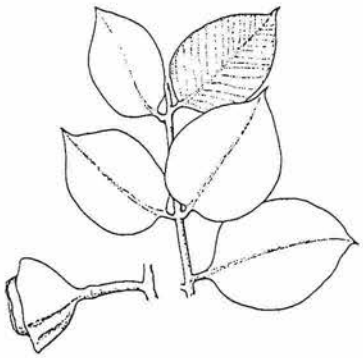
Height: 1.5-3.5 m

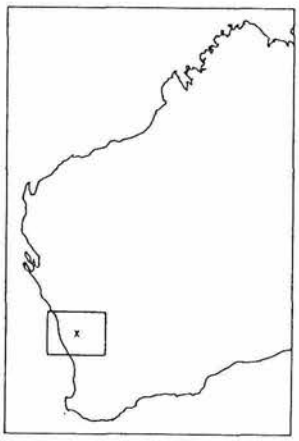
Flowering period: unknown

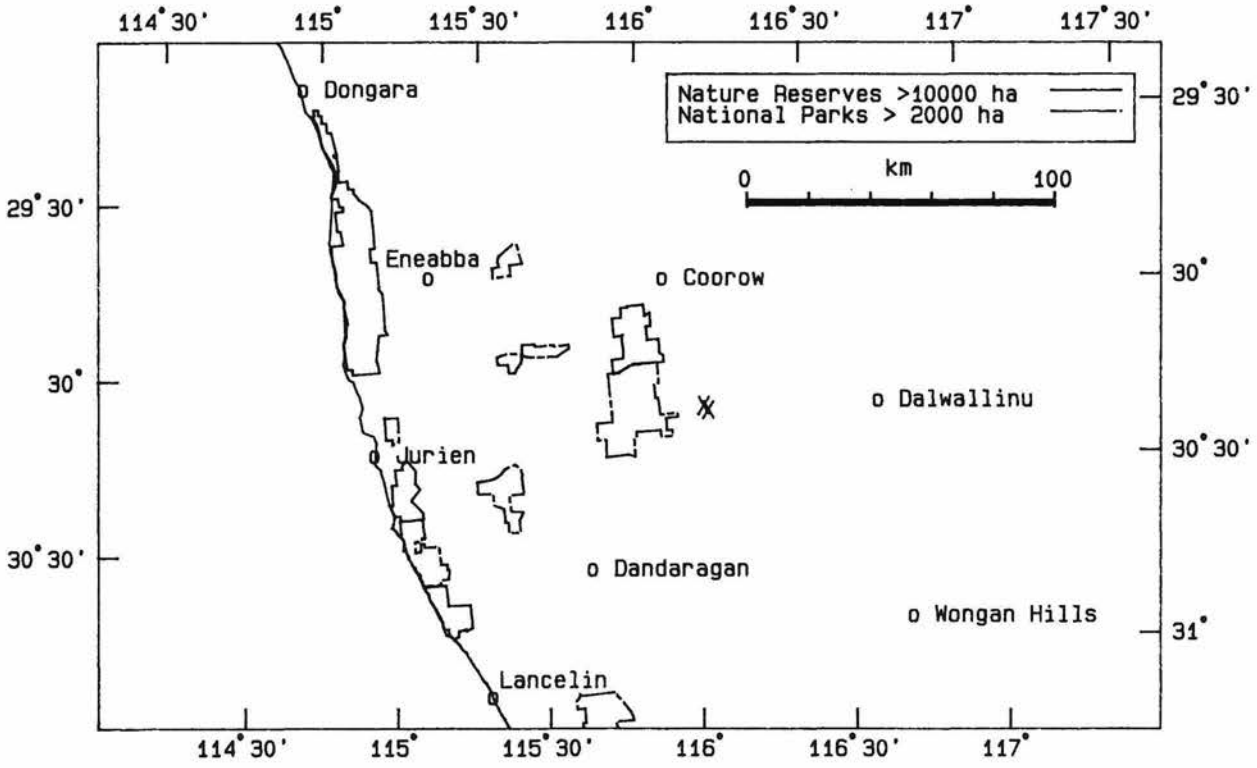
*Eucalyptus rhodantha* var. *petiolaris* is restricted to the Watheroo area where it grows in association with var. *rhodantha* on sandy flat or undulating country. A total of only two plants are known from remnant vegetation on private property. Few further populations are likely to be found as the area is extensively cleared and well surveyed. Protection of the plants from grazing is essential. *E. rhodantha* (including var. *rhodantha* and var. *petiolaris*) is gazetted as Declared Rare Flora [Appendix 2] and a management program detailing strategies for conservation has been prepared (Sampson *et al.* 1990).

*E. rhodantha* var. *petiolaris* is distinguished from var. *rhodantha* by its shortly petiolate leaves which tend to be yellowish green and more lanceolate in shape. The leaves are never stem-clasping as with var. *rhodantha*.

Specific References: Blakely (1941), Sampson *et al.* (1990).

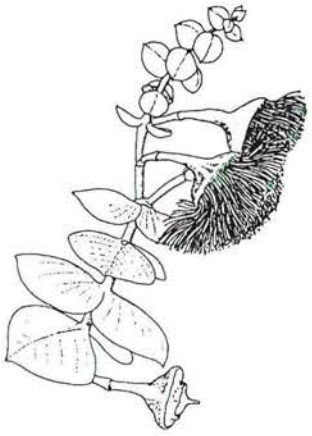






**EUCALYPTUS RHODANTHA** Blakely & Steedman var. **RHODANTHA**

**Rose Mallee, Rose Gum**



Number of records: 7

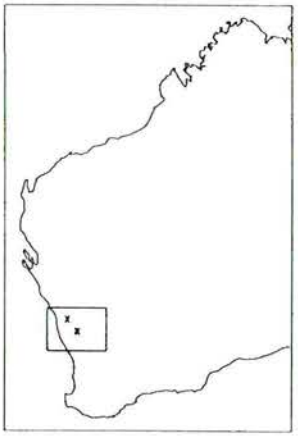
Population Size
<10(3) 10-20(1) 20-50(1) 50-100(0) 100-500(2) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (43%), Not (57%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

Height: 2-3.5 m

Flowering period: May - September

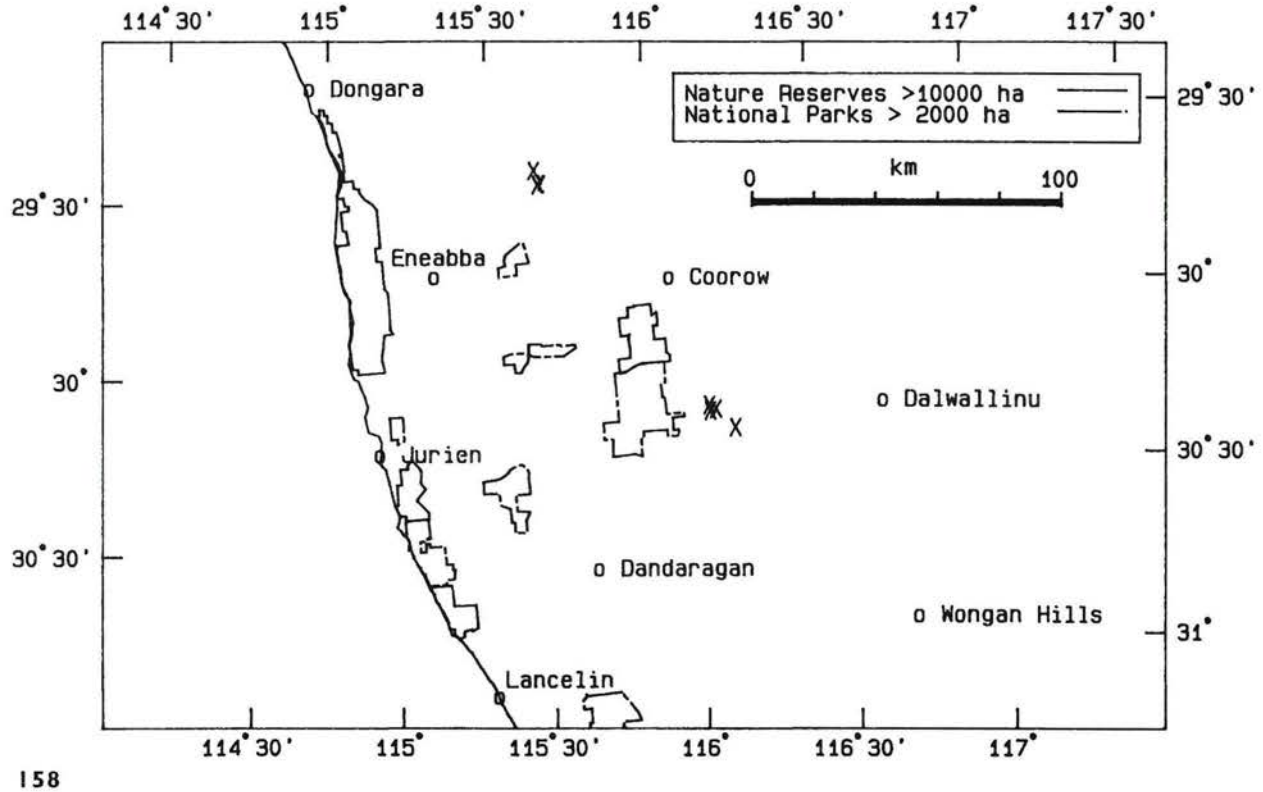
*Eucalyptus rhodantha* var. *rhodantha* is confined to a few remnant populations in largely cleared agricultural land near Watheroo and Three Springs. It grows on flat or gently undulating country in cleared farmland or emergent from scrub and heath. Soils are sand or sandy loam, often with gravel. Less than 500 individuals are known, with all populations occurring on private property and road verge. 79 per cent of the total plants are on uncleared bushland where they grow in almost pure stands with *Allocasuarina campestris, Dryandra ashbyi, Calothamnus quadrifidus* and *Gastrolobium spinosum* (Sampson 1988). Conservation of these areas is a priority.

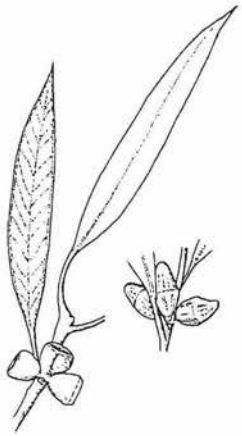


*E. rhodantha* (including var. *rhodantha* and var. *petiolaris*) is gazetted as Declared Rare Flora [Appendix 2]. A detailed management program outlining strategies for management and conservation has been prepared (Sampson *et al.* 1990). To date, conservation of this species has been achieved through the goodwill and assistance of private landowners, local shires and authorities.

*E. rhodantha* var. *rhodantha* is a low, straggling mallee characterized by its blue-grey, very glaucous leaves and large, red flowers on long pedicels and peduncles. The leaves are sessile and usually in opposite pairs on the branches. There is usually one, but may be up to three, flowers per inflorescence.

Specific References: Blakely, McKie and Steedman (1938), Lucas and Synge (1978), Holliday and Watton (1980), Pryor (1981), Rye and Hopper (1981), Leigh *et al.* (1984), Elliot and Jones (1986), McNee (1986, 1989), Sampson (1988), Sampson *et al.* (1989, 1990).





**EUCALYPTUS RIGENS** Brooker & Hopper

Number of records: 48

Population Size
<10(0) 10-20(4) 20-50(4) 50-100(2) 100-500(3) >500(0)
unspecified(35)

Conservation Status
Restricted to road verge (6%), Not (90%), Unspecified (4%)
In conservation reserve (42%), Not (56%), Unspecified (2%)

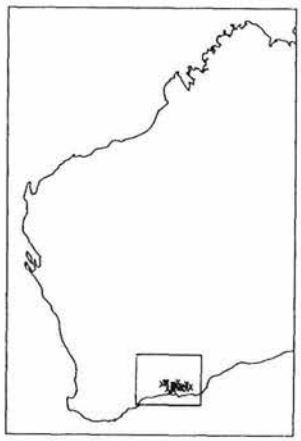
Height: 1-4 m

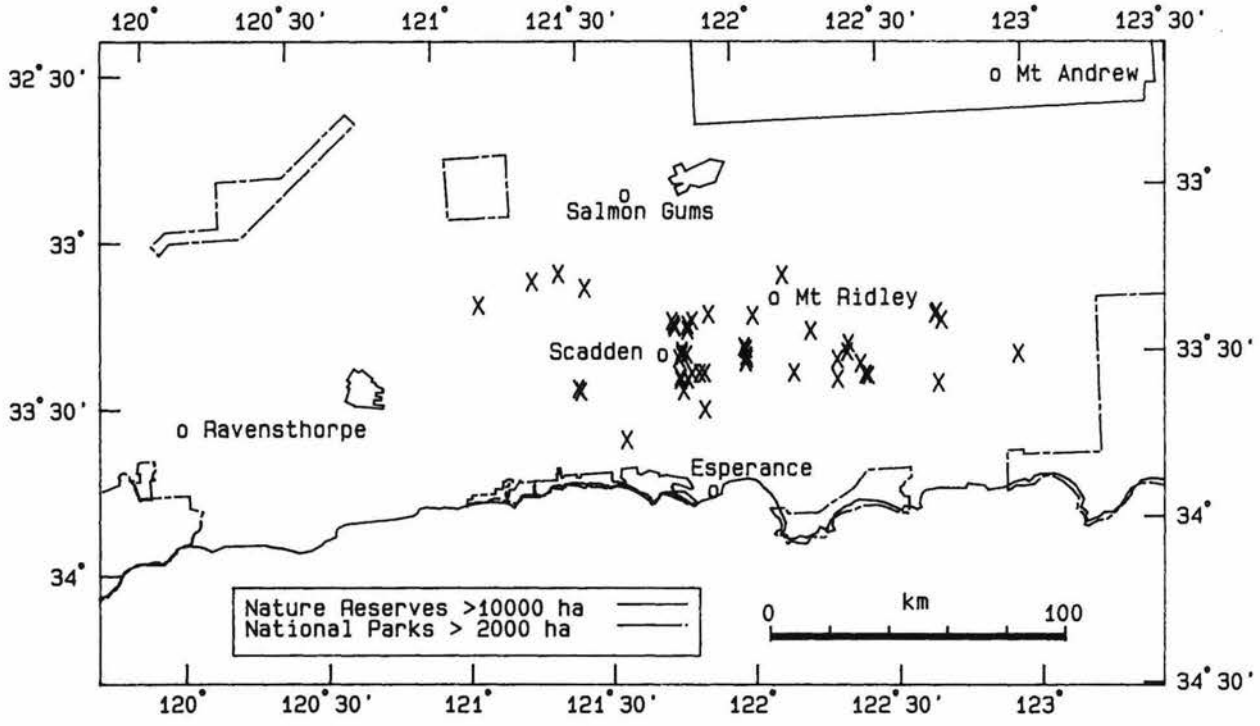
Flowering period: July - September

*Eucalyptus rigens* is found in sandy and clayey soils on flats and salt lake margins from north-west to north-east of Esperance. It forms open shrub-mallee communities over samphire (*Halosarcia* sp.) or scrub dominated by *Melaleuca* species. *E. halophila, E. leptocalyx, E. uncinata* and *E. eremophila* are commonly associated. It is adequately conserved with 42 per cent of the total records from seven nature reserves. Other populations are from private property and vacant Crown land. The number of records for *E. rigens* has doubled since the commencement of the survey. Its potential value in the reclamation of salt-affected areas requires investigation.

*E. rigens* is an effuse mallee with smooth bark and stiff, erect leaves that may be dull or glossy. It differs from the related *E. famelica* and *E. litorea* in its sprawling habit, three-flowered inflorescence and larger buds.

Specific Reference: Brooker and Hopper (1989).





**EUCALYPTUS 'RIVALIS'** Blakely ms.

Number of records: 2

Population Size
<10(2) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(0)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (50%), Not (50%), Unspecified (0%)

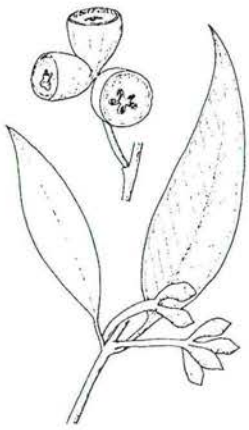
Height: 5 m

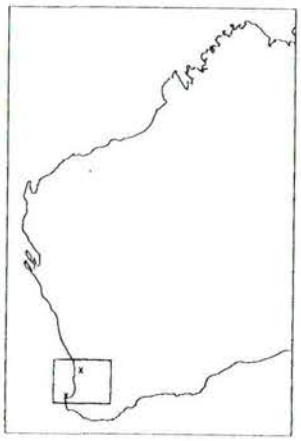
Flowering period: unknown

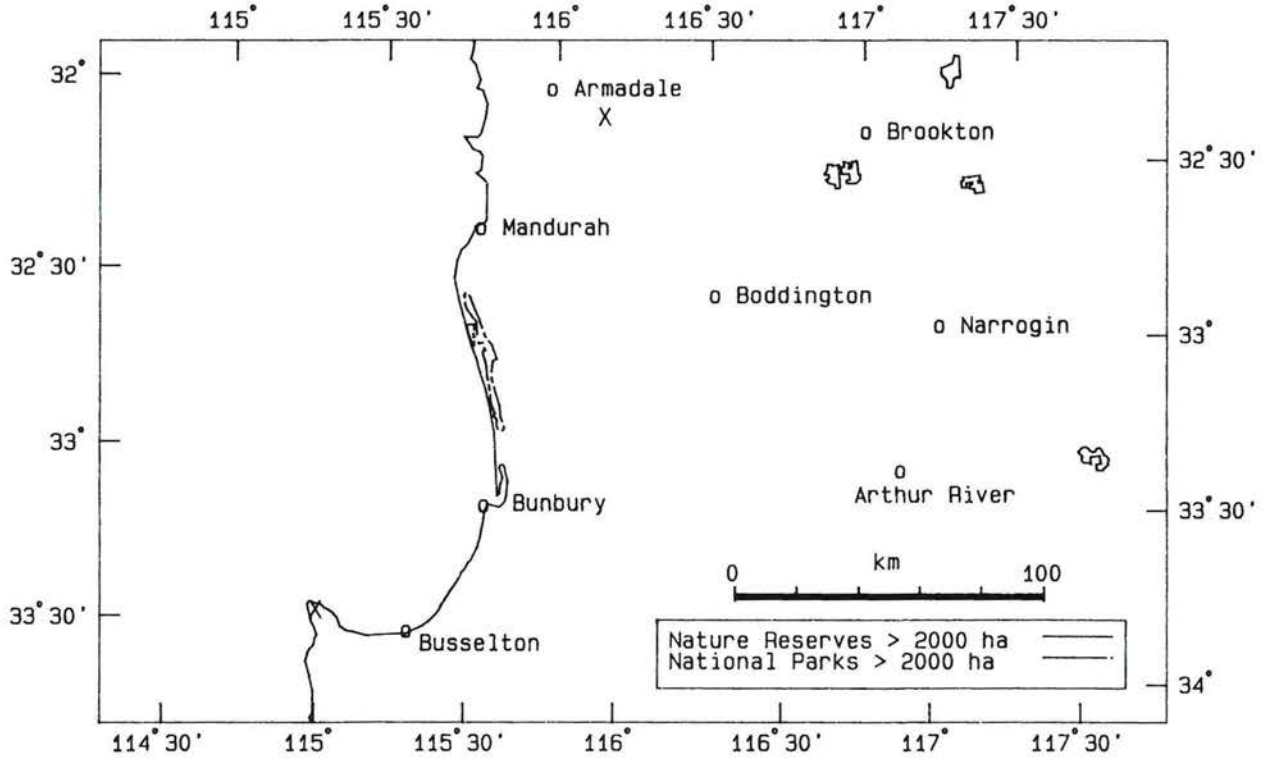
A rare hybrid known from only two populations, in State forest south-east of Armadale and in the Leeuwin-Naturaliste National Park. It was first collected in the late 1930s at the northern locality and originally thought to be a new species allied to *Eucalyptus megacarpa*. The site was last visited in 1960 when two trees were found growing at the boundary of *E. marginata* and *E. megacarpa* stands. The current status of this population is not known. The southern population of five plants grows on brown sandy loam with *Agonis* sp. No *E. marginata* or *E. megacarpa* occur in the immediate vicinity. Hybridization between the parent species is not frequent so few further populations are expected. Careful monitoring of the sites to prevent accidental destruction is required. Collection of seed and cultivation should be undertaken.

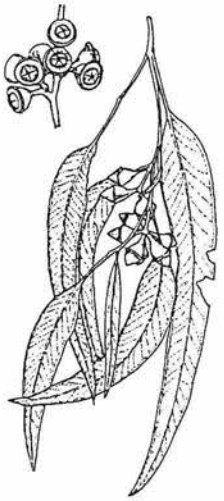
*E. 'rivalis'* is a tree with coarse, grey bark on the trunk. It is considered to be a hybrid between *E. marginata* and *E. megacarpa*. The buds, fruits and leaves are intermediate between the two parent species.

Specific Reference: Pryor and Johnson (1962).









**EUCALYPTUS RUDIS** Endl. ssp. **CRATYANTHA** Brooker & Hopper

Number of records: 4

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(4)

Conservation Status
Restricted to road verge (25%), Not (75%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

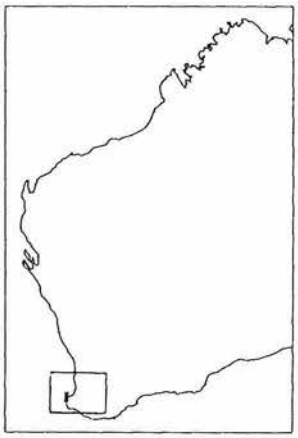
Height: 5-10 m

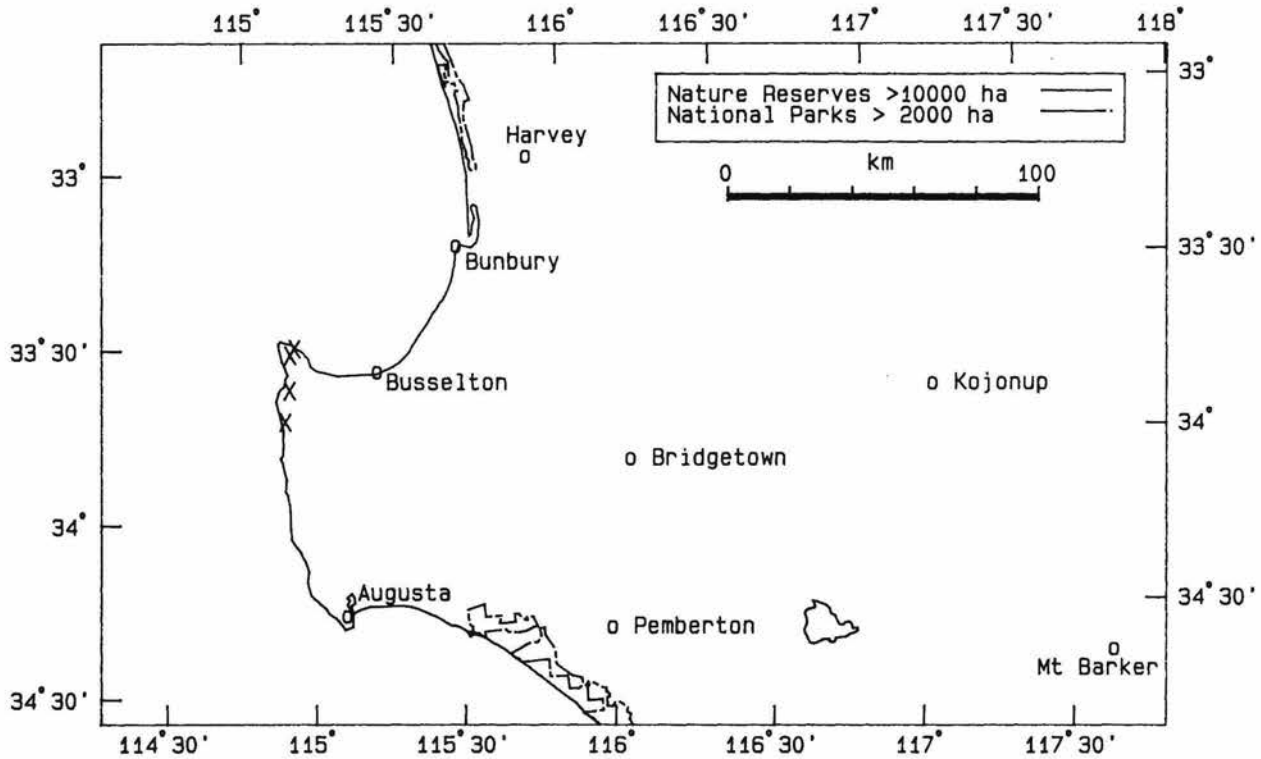
Flowering period: unknown

*Eucalyptus rudis* ssp. *cratyantha* is known from four populations, of unrecorded size, between Eagle Bay and Gracetown. It grows in loam or sandy loam soils bordering watercourses near the coast. *E. calophylla, E. cornuta, Agonis flexuosa* and *Melaleuca rhaphiophylla* are associated. One population is from a sedge swamp. None of the records are from conservation reserves and one is restricted to road verge. Protection of these populations in order to conserve the range of morphological and genetic diversity within *E. rudis* is important. More recently, the subspecies has been recorded near Collie and Pinjarra.

*E. rudis* ssp. *cratyantha* is a tree with rough, grey, tesselated or furrowed bark. It differs from *E. rudis* in its exceptionally large buds and fruits and large leaves up to 20 cm long.

Specific Reference: Brooker and Hopper (1993).





**EUCALYPTUS** aff. **SALMONOPHLOIA** F. Muell.

Number of records: 2

Population Size
<10(1) 10-20(0) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(0)

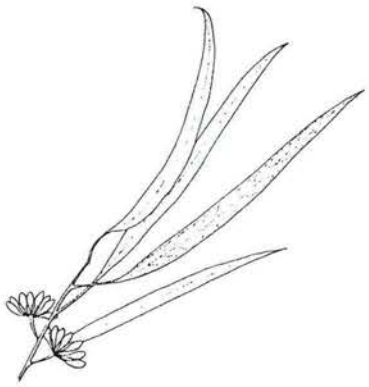
Conservation Status
Restricted to road verge (0%), Not (50%), Unspecified (50%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

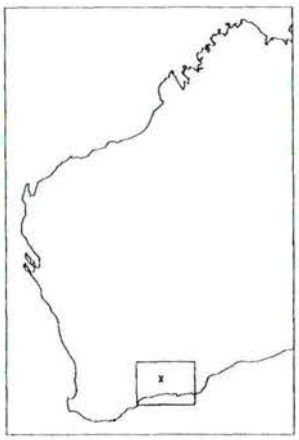
Height: 16-18 m

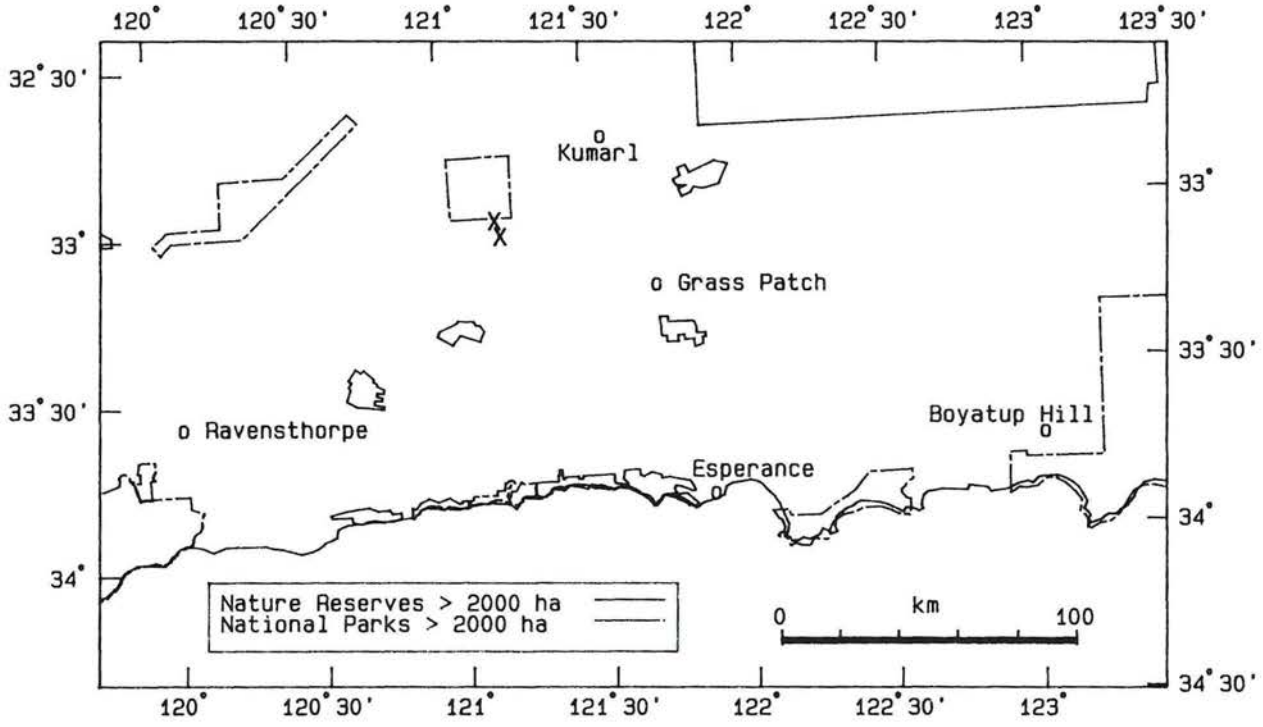
Flowering period: unknown

*Eucalyptus* aff. *salmonophloia* is known from only two populations on vacant Crown land just south of Peak Charles National Park. The southern population of 20 to 50 plants grows as woodland among dense mallee on a clay-loam flat. The northern population consists of two trees in an open patch of mallee on sandy clay soil. Other species recorded in association were *E. flocktoniae* and *E. conglobata*. There has been little survey for this species and its true conservation status is unknown. It may have been overlooked in the past because of its superficial similarity to *E. longicornis*.

*E.* aff. *salmonophloia* is closely related to Salmon Gum (*E. salmonophloia*) differing in its rough basal bark, narrower leaves and ovoid to spindle-shaped buds with a conical operculum. The buds of *E. salmonophloia* are ovoid to globose with a hemispherical operculum.







**EUCALYPTUS SARGENTII** Maiden

**Salt river gum**

Number of records: 66

Population Size
<10(10) 10-20(11) 20-50(8) 50-100(4) 100-500(10) >500(0) unspecified(23)

Conservation Status
Restricted to road verge (0%), Not (92%), Unspecified (8%)
In conservation reserve (27%), Not (73%), Unspecified (0%)

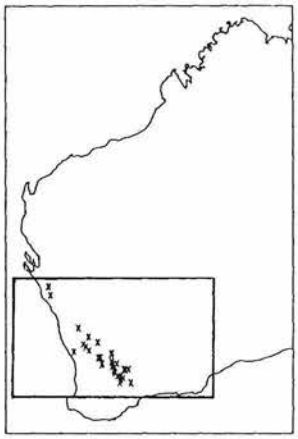
Height: 3-11 m

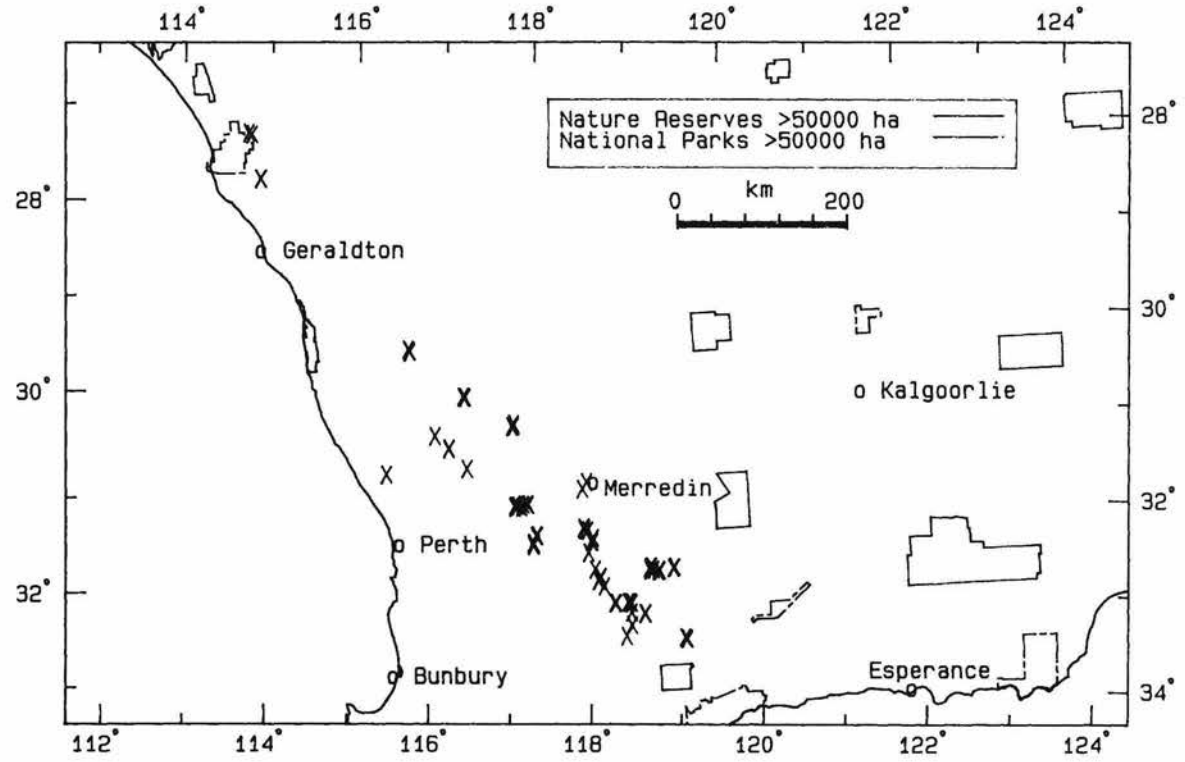
Flowering period: September - January

*Eucalyptus sargentii* occurs in the wheatbelt from Coorow south to Lake Magenta, with isolated populations further north near Binnu and Eurardy. It is confined to salty flats, river banks and lake margins on sandy or sometimes clayey and loamy soils. It grows as scattered individuals or in low woodlands, usually over *Melaleuca* and *Halosarcia* species. It is reasonably common within its specific habitat, and is usually the closest eucalypt species to salty areas. *E. spathulata* is sometimes associated. Of the total records 27 per cent are represented in eleven nature reserves. A large proportion of the populations occurs in remnant vegetation on otherwise cleared farmland. Some of the populations are in poor condition with a number of dead individuals, apparently owing to rising water tables and increased salinity. This species has considerable potential for the rehabilitation of salt-affected land and has been used to some extent for this purpose.

*E. sargentii* is a small tree with a stocking of rough, brown-black bark on the short trunk, or less commonly a mallee with smooth bark throughout. It is characterized by its horn-shaped budcaps, black basal bark and narrow, slightly glossy leaves. The inflorescences are down-curved on slender peduncles.

Specific References: Maiden (1903-1933), Holliday and Watton (1980), Elliot and Jones (1986), Hill and Johnson (1992).





**EUCALYPTUS SEMIGLOBOSA** (Brooker) L. Johnson & K. Hill

Number of records: 12

Population Size
<10(0) 10-20(0) 20-50(1) 50-100(0) 100-500(1) >500(0) unspecified(10)

Conservation Status
Restricted to road verge (17%), Not (66%), Unspecified (17%)
In conservation reserve (33.3%), Not (33.3%), Unspecified 33.3%)

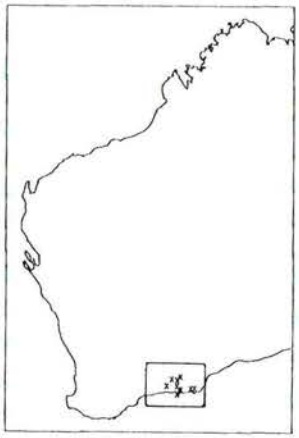
Height: 2-6 m

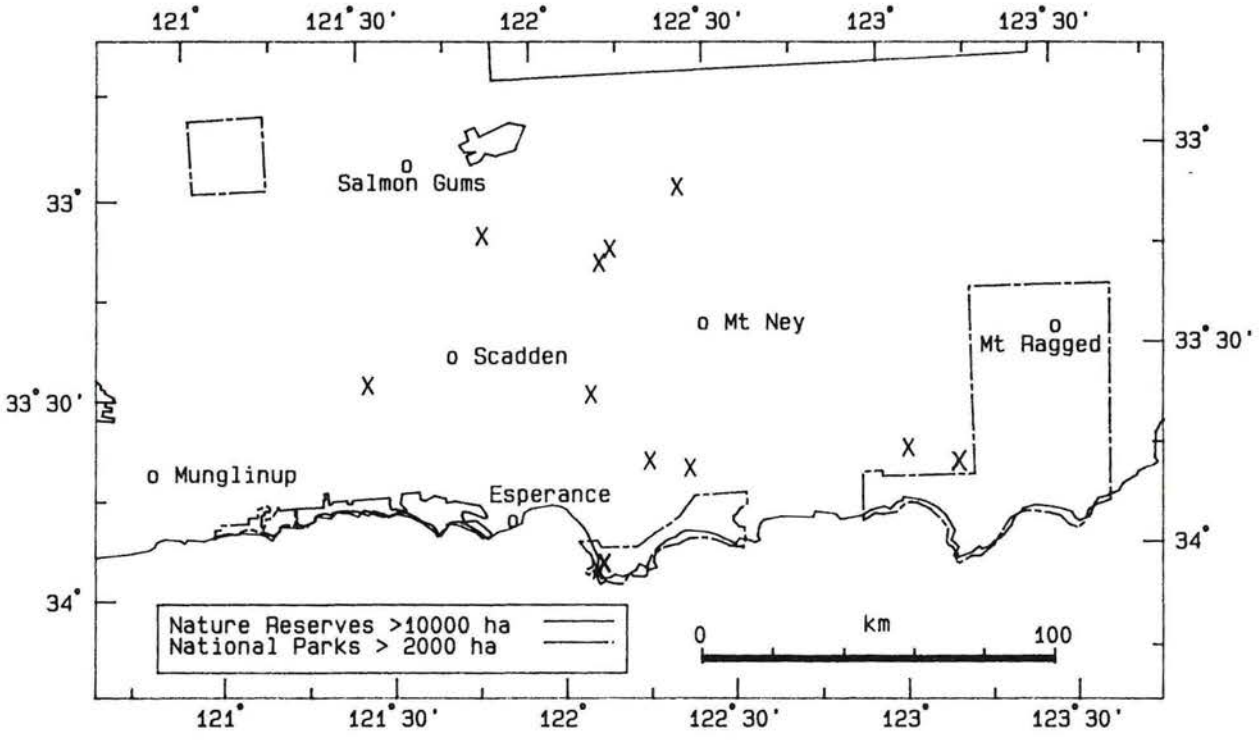
Flowering period: April - June

*Eucalyptus semiglobosa* has a scattered distribution from the Dalyup River east toward Cape Arid National Park and to north of Sheoak Hill, a range of approximately 160 km. It grows on often rocky, sandy loams or sandy clays in mallee or mallee-heath communities. The topography is usually flats or wet depressions. A wide variety of species including *E. aquilina, E. ligulata, E. occidentalis* and *E. kessellii* are associated. There are four confirmed records (33.3 per cent of total) from conservation reserves, two in Cape Le Grand National Park and one each from nature reserves north-east and north-west of Esperance. Population sizes were mostly unspecified. There has been little recent survey for this species and further investigation of known records (regarding population size and land status) and survey for new populations is required before its conservation status can be accurately assessed.

*E. semiglobosa* is a mallee, or rarely a small tree, with smooth bark and glossy grey-green leaves. It is related to *E. goniantha* differing in its usually down-curved inflorescences, larger, more globular fruits and smooth buds with a non-beaked operculum.

Specific References: Brooker (1976a), Elliot and Jones (1986), Hill and Johnson (1992).





**EUCALYPTUS SEPULCRALIS** F. Muell.

**Weeping Mallee**

Number of records: 12

Population Size
<10(1) 10-20(0) 20-50(1) 50-100(1) 100-500(1) >500(0) unspecified(8)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (100%), Not (0%), Unspecified (0%)

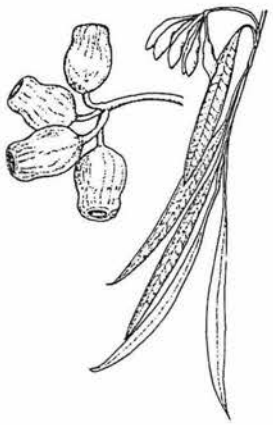
Height: 4 m

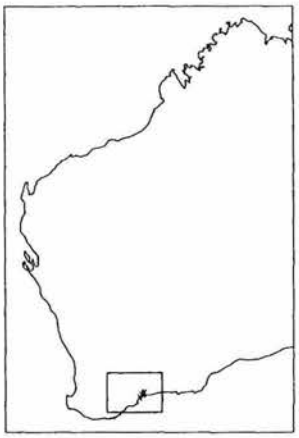
Flowering period: September - January

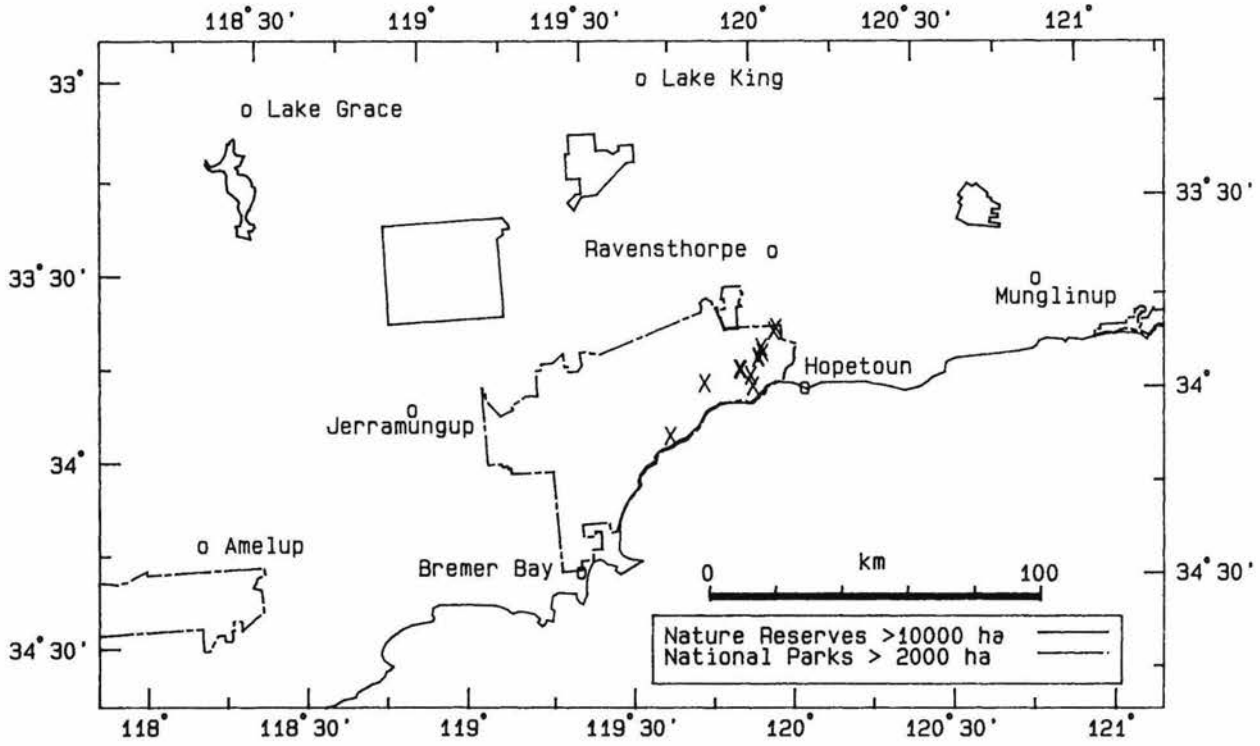
*Eucalyptus sepulcralis* occurs over a 45 km range in the Fitzgerald River National Park from Mid Mt Barren to No Tree Hill. It grows emergent above proteaceous heath on rocky quartzite slopes and hilltops. It is sometimes found in association with *E. coronata,* with which it hybridizes, and *E. preissiana.* Population sizes often exceed several thousand, particularly in the Eyre Range. Monitoring and careful management of the sites is required.

*E. sepulcralis* is an elegant, slender-stemmed mallee with glaucous branchlets and a drooping crown of glossy leaves. The buds and fruits are glaucous and pendulous on long pedicels and peduncles. It is closely related to *E. pendens*, differing in its elongated buds and urn to barrel-shaped fruits.

Specific References: Hopper *et al.* (1978), Holliday and Watton (1980), Pryor (1981), Mueller (1882), Elliot and Jones (1986).







**EUCALYPTUS SP. C** (aff. **DIVERSIFOLIA** Bonpl.)

**Jimberlana Mallee**

Number of records: 2

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(1) >500(0) unspecified(1)

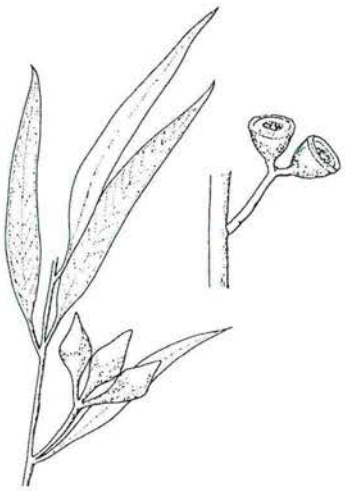
Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

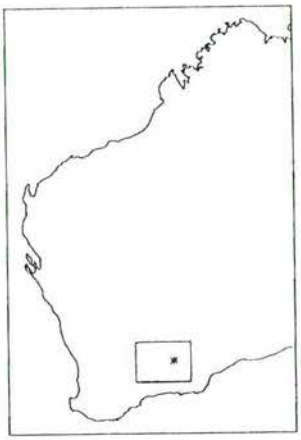
Height: 1.5-4 m

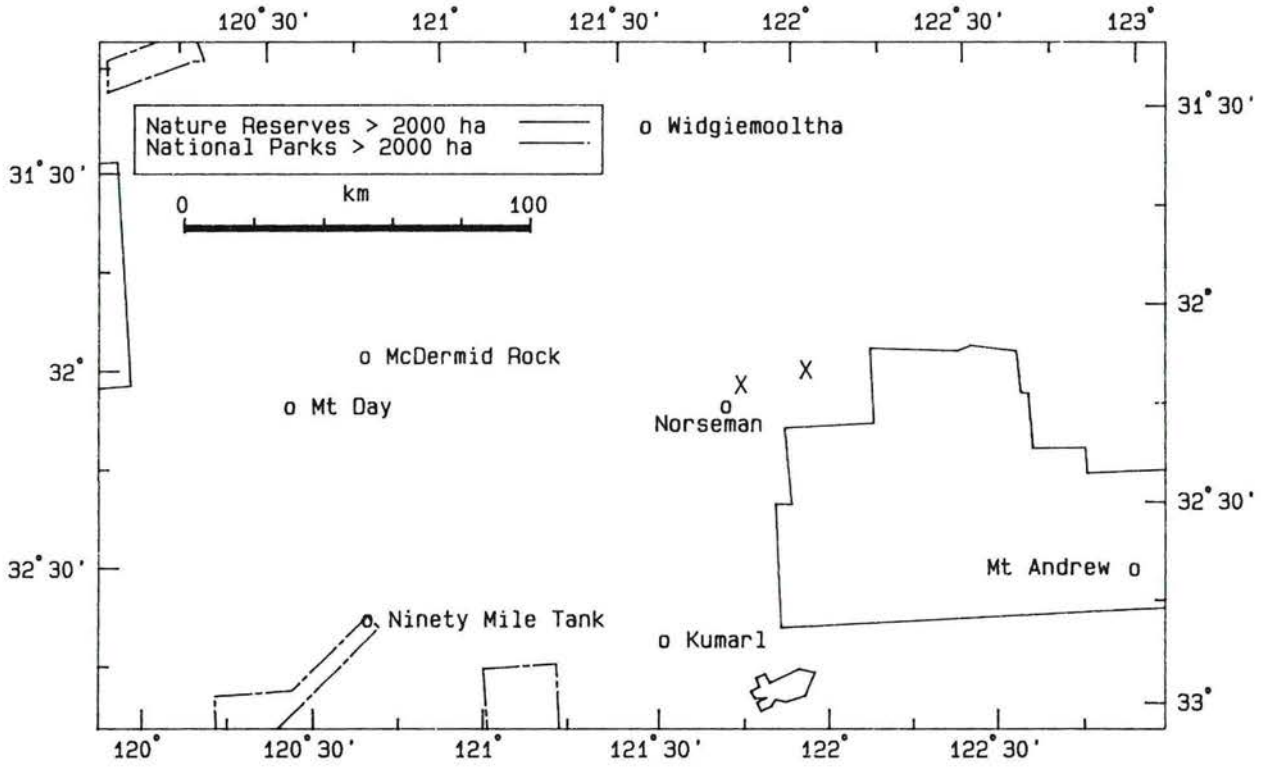
Flowering period: March - May

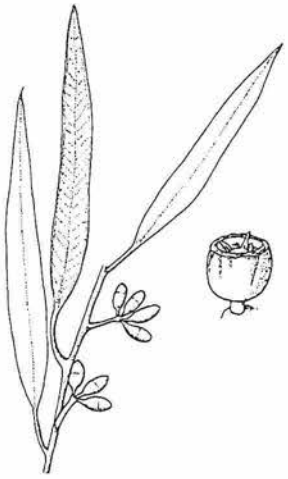
An undescribed taxon confined to the slopes of two hills north-east of Norseman, growing in loamy soils among granite boulders. At the western locality *ca* 200 plants form an open mallee community with *Eucalyptus oleosa*. No recent data are available for the eastern site. Both areas are vested as water reserves and the western locality is under active mineral exploration. Protection of the populations from accidental destruction and seed collection and cultivation is required. Acquisition of the western site as a nature reserve would be desirable. It is gazetted as Declared Rare Flora [Appendix 2 - *E.* sp. (Norseman) S.D. Hopper 2736].

*E.* sp. C is a smooth-barked mallee with erect, blue-green and slightly glaucous leaves. It is closely related to *E. diversifolia* but differs in its arid rocky habitat, elongated buds and fruits with a usually flattened disc.









**EUCALYPTUS SP. M** (aff. **OLEOSA** F. Muell. ex Miq.)

Number of records: 14

Population Size
<10(0) 10-20(1) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(13)

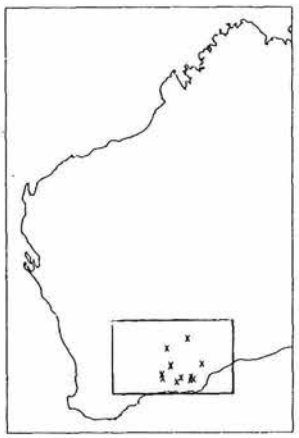
Conservation Status
Restricted to road verge (0%), Not (64%), Unspecified (36%)
In conservation reserve (14%), Not (86%), Unspecified (0%)

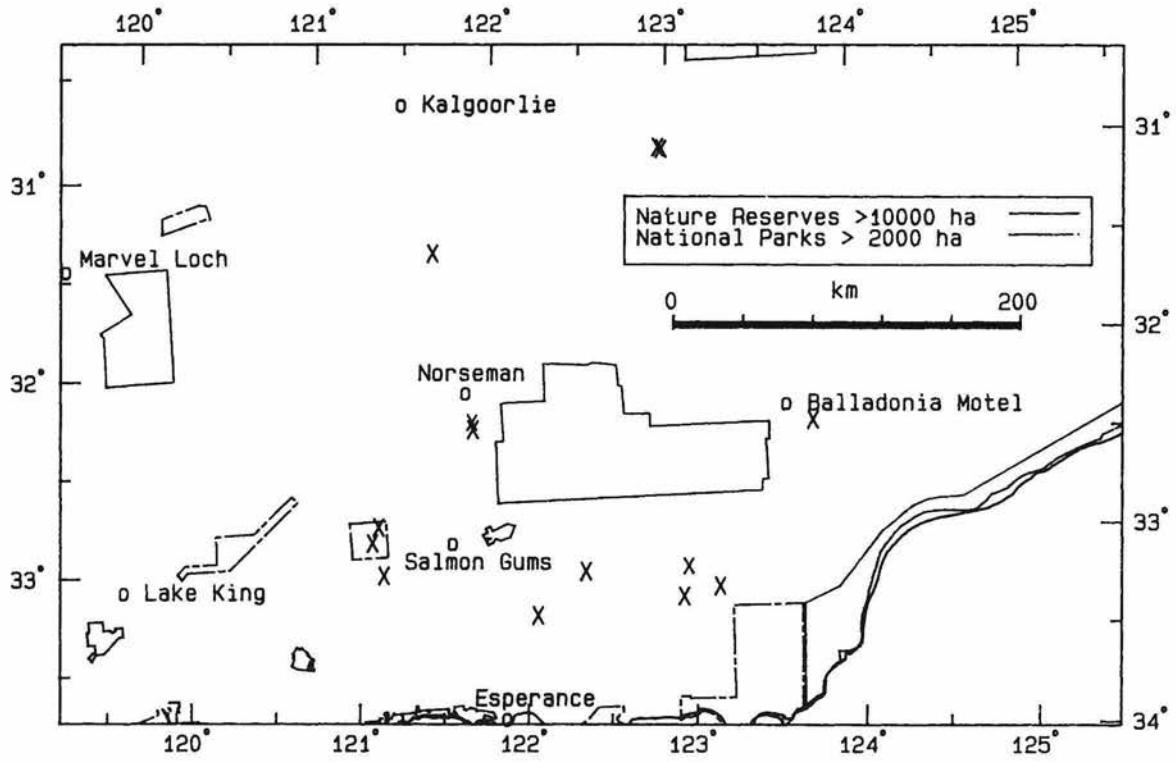
Height: 4-12 m

Flowering period: May - July

*Eucalyptus* sp. M occurs as scattered populations in the area between Peak Charles, Coonana, Balladonia and Scaddan. It grows on flat or gently sloping terrain, in soils that are varied but mostly sandy. Associated species in the mallee or woodland communities include *E. gracilis, E. diptera, E. calycogona* and *E. transcontinentalis*. Of the total collections 14 per cent are from conservation reserves. A number of the populations occur in areas where they may be under threat from agriculture and mining. Given its wide distribution and general habitat requirements, *E.* sp. M is likely to be more common than records indicate. Further surveys throughout its range are necessary before its conservation status can be accurately assessed.

*E.* sp. M is a mallee recorded to a height of 12 m but more commonly growing to 6-8 m. It has rough bark on the lower stems and narrow, glossy leaves. It is closely related to *E. longicornis* and *E. oleosa* with ovoid to spindle-shaped buds and cup-shaped fruits.





**EUCALYPTUS SP. U** (aff. **PILEATA** Blakely)

Number of records: 10

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(10)

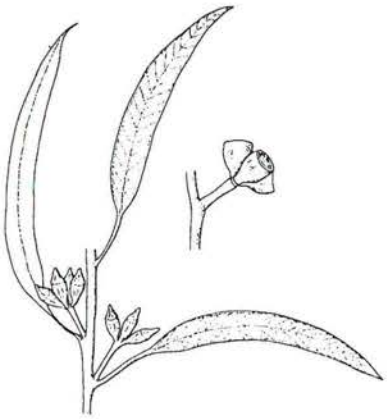
Conservation Status
Restricted to road verge (0%), Not (80%), Unspecified (20%)
In conservation reserve (10%), Not (90%), Unspecified (0%)

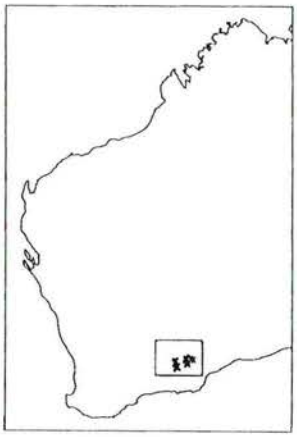
Height: 5-10 m

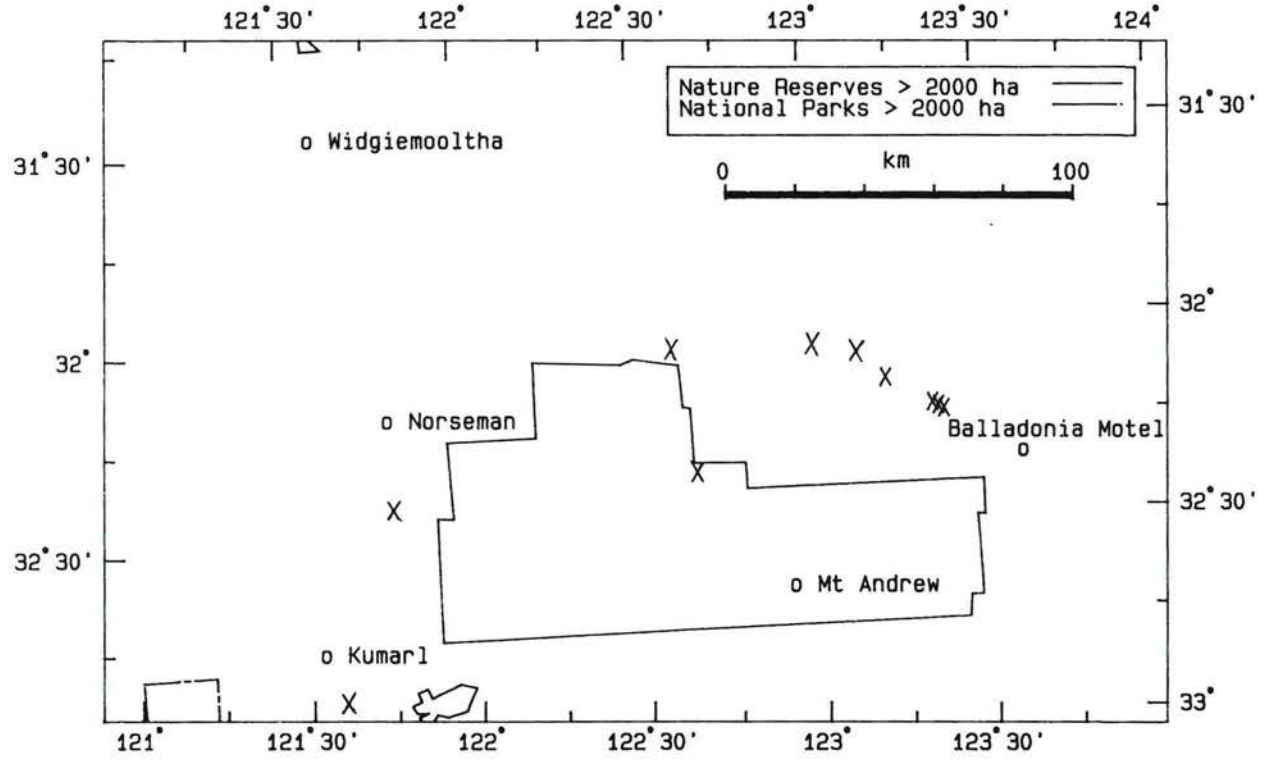
Flowering period: unknown

*Eucalyptus* sp. U occurs in scattered populations from north-west of Balladonia to south of Norseman. It forms woodland or mallee-scrub communities on loamy flats, often in association with *E. calycogona* and *E. flocktoniae*. Most of the records were made from along major transport routes, with one record from the Dundas Nature Reserve. Several of the populations were recorded as 'locally abundant' and it is probably more frequent in the poorly surveyed and remote region.

*E.* sp. U is a smooth-barked mallee or small tree of steeply branching habit. It is related to *E. pileata*, differing in its strongly beaked budcap and smaller fruits. *E. polita* is also similar but has much smaller buds.







**EUCALYPTUS SPARSA** Boomsma

**Northern Ranges Box**

Number of records: 3

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(3)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

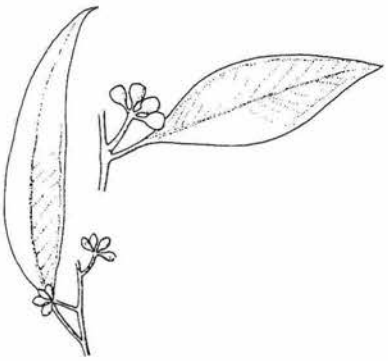
Height: 3 m

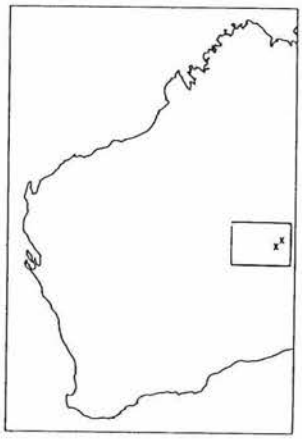
Flowering period: January - February

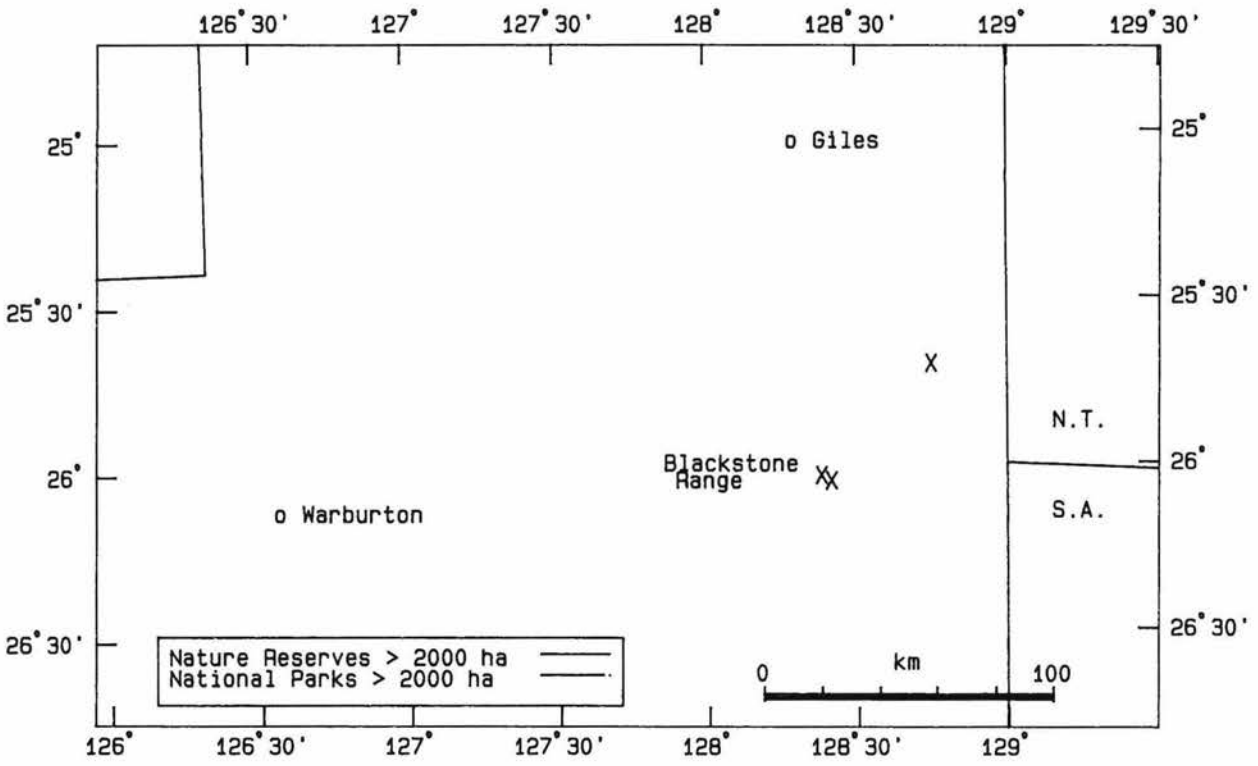
In Western Australia, recorded from the Blackstone Range and north-east towards the Northern Territory border. It grows on hill slopes and on sandy plains at the base of the ranges. It extends into central Australia to the Everard Range and the common name refers to its main distribution in the far north-west of South Australia. Its remote habitat affords considerable protection.

*Eucalyptus sparsa* is a small tree or mallee with rough, grey bark on the lower trunk and distinctive shiny, green, lanceolate to ovate leaves. Its buds and fruits are in compound inflorescences that are either terminal or axillary.

Specific References: Boomsma (1979), Jessop (1985), Elliot and Jones (1986).







**EUCALYPTUS STEEDMANII** Gardner

**Steedman's Mallee**

Number of records: 12

Population Size
<10(0) 10-20(0) 20-50(1) 50-100(0) 100-500(1) >500(5) unspecified(5)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

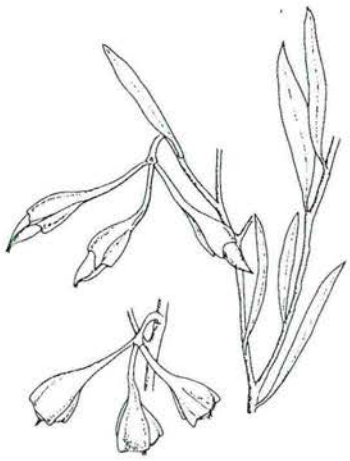
Height: 1.5-12 m

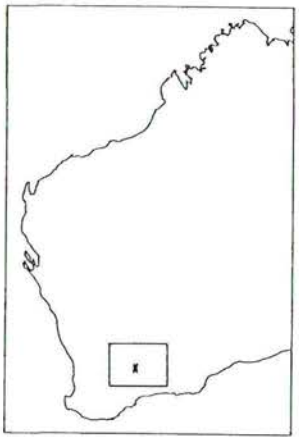
Flowering period: December - March

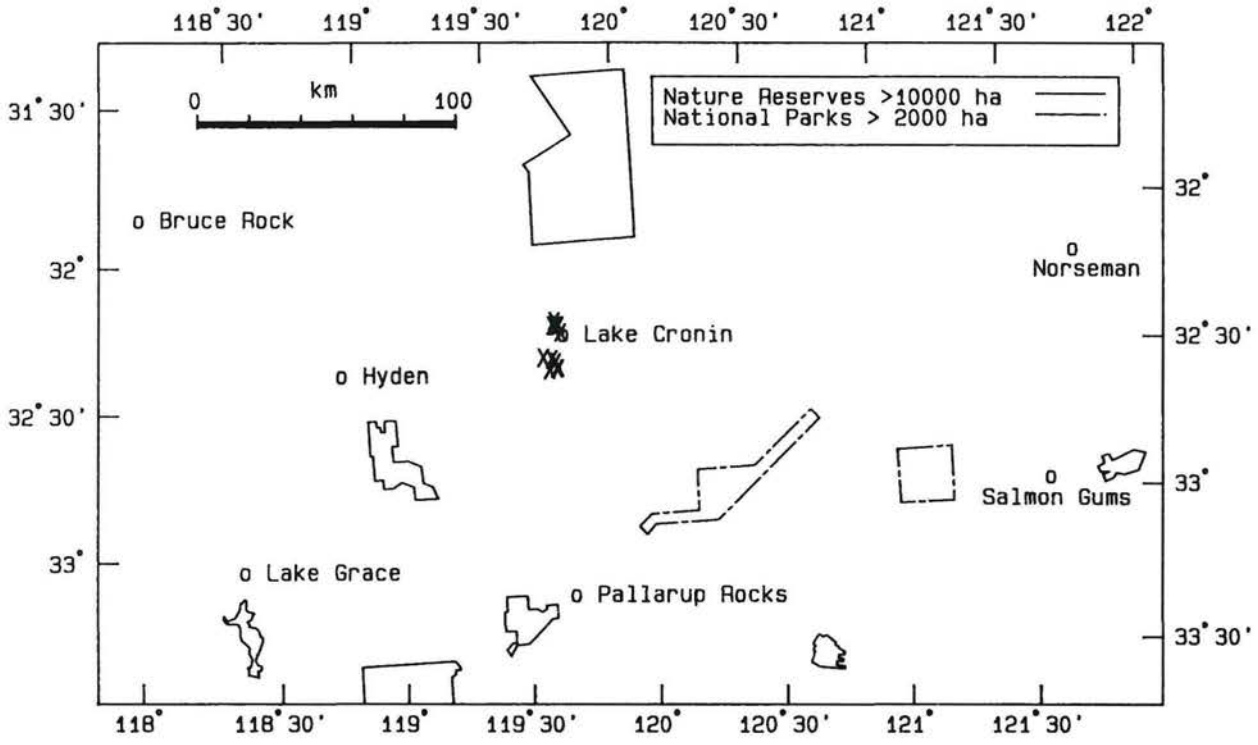
*Eucalyptus steedmanii* is restricted to several populations in two disjunct localities in the Ironcaps area east of Hyden. Until recently it was known from only two populations south of North Ironcap, and prior to 1978 was believed to be extinct as it had not been collected or reliably observed for 40 years. It favours clay and loam soils on gentle slopes and ridges of ironstone and greenstone. It grows in extensive stands, forming low woodland over *Melaleuca* scrub and heath. *E. eremophila, E. salubris, E. salmonophloia* and *E. densa* are associated. At sites recovering from fire it is the dominant species and forms dense pole stands (van Leeuwen, personal communication). All populations, totalling several hundred thousand plants, occur on vacant Crown land. Both localities are covered by mineral tenements and protection from accidental destruction is essential. It is gazetted as Declared Rare Flora [Appendix 2]. It has been widely cultivated.

*E. steedmanii* is a smooth-barked mallet with a dense, rounded canopy of glossy, olive-green leaves. It is characterized by its prominently four-winged buds and fruits in pendulous, usually three-flowered inflorescences. It is most closely related to *E. 'mimica'* differing in its mallet habit, larger, pendulous buds and fruits and more squat, pyramidal budcaps.

Specific References: Gardner (1934), Lucas and Synge (1978), Holliday and Watton (1980), Pryor (1981), Rye and Hopper (1981), Leigh *et al.* (1984), Elliot and Jones (1986).







**EUCALYPTUS STOATEI** Gardner

**Scarlet Pear Gum**

Number of records: 31

Population Size
<10(1) 10-20(2) 20-50(2) 50-100(0) 100-500(2) >500(6) unspecified(18)

Conservation Status
Restricted to road verge (6%), Not (71%), Unspecified (23%)
In conservation reserve (6%), Not (84%), Unspecified (10%)

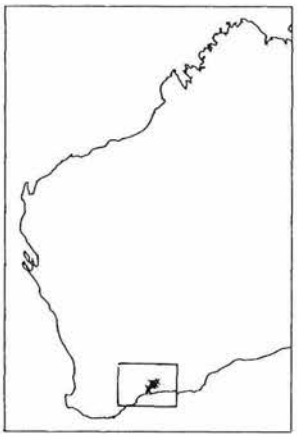
Height: 2-7 m

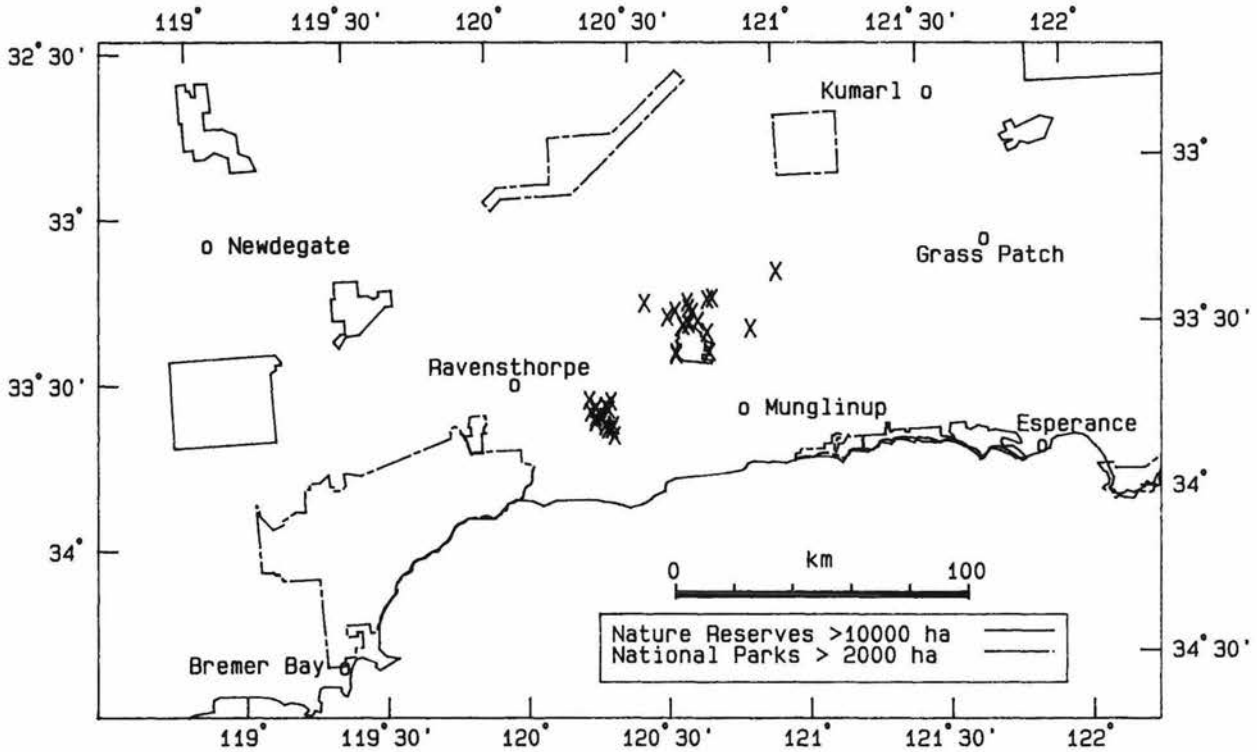
Flowering period: December - February

A species with a restricted distribution in the Jerdacuttup and Oldfield River-Young River regions. It is usually dominant in low woodland and forest over shrub-mallee including *Eucalyptus eremophila, E. tetragona, E. uncinata* and *E. flocktoniae*. In the lower storey, *Banksia media* and *Melaleuca uncinata* are often associated. Soils are sandy loams and sandy clays, occasionally with gravel, in flat or gently sloping country. It is locally abundant in its areas of occurrence, with surveys in the early to mid-1980s estimating the total number of individuals at approximately nine hundred thousand. Only two populations (6 per cent of total records) consisting of *ca* 250 plants occur in a nature reserve north of Munglinup. Other populations are from road verge, vacant Crown land and private property. It occurs in the western and south-western extent of the range of *E. forrestiana*, with intergradation between the two in bud and fruit form. It is sensitive to fire and regenerates from seed rather than rootstock. Acquisition of land as reserves in both areas would be desirable.

*E. stoatei* is a mallet or mallee very similar to *E. forrestiana* and previously included as a subspecies of this taxon. It can be distinguished by its prominent, irregularly ribbed buds and fruits and shorter, broader leaves. Hybrids between *E. tetraptera* and *E. stoatei* have been recorded.

Specific References: Gardner (1936), Holliday and Watton (1980), Hopper and Moran (1981), Pryor (1981), Leigh *et al.* (1984), Robinson (1984).





**EUCALYPTUS STOWARDII** Maiden

**Fluted Horn Mallee**

Number of records: 49

Population Size
<10(9) 10-20(9) 20-50(5) 50-100(4) 100-500(1) >500(0) unspecified(21)

Conservation Status
Restricted to road verge (18%), Not (41%), Unspecified (41%)
In conservation reserve (8%), Not (90%), Unspecified (2%)

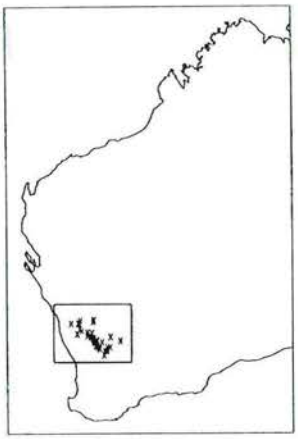
Height: 2.5-7 m

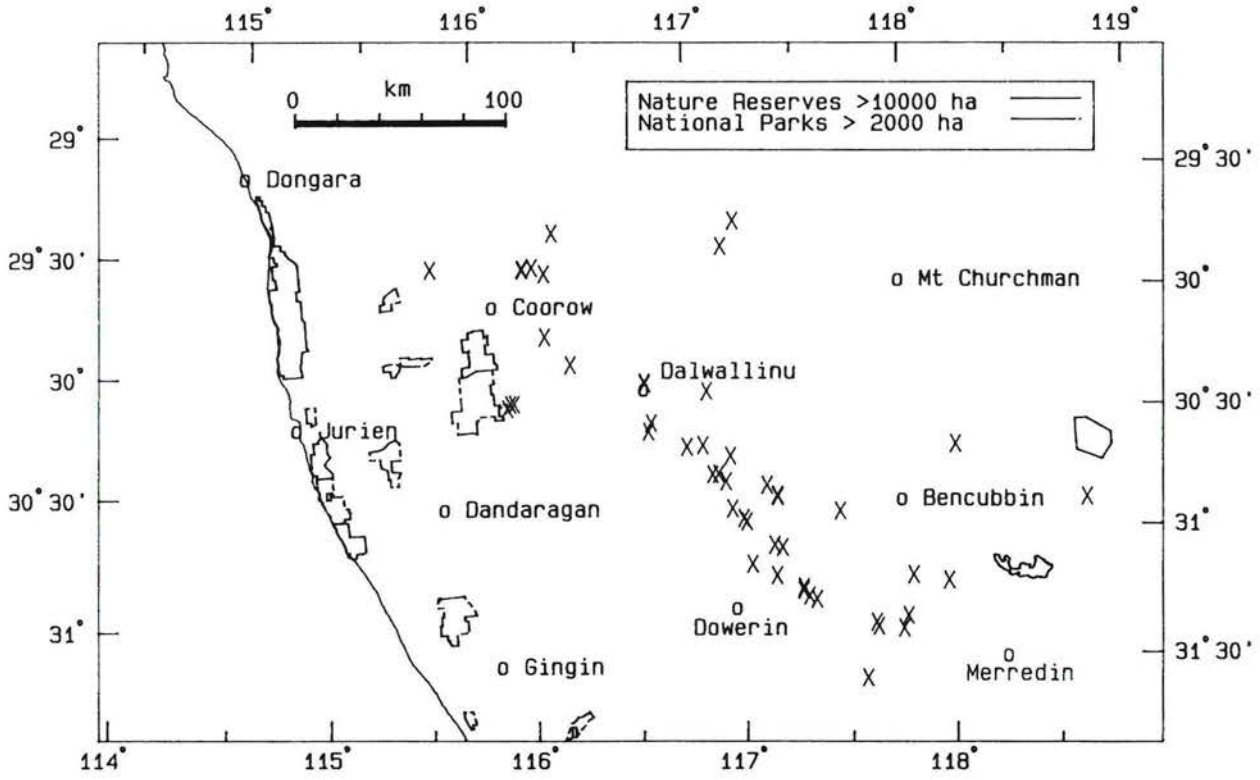
Flowering period: June - November

*Eucalyptus stowardii* is a widespread mallee occurring over a 330 km range from Mt Gibson and Perenjori in the north, east to Chiddarcooping Hill and south towards Kellerberrin. It is usually found as small populations on gentle slopes at the ecotone of mallee and tall shrubland communities. Soils are mostly sandy or loamy, often with gravel and sometimes with rocky granite or limestone. *E. eremophila, E. erythronema* and *E. subangusta* are commonly associated. It was found to be more abundant than previously thought with 29 new records made since the commencement of the survey. However, most of the known sites are on private property and road verge, with only four populations recorded from three nature reserves. A system of reserves conserving populations of *E. stowardii* throughout its range would be desirable.

*E. stowardii* is a mallee with smooth, grey bark and a drooping crown of large, very glossy leaves. Its distinctly ribbed buds and fruits are borne on a slender, down-curved peduncle. It is similar to *E. 'diminuta'* which has smaller, less glossy leaves and smaller buds and fruits with less ribbing.

Specific References: Maiden (1917), Elliot and Jones (1986).





**EUCALYPTUS SUBANGUSTA** (Blakely) Brooker & Hopper ssp. **PUSILLA** Brooker & Hopper

Number of records: 21

Population Size
<10(1) 10-20(0) 20-50(0) 50-100(0) 100-500(0) >500(0) unspecified(20)

Conservation Status
Restricted to road verge (0%), Not (52%), Unspecified (48%)
In conservation reserve (24%), Not (62%), Unspecified (14%)

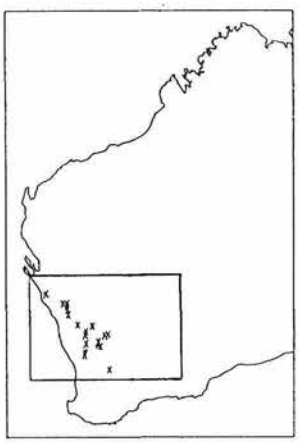
Height: 4 m

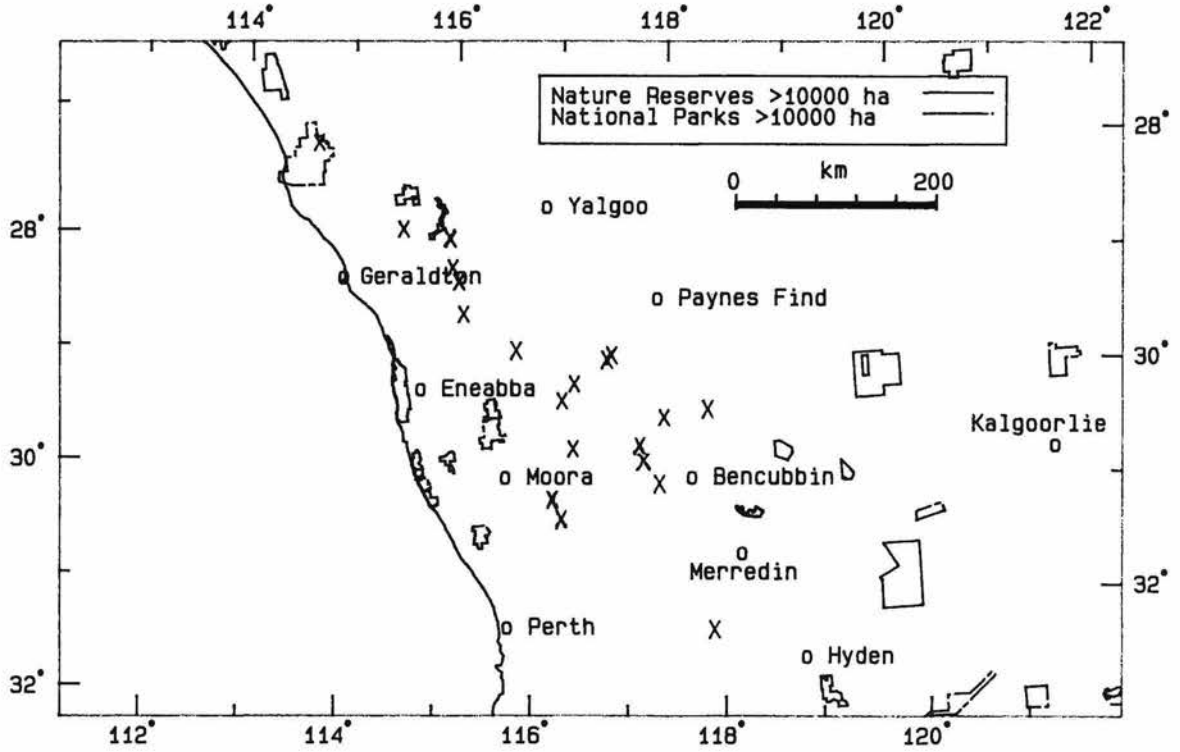
Flowering period: unknown

*Eucalyptus subangusta* ssp. *pusilla* has a scattered and widespread distribution in the northern wheatbelt from Yuna south to near Wongan Hills, with disjunct collections from north of Kalbarri and west of Babakin. It occurs on flat or gently undulating terrain, in sandy and loamy soils that are often rocky. Surrounding vegetation is low woodland or tall mallee with *E. leptopoda, E. horistes, E. arachnaea* and *E. hypochlamydea.* The majority of mapped localities are from herbarium collections where size and extent of populations are not specified. It has been poorly surveyed and is probably mistaken for ssp. *subangusta* unless closely examined. Of the total records 24 per cent are confirmed occurrences in five conservation reserves distributed throughout its range.

*E. subangusta* ssp. *pusilla* is a small mallee or mallet with dull leaves and smooth, grey and salmon bark. Its often mallet habit and very small buds and fruits distinguish it from the typical subspecies. It differs from ssp. *cerina* in its non-glaucous branchlets and from ssp. *virescens* in its dull leaves.

Specific Reference: Brooker and Hopper (1991).





**EUCALYPTUS SUBEREA** Brooker & Hopper

**Mount Lesueur Mallee**

Number of records: 15

Population Size
<10(2) 10-20(1) 20-50(2) 50-100(0) 100-500(1) >500(0) unspecified(9)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (73%), Not (27%), Unspecified (0%)

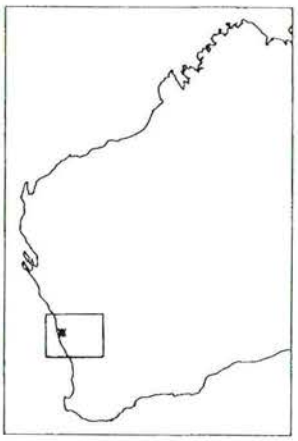
Height: 1-6 m

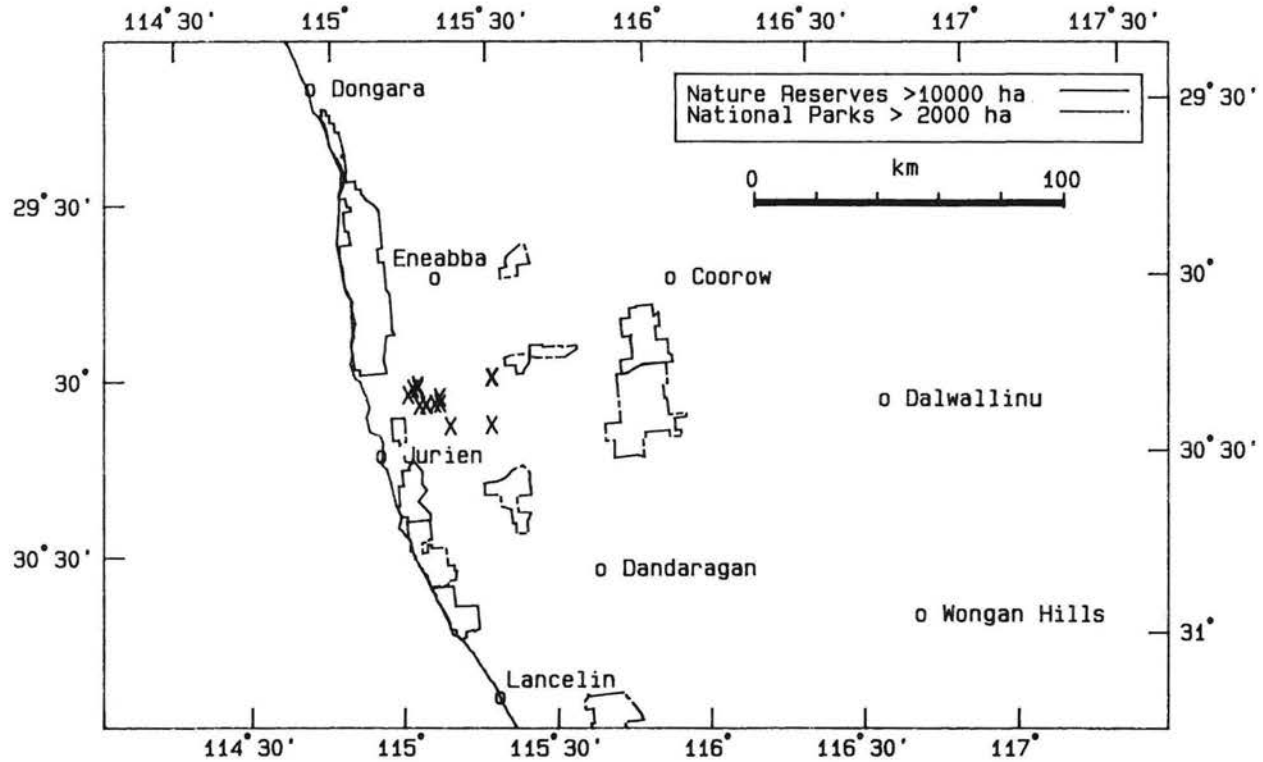
Flowering period: December - March

*Eucalyptus suberea* occurs over a range of about 30 km on the slopes and breakaways of lateritic uplands in the Gairdner Range-Coomallo Hill area. It grows in usually small localized populations in open mallee over dense heath . *E. lateritica, E. gittinsii* and *E. accedens* are most commonly associated. The majority of populations occur in the recently vested Lesueur National Park. A large population of 200+ plants is on private land. Fire management of the sites requires attention. It is gazetted as Declared Rare Flora [Appendix 2].

*E. suberea* is a dense-canopied mallee usually growing to 2-3 m but up to 6 m in older individuals. It has no close relatives in Western Australia and is easily distinguished by its many-flowered inflorescences and small, globular fruits. The larger individuals have yellowish, flaky bark while smaller specimens have rough, corky, grey bark.

Specific Reference: Brooker and Hopper (1986).





**EUCALYPTUS SUBTILIS** Brooker & Hopper

**Narrow-leaved Mallee**

Number of records: 6

Population Size
<10(1) 10-20(0) 20-50(1) 50-100(0) 100-500(0) >500(0) unspecified(4)

Conservation Status
Restricted to road verge (0%), Not (83%), Unspecified (17%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

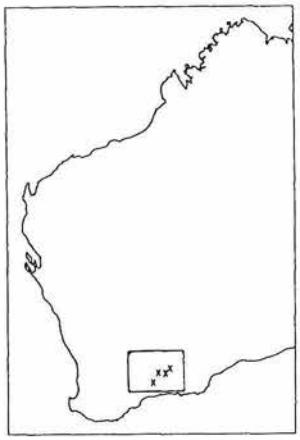
Height: 1.5-3.5 m

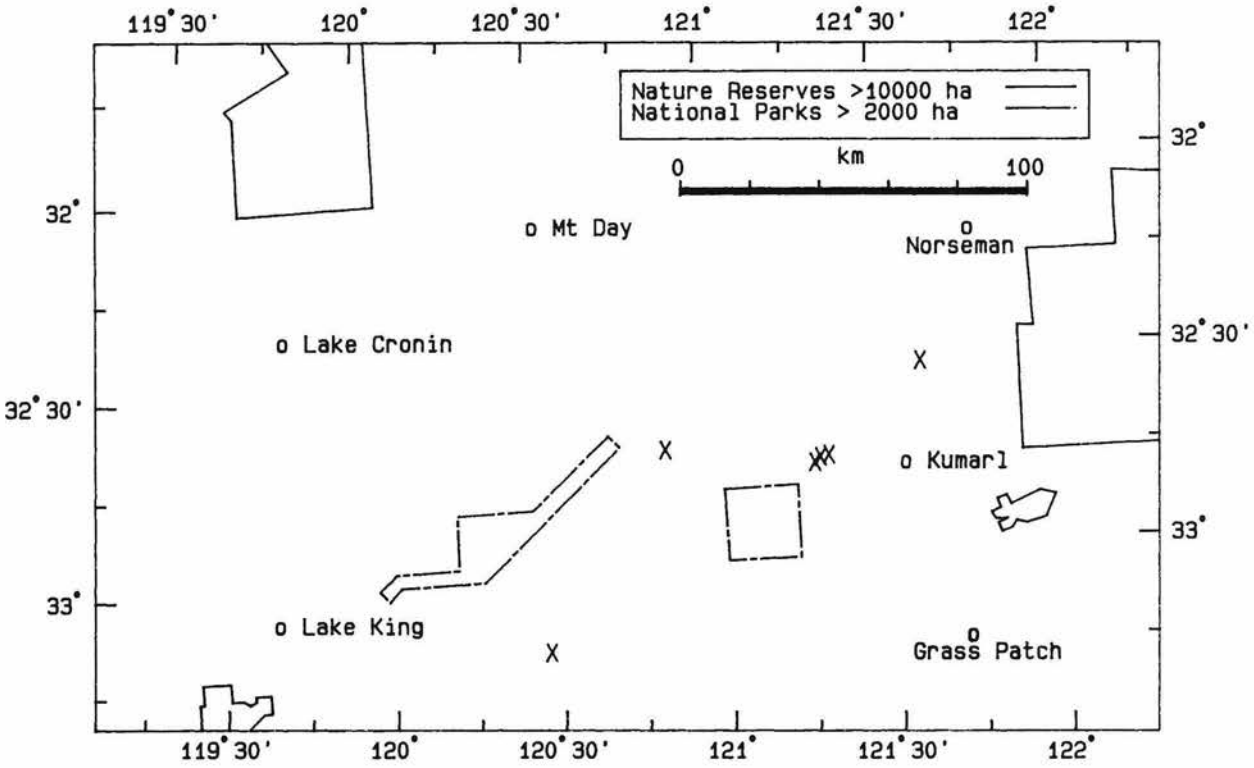
Flowering period: February - April

A species of scattered distribution from north of Coujinup Hill to south of Norseman, growing in mallee or shrubland communities on flat or undulating country. Soils are sandy or loamy, often with some surface gravel. Associated species include *Eucalyptus eremophila, E. flocktoniae, E. pileata* and *E. grossa*. Hybrids with *E. livida* have been recorded at one locality. It is apparently widespread at the known sites (Hopper, unpubl.) and is probably more common throughout its range. All of the records are from vacant Crown land.

*E. subtilis* is a smooth-barked mallee with small, spindle-shaped buds and cupular fruits on a flattened peduncle. It is distinguished from other members in the *Levispermae* series by its very small, linear leaves that are dull or slightly glossy.

Specific Reference: Brooker and Hopper (1991).





**EUCALYPTUS SYNANDRA** Crisp

**Jingymia Mallee**

Number of records: 9

Population Size
<10(0) 10-20(2) 20-50(2) 50-100(2) 100-500(0) >500(0) unspecified(3)

Conservation Status
Restricted to road verge (0%), Not (78%), Unspecified (22%)
In conservation reserve (22%), Not (78%), Unspecified (0%)

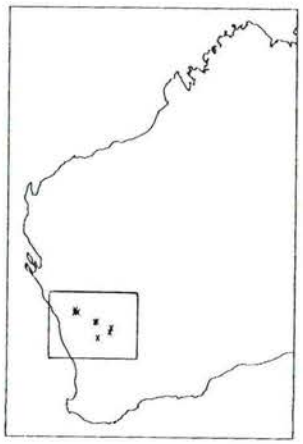
Height: 2-5.5 m

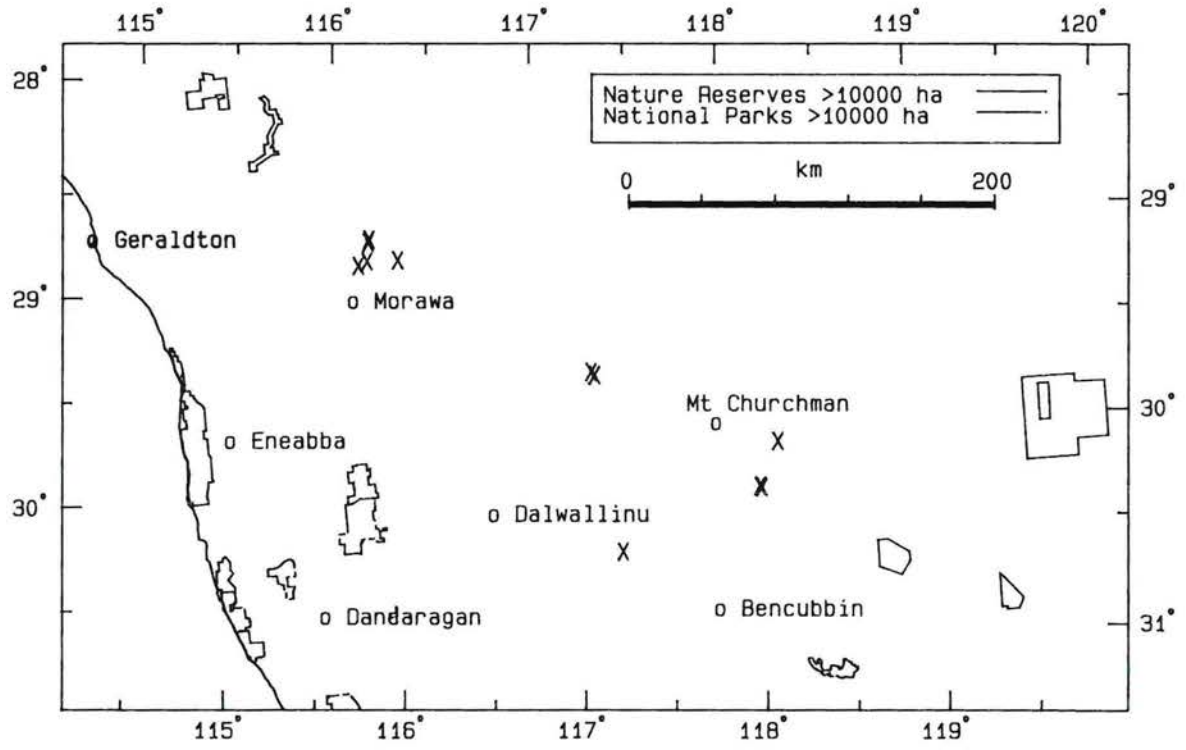
Flowering period: December - March

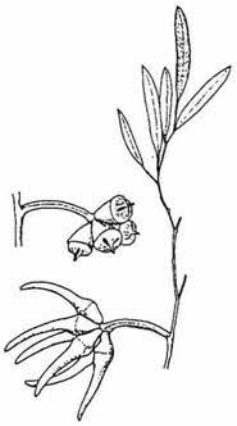
*Eucalyptus synandra* is known from a few hundred plants in populations scattered through the northern wheatbelt from north of Morawa, south and east to Karroun Hill and Koorda. It grows on flat or gently undulating country, as an emergent above heath and scrub of *Acacia, Allocasuarina, Grevillea* and *Hakea* species. Soils are sand or sandy loam over laterite. Two populations (22 per cent of total records) are from the Karroun Hill Nature Reserve while the majority are restricted to private land and road verge. Close liaison with landowners and careful management of all sites is essential. Most of its range has been cleared but further surveys in the north-east may find more populations. It is gazetted as Declared Rare Flora [Appendix 2]. The eastern form of *E. synandra* occurring in the Great Victoria Desert has been recently described as *E. rosacea*.

*E. synandra* is a straggly mallee with pendulous, glaucous branches and dull leaves. Its flowers are cream-yellow, turning pink-red with age. It is one of only three species in *Eucalyptus* to have stamens united in the lower half to form a tube. The closely related *E. rosacea* has erect, non-glaucous branches and grows on sand.

Specific References: Crisp (1982), Keighery (1983), Elliot and Jones (1986), Hill and Johnson (1992).







**EUCALYPTUS TALYUBERLUP** D.J. Carr & S.G.M. Carr

Number of records: 15

Population Size
<10(0) 10-20(0) 20-50(0) 50-100(0) 100-500(3) >500(0) unspecified(12)

Conservation Status
Restricted to road verge (0%), Not (93%), Unspecified (7%)
In conservation reserve (73%), Not (27%), Unspecified (0%)

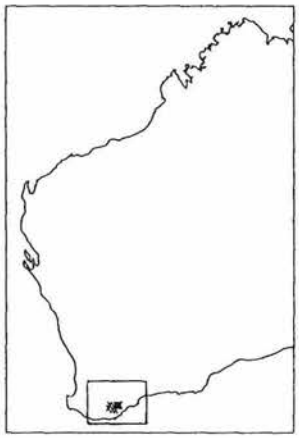
Height: 2-12 m

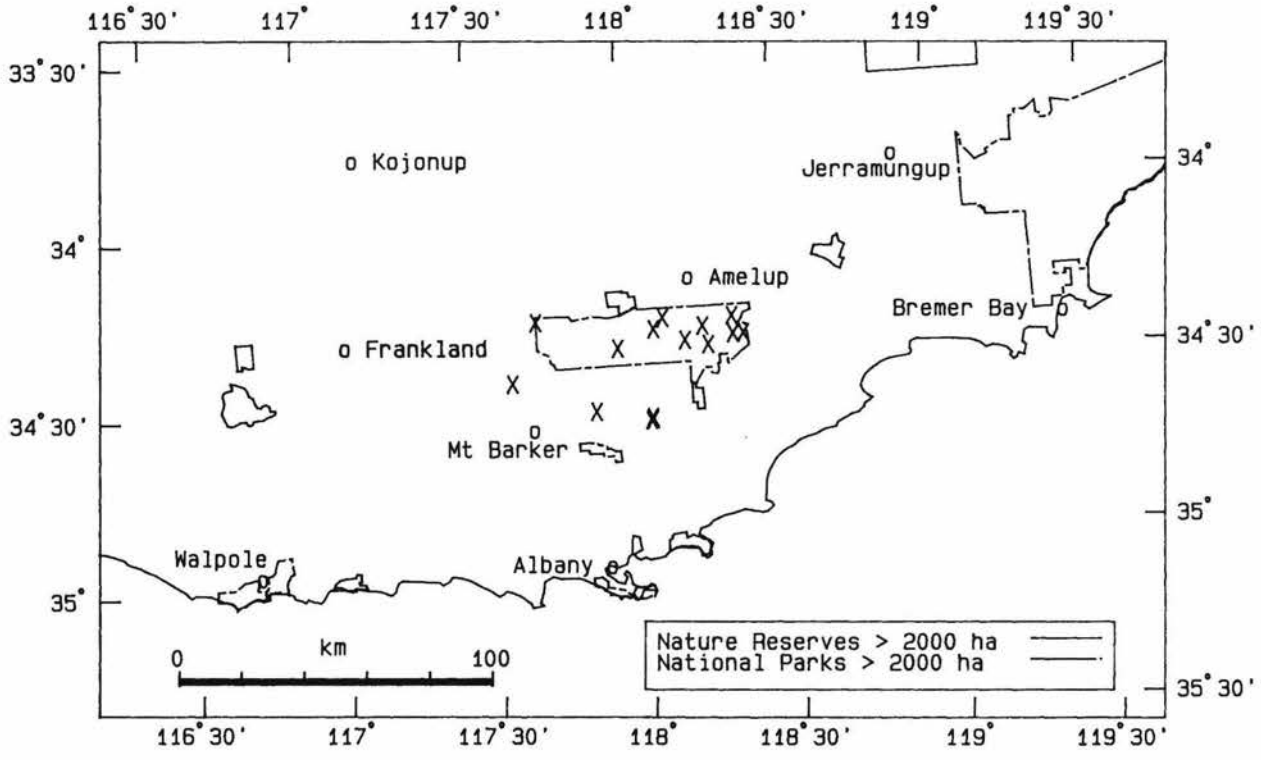
Flowering period: May - September

*Eucalyptus talyuberlup* is known from a number of populations in the Stirling Range and south near the Kalgan River. It grows on rocky slopes and hilltops with a variety of eucalypt species including *E. cornuta, E. preissiana, E. falcata* and *E. incrassata*. Of the total records, 73 per cent are from the Stirling Range National Park. Population data were unspecified for all but three populations where it was recorded as 'common' or 'dominant'. Two collections made from the Ravensthorpe area are closely allied to *E. talyuberlup*. Monitoring of populations and appropriate management within the national park is required.

*E. talyuberlup* is a smooth-barked mallee or small tree with striking inflorescences characteristic of the *Cornutae* series. It is most similar to *E. burdettiana, E. megacornuta* and *E. newbeyi*, the former two differing in their warty budcaps and *E. newbeyi* in its larger buds and fruits.

Specific References: Carr and Carr (1980), Elliot and Jones (1986).





**EUCALYPTUS TEREBRA** L. Johnson & K. Hill

Number of records: 29

Population Size
<10(0) 10-20(2) 20-50(2) 50-100(0) 100-500(0) >500(0) unspecified(25)

Conservation Status
Restricted to road verge (0%), Not (93%), Unspecified (7%)
In conservation reserve (10%), Not (90%), Unspecified (0%)

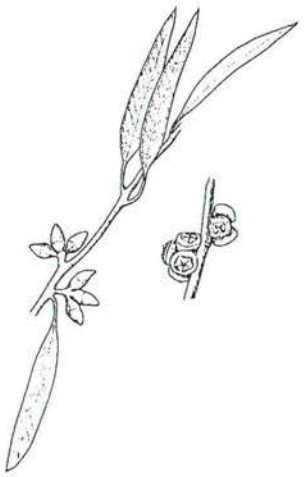
Height: 2.5-10 m

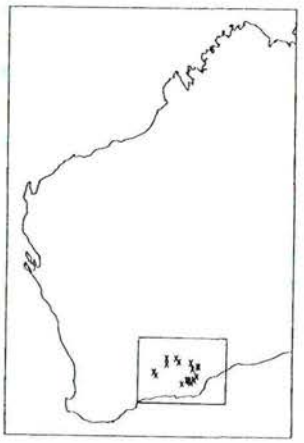
Flowering period: November, February - May

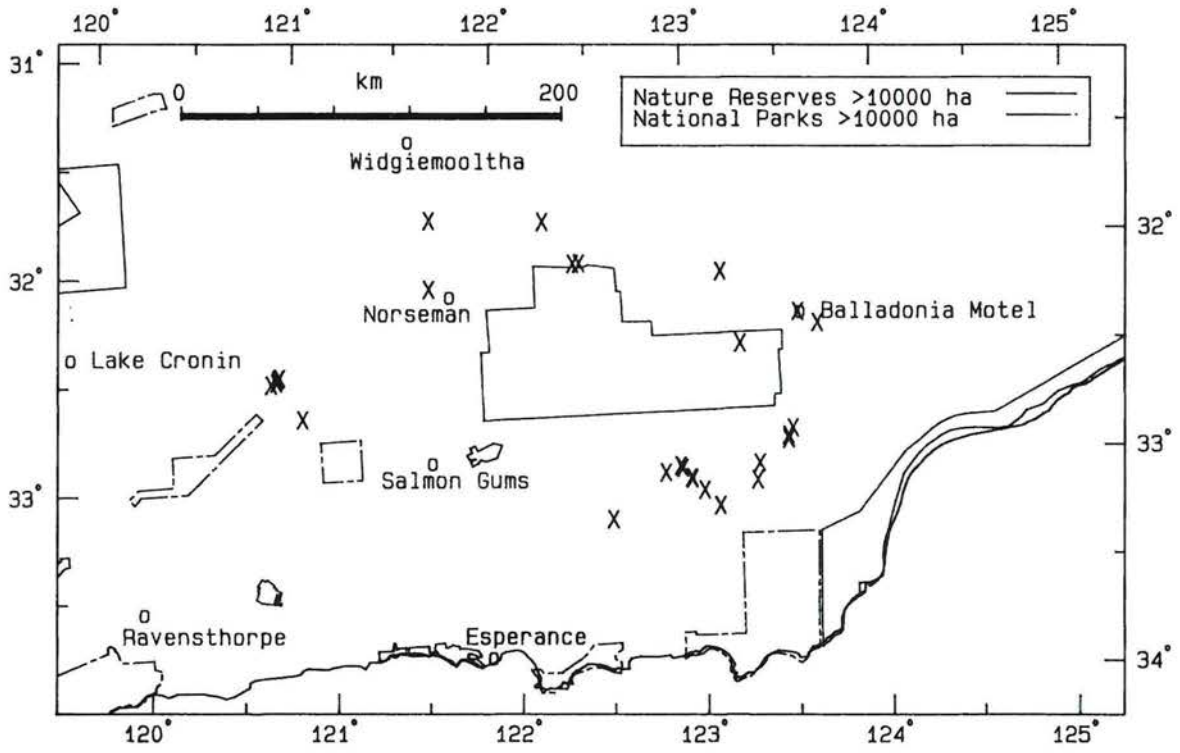
Previously known from north-east of Esperance to Balladonia and Higginsville but since the commencement of the survey recorded over a range of *ca* 290 km west to Mt Glasse. It is locally abundant in sandy, clayey and calcareous loams on flat or gently undulating country. A few observations were made from sand over limestone or fringing granite rocks. It is most commonly associated with *Eucalyptus flocktoniae, E. oleosa, E. calycogona* and *E. eremophila* in low woodland, mallee and occasionally low forest communities. Of the total records, 10 per cent occur in the Dundas Nature Reserve while the remainder are from vacant Crown land. There are some mining interests in the Mt Glasse and Norseman areas but it is otherwise under no threat. The new records in the west match the seven-flowered form of *E. terebra* but some recent sitings in the east of its range had five-flowered inflorescences and require further investigation regarding their taxonomic affinities.

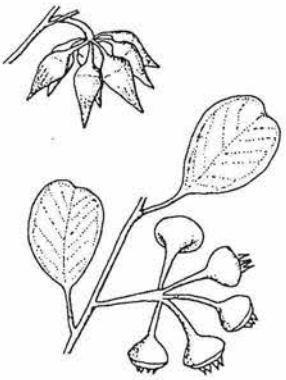
*E. terebra* is a mallee or small tree with smooth bark and glossy leaves. It is related to *E. diptera* and *E. creta*, differing in its smaller, wingless buds and fruits in groups of seven. It differs from *E. jimberlanica* in its sometimes shortly-pointed buds and sessile fruits.

Specific References: Burgman (1985b), Johnson and Hill (1991).









**EUCALYPTUS WEBSTERIANA** Maiden

**Webster's Mallee**

Number of records: 52

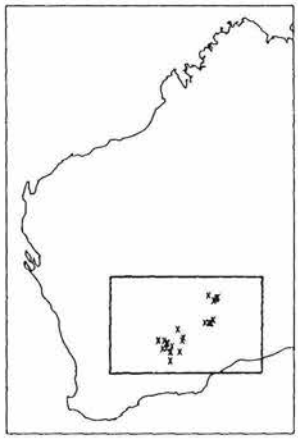
Population Size
<10(1) 10-20(8) 20-50(18) 50-100(7) 100-500(8) >500(5) unspecified(5)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (4%), Not (96%), Unspecified (0%)

Height: 1.5-6 m

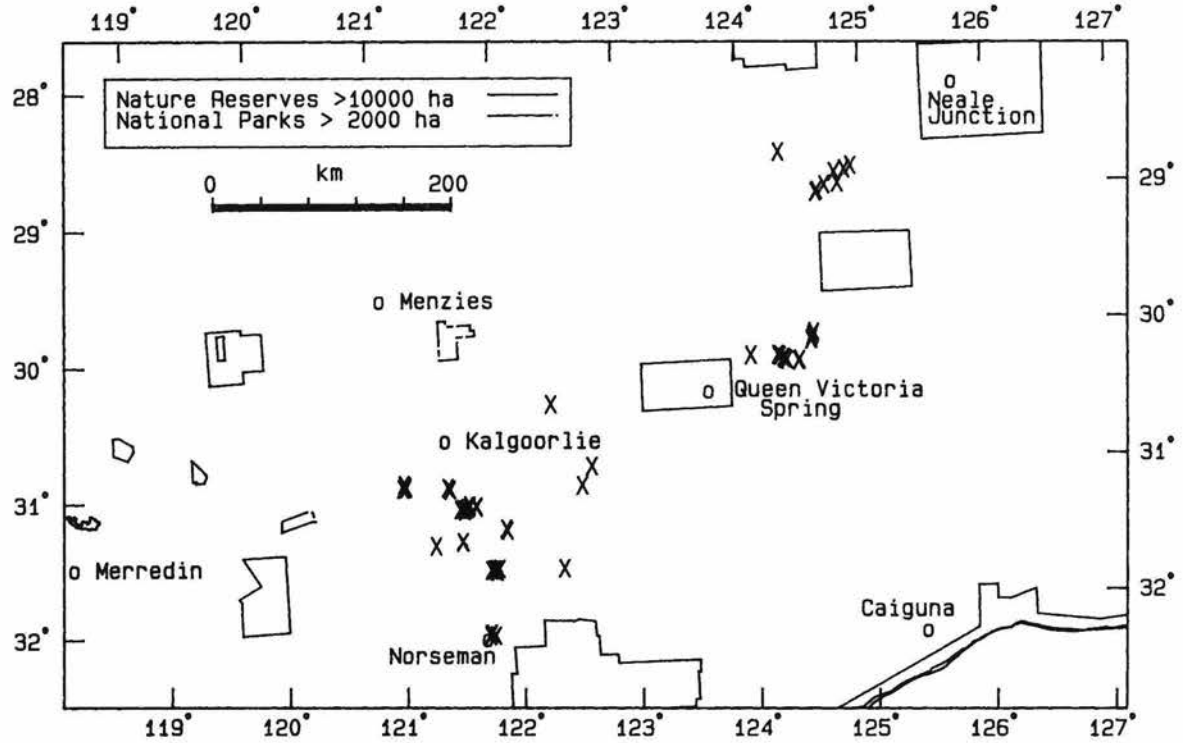
Flowering period: September - November

*Eucalyptus websteriana* occurs over a range of *ca* 500 km from Coolgardie south to Norseman and north-east to Rason Lake. It grows in mulga (*Acacia aneura*) woodland, spinifex (*Triodia* spp.) grasslands or scrub on flat plains, slopes and hilltops. Soils are loamy with rocky outcrops of quartzite, laterite and granite. The most commonly associated eucalypt species include *E. torquata, E. oleosa, E. griffithsii* and *E. kruseana*. Over 40 new records were made since the commencement of the survey, the majority from near Rason Lake and Queen Victoria Spring where it is locally abundant. A number of new populations were also recorded from the Coolgardie-Kambalda-Higginsville area. There has been some confusion over the identity of the north-eastern populations (refer *E. orbifolia*) which, after recent surveys by regional staff, are believed to be *E. websteriana*. The specimens possessed slender pedicels, small fruits with a broad convex disc, and usually smaller non-glaucous leaves. The majority had non-glaucous inflorescences and branchlets (Kealley, personal communication). Two populations (4 per cent of total records) are from a nature reserve near Kambalda and six populations (12 per cent of total records) from three timber reserves in the west of its range. Its geographical remoteness and occurrence in reserves affords considerable protection.



*E. websteriana* is a mallee or small tree closely related to *E. orbifolia* and previously regarded as a subspecies of this taxon. It differs in its usually more elongated, greener leaves, generally non-glaucous buds and fruits and longer, slender pedicels.

Specific References: Maiden (1916), Holliday and Watton (1980), Jessop (1985), Elliot and Jones (1986).



**EUCALYPTUS WOODWARDII** Maiden

**Lemon-flowered Gum**

Number of records: 23

Population Size
<10(3) 10-20(1) 20-50(6) 50-100(1) 100-500(4) >500(5) unspecified(3)

Conservation Status
Restricted to road verge (0%), Not (100%), Unspecified (0%)
In conservation reserve (4%), Not (92%), Unspecified (4%)

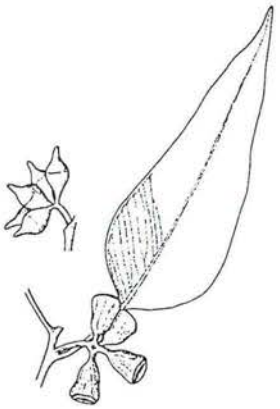
Height: 5-10 m

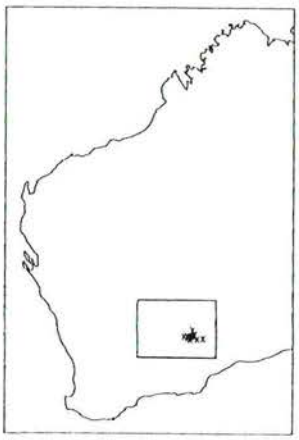
Flowering period: August - November

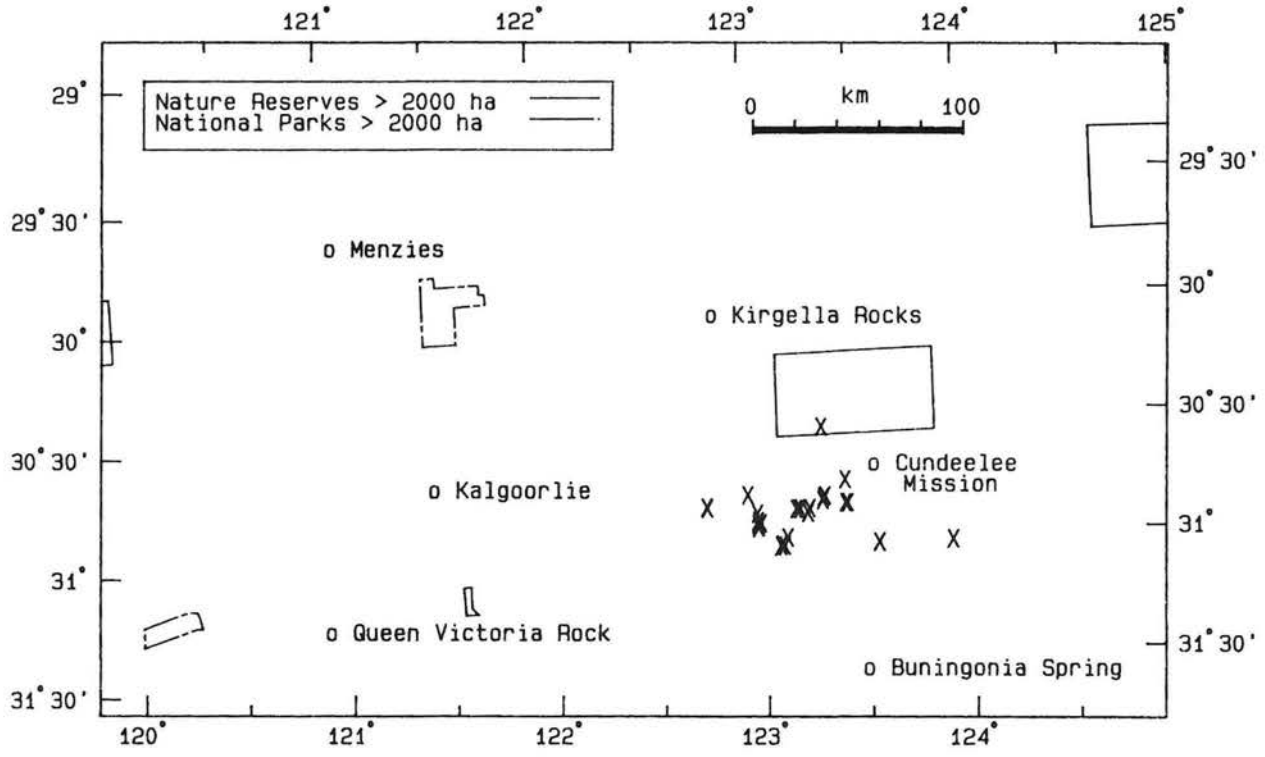
*Eucalyptus woodwardii* is a restricted but locally abundant species in the Karonie-Cundeelee Mission area east of Kalgoorlie. It is found on sand and sandy loam flats and undulating terrain, forming low woodlands and forests over mallee, scrub and spinifex (*Triodia* spp.). It grows in pure stands or in association with *E. transcontinentalis, E. oleosa, E. salmonophloia* and *E. celastroides*. The scrub is dominated by *Acacia, Eremophila* and *Cassia* species. Extensive surveys resulting in 18 new records have confirmed and extended its distribution. Only one population (4 per cent of total records) is from a nature reserve, however, 61 per cent of records occur in two sandalwood reserves which are valued conservation areas. Management tracks have been surveyed but the reserves are likely to include more populations in less accessible areas. A few old records extending east to Zanthus require verification. It is in cultivation throughout southern Australia.

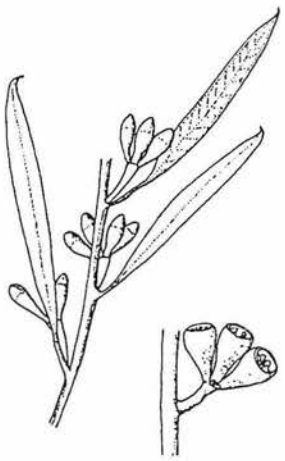
*E. woodwardii* is an attractive tree or mallee with straggling, pendulous branches and smooth bark often persistent in long, trailing ribbons. It has a sparse canopy of large, dull leaves. The glaucous inflorescences and branchlets are in striking contrast with the lemon-yellow flowers.

Specific References: Maiden (1910), Holliday and Watton (1980), Pryor (1981), Elliot and Jones (1986).









**EUCALYPTUS ZOPHEROPHLOIA** Brooker & Hopper

**Blackbutt Mallee**

Number of records: 11

Population Size
<10(3) 10-20(0) 20-50(1) 50-100(1) 100-500(0) >500(0) unspecified(6)

Conservation Status
Restricted to road verge (18%), Not (27%), Unspecified (55%)
In conservation reserve (0%), Not (100%), Unspecified (0%)

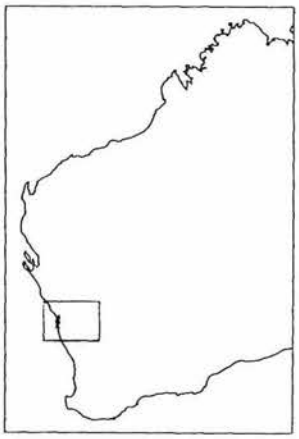
Height: 1.5-6 m

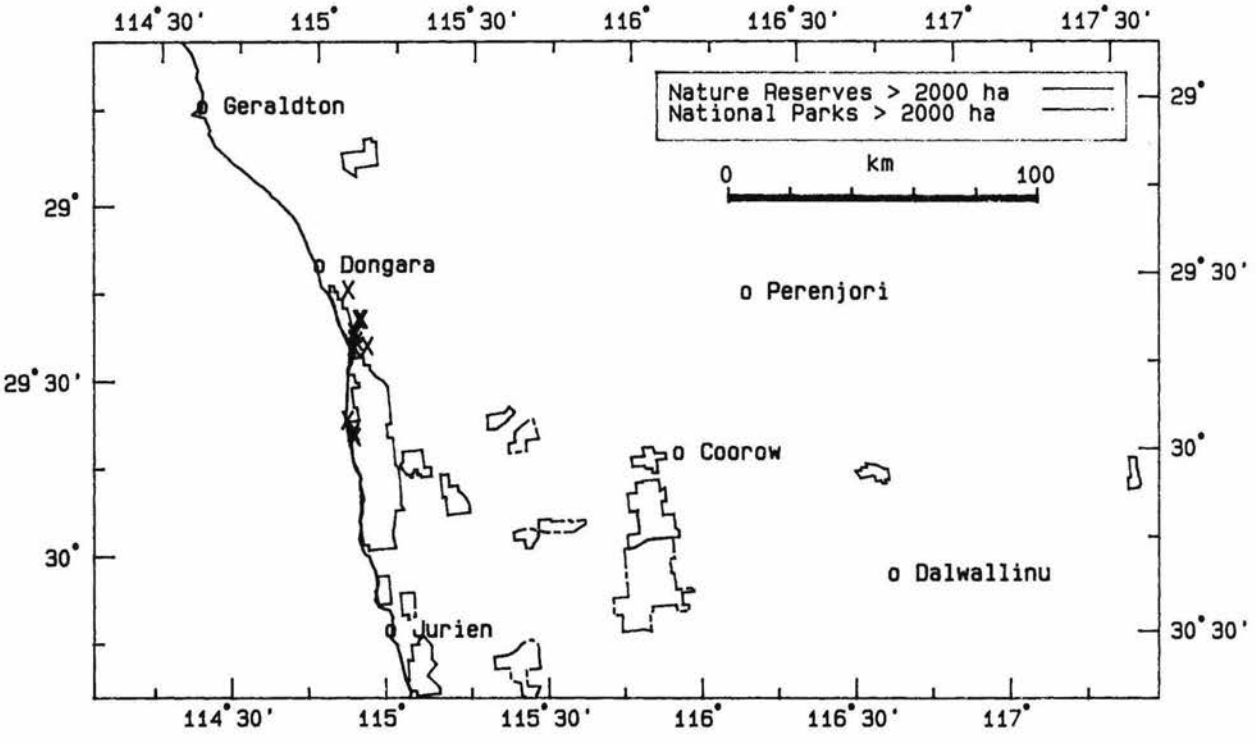
Flowering period: November - January

A recently described species restricted to coastal and subcoastal habitats between Dongara and Coolimba. It grows above scrub and heath on sandy, calcareous flats and slopes, sometimes in association with *Eucalyptus foecunda* ssp. "Cliff Head"and *E. obtusiflora*. The discovery of three small populations north of Coolimba was a southerly range extension of about 30 km. Two of the records (18 per cent of total) are from an area reserved for apiculture and conservation of flora. Protection of populations from accidental destruction and careful management in the reserve is required.

*E. zopherophloia* is a mallee or tree-mallee with a stocking of rough, grey bark on the lower stems. It is allied to *E. accedens*, differing in its rough bark, smaller buds and fruits, slightly glossy leaves and preference for limestone habitats.

Specific Reference: Brooker and Hopper (1993).





## ACKNOWLEDGEMENTS

We wish to thank the following people who contributed to the success of the project by conducting surveys, completing record sheets or by providing support, field assistance, accommodation and access to private property. We apologize to any person that may have contributed in some way but has been omitted from the list. (R) denotes completed record sheets.

Laurie Anderson (R)
Ken Atkins (R)
Maurice Barnes (R)
Peter Batt (R)
Toni Beaton (R)
Don & Barbara Bellairs (R)
Tup Biggs
Laurel & Harry Blyth (R)
Peter Booth (R)
Keith Bradby (R)
Andrew Brown (R)
Paul Brown (R)
Roz & Rob Brown (R)
Suzy Bryan
Bob Burking (R)
Dan Carter (R)
Andy Chapman (R)
Anne Coates (R)
Verco Cook
Ray Cranfield (R)
Christine Creighton (R)
Colin Day (R)
Denmark Wildflower Group
Bill & Roma Dixon (R)
Alison Doley (R)
Chris Done (R)
Greg Durell (R)
Graham Edwards (R)
Ray Garstone (R)
Neil Gibson (R)
Kelly Gillen (R)
Dinky Goble-Garratt (R)
Mal Graham (R)
Peter Grayling (R)
Olga Green (R)
Gundle family
Bernie Haberley
Brenda Hammersley (R)
Mary Hart (R)
Nic Hall (R)
Kalgoorlie Naturalists Club
Ian Kealley (R)
John Koch (R)
Pattie Leighton
Estelle Leyland
Peter Luscombe (R)
Kath Mathwin (R)
Graham McCutcheon (R)
Joan McDowall (R)
Nathan McQuoid (R)
Penny Moir (R)
Bill Muir
Malcolm Olden (R)
Lois Powlesland
Barry Rick
Phil Roberts (R)
Les Robson (R)
R. Roe
Pat Ryan (R)
Jane Sampson
Libby Sandiford (R)
Basil Schur (R)
Hugh Seeds
Ron Shimmon
Ray Smith
Audrey Sole
Ian Solomon
Mary Squire
Lindsey Stephens (R)
Margaret Stockwell (R)
Rachel Storer (R)
Michael Stralow (R)
Jan & Ian Swinney
Katie Syme
Len Talbot
Rob Thomas (R)
Stephen van Leeuwen (R)
Mrs Venning (R)
Grant Wardell-Johnson (R)
Bill Watson (R)
Kath White
Peter White (R)
Don & Joy Williams (R)
Jim Williams (R)
Ian Wilson (R)

We are grateful to the following persons and organizations for their assistance : Australian Nature Conservation Agency for financial support; Anne Taylor for her work as initial co-ordinator; Ian Brooker for access to unpublished data, advice and assistance with identifications; Lawrie Johnson, Ken Hill and Don Blaxell for access to unpublished results; the Western Australian Herbarium for access to specimens; Paul Gioia for FLORAPLOT computer mapping; Nathan McQuoid, Graham Edwards and Ian Kealley for their outstanding contributions in the South Coast and Goldfields Regions, Susan Patrick for illustrations and other assistance; Grant Wardell-Johnson for access to unpublished results; Murdoch University for access to specimens; Peter Grayling for advice and access to results; *Nuytsia*, *Telopea* and the Australian Government Publishing Service for permssion to reproduce illustrations; and Jan Rayner and Raelene Hick for typing the manuscript.

## REFERENCES

Beard, J.S. (1973a). A progeny trial to obtain evidence of hybridity in two taxa of *Eucalyptus*. *Journal of the Royal Society of Western Australia* **56**(3), 78-79.

Beard, J.S. (1973b). The ecology and distribution of *Eucalyptus forrestiana* Diels. *Journal of the Royal Society of Western Australia* **56**(3), 76-77.

Bennett, E.M. (1982). Rare and Geographically Restricted Plants of Western Australia. Department of Fisheries and Wildlife Western Australia Unpublished Report No. 12.

Bentham, G. (1867). *Flora Australiensis*. Vol. 3. Lovell Reeve and Co., London.

Blake, S.T. (1953). Botanical contributions of the northern Australia regional survey. I. Studies on northern Australian species of *Eucalyptus*. *Australian Journal of Botany* **1**(2), 185-352.

Blakely, W.F. (1926). Descriptions of nine new species of *Eucalyptus*. *Journal and Proceedings of the Royal Society of New South Wales* **61**, 175-178.

Blakely, W.F. (1934). *A Key to the Eucalypts*. The Worker Trustees, Sydney.

Blakely, W.F. (1941). Additions to the Australian Myrtaceae. *Australian Naturalist* **10**, 257-261.

Blakely, W.F. (1965). *A Key to the Eucalypts*. Third edn. Forestry and Timber Bureau, Canberra.

Blakely, W.F., McKie, E.N. and Steedman, H.S. (1938). Descriptions of four new species and two varieties of eucalypts. *Proceedings of the Linnean Society of New South Wales* **63**, 65-69.

Blakely, W.F. and Steedman, H. (1939). Additions to the Australian Myrtaceae. *Contributions from the New South Wales National Herbarium* **1**, 34-38.

Boland, D.J., Brooker, M.I.H., Chippendale, G.M., Hall, N., Hyland, B.P.M., Johnston, R.D., Kleinig, D.A. and Turner, J.D. (1984). *Forest Trees of Australia*. Thomas Nelson and Commonwealth Scientific and Industrial Research Organisation, Melbourne.

Boomsma, C.D. (1979). Four new species of *Eucalyptus* L'Herit. from South Australia. *Journal of the Adelaide Botanic Gardens* **1**(6), 363-366.

Briggs, J.D. and Leigh, J.H. (1988). Rare or Threatened Australian Plants. *Australian National Parks and Wildlife Service Special Publication 14.* Commonwealth of Australia, Canberra.

Brooker, M.I.H. (1972). Four new taxa of *Eucalyptus* from Western Australia. *Nuytsia* **1**, 243-253.

Brooker, M.I.H. (1973). *Eucalyptus forrestiana* subsp. *dolichorhyncha*, a new taxon from Western Australia. *Journal of the Royal Society of Western Australia* **56**, 74-75.

Brooker, M.I.H. (1974). Six new species of *Eucalyptus* from Western Australia. *Nuytsia* **1**(4), 297-314.

Brooker, M.I.H. (1976a). Six new taxa of *Eucalyptus* from Western Australia. *Nuytsia* **2**(2), 103-117.

Brooker, M.I.H. (1976b). Two new combinations in *Eucalyptus* from Western Australia. *Australian Forest Research* **7**, 65-67.

Brooker, M.I.H. (1979). A revision of the informal series *Foecundae* Pryor & Johnson of the genus *Eucalyptus* L'Herit. and notes on variation in the genus. *Brunonia* **2**, 125-170.

Brooker, M.I.H. (1981). A new series, *Ovulares* of the genus *Eucalyptus* based on the subseries *Ovularinae* Pryor & Johnson. *Brunonia* **4**, 1-26.

Brooker, M.I.H. (1986). New species and subspecies of the informal "*Eucalyptus* series *Calycogonae*" Pryor and Johnson (*Eucalyptus* series *Aridae* Blakely - Myrtaceae). *Nuytsia* **5**, 357-371.

Brooker, M.I.H. (1988). *Eucalyptus foecunda* revisited and six related new species (Myrtaceae). *Nuytsia* **6**, 325-334.

Brooker, M.I.H. and Blaxell, W. (1978). Five new species of *Eucalyptus* from Western Australia. *Nuytsia* **2**, 220-231.

Brooker, M.I.H. and Done, C.C. (1986). *Eucalyptus ceracea, E. rupestris and E. chlorophylla* (Myrtaceae), three new species in the Kimberley Division of Western Australia. *Nuytsia* **5**, 381-390.

Brooker, M.I.H. and Edgecombe, W.B. (1986). *Eucalyptus ferriticola* and *E. pilbarensis* (Myrtaceae), two new species from the Pilbara region of Western Australia. *Nuytsia* **5**, 373-380.

Brooker, M.I.H. and Hall, N. (1975a). Mt Le Grand Mallee *Eucalyptus aquilina* Brooker. Forest Tree Series No. 181. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Brooker, M.I.H. and Hall, N. (1975b). Twin Peak Island Mallee *Eucalyptus insularis* Brooker. Forest Tree Series No. 184. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Brooker, M.I.H. and Hall, N. (1975c). Lucky Bay Mallee *Eucalyptus ligulata* Brooker. Forest Tree Series No. 182. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Brooker, M.I.H. and Hall, N. (1975d). Badgingarra Mallee *Eucalyptus pendens* Brooker. Forest Tree Series No. 183. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Brooker, M.I.H. and Hopper, S.D. (1982). New subspecies in *Eucalyptus caesia* and *E. crucis* (Myrtaceae) of Western Australia. *Nuytsia* **4**, 113-128.

Brooker, M.I.H. and Hopper, S.D. (1986). Notes on the informal subgenus "Monocalyptus" of *Eucalyptus* (Myrtaceae) and the description of three new upland species from south-west Western Australia. *Nuytsia* **5**, 341-356.

Brooker, M.I.H. and Hopper, S.D. (1989). A new series *Rigentes*, of *Eucalyptus* L'Herit. (Myrtaceae) comprising three new species endemic to Western Australia. *Nuytsia* 7, 5-13.

Brooker, M.I.H. and Hopper, S.D. (1991). A taxonomic revision of *Eucalyptus wandoo, E. redunca,* and allied species (*Eucalyptus* series *Levispermae* Maiden - Myrtaceae) in Western Australia. *Nuytsia* **8**, 1-189.

Brooker, M.I.H. and Hopper, S.D. (1993). New series, subseries, species and subspecies of *Eucalyptus* (Myrtaceae) from Western Australia and from South Australia. *Nuytsia* **9**, 1-68.

Brooker, M.I.H. and Kleinig, D.A. (1990). *Field Guide to Eucalypts:* Vol. 2. *South-western and Southern Australia.* Inkata Press Pty. Ltd., Melbourne and Sydney.

Burgman, M.A. (1985a). Rare and Geographically Restricted Plants of Western Australia. Department of Conservation and Land Management Unpublished Report Number 27.

Burgman, M.A. (1985b). Cladistics, Phenetics and Biogeography of populations of *Boronia inornata* Turcz. (Rutaceae) and the *Eucalyptus diptera* Andrews (Myrtaceae) species complex in Western Australia. *Australian Journal of Botany* **33**, 419-431.

Carr, D.J. and Carr, S.G.M. (1980a). The *Lehmannianae*: a natural group of Western Australian Eucalypts. *Australian Journal of Botany*, **28**, 523-550.

Carr, S.G.M. and Carr, D.J. (1980b). A new species of *Eucalyptus* from the margins of salt lakes in Western Australia. *Nuytsia* **3**, 173-178.

Carr, D.J. and Carr, S.G.M. (1885). Eucalyptus *1: New or little-known species of the* Corymbosae. Phytoglyph Press, Canberra.

Carr, D.J. and Carr, S.G.M. (1987). Eucalyptus *2: The rubber cuticle, and other studies of the* Corymbosae. Phytoglyph Press, Canberra.

Chippendale, G.M. (1973). *Eucalypts of the Western Australian Goldfields (and the adjacent wheatbelt).* Australian Government Publishing Service, Canberra.

Chippendale, G.M. (ed.) (1981). *Eucalyptus Buds and Fruits.* Australian Government Publishing Service, Canberra.

Chippendale, G.M. (1988). *Eucalyptus, Angophora* (Myrtaceae). *Flora of Australia* **19**. Australian Government Publishing Service, Canberra.

Crisp, M.D. (1982). *Eucalyptus synandra* (Myrtaceae), a new species of mallee from Western Australia. *Nuytsia* **4**, 129-134.

Crisp, M.D. (1984). *Eucalyptus ornata* (Myrtaceae), a new Silver Mallet from near Kondinin, Western Australia. *Nuytsia* **5**, 311-315.

Department of Conservation and Land Management (1991). Declared Rare and Priority Flora List.

Diels, L. and Pritzel, E. (1904). Fragmenta Phytographiae Australiae occidentalis. *Botanische Jahrbücher* **35**, 439.

Doran, J. and Brooker, M.I.H. (1979). Pimpin Mallee *Eucalyptus pimpiniana* Maiden. Forest Tree Series No. 217. Division of Forest Research, CSIRO, Melbourne.

Elliot, W.R. and Jones, D.L. (1986). *Encyclopedia of Australian Plants Suitable for Cultivation*. Vol. 4. Lothian, Melbourne.

Gardner, C.A. (1926). Contributions to the Flora of Western Australia No. 5. *Journal of the Royal Society of Western Australia* **12**, 67-68.

Gardner, C.A. (1934). Contributiones Florae Australiae Occidentalis No. 8. *Journal of the Royal Society of Western Australia* **19**, 86-89.

Gardner, C.A. (1936). Contributiones Florae Australiae Occidentalis No. IX. *Journal of the Royal Society of Western Australia* **22**, 126-127.

Gardner, C.A. (1942). Contributiones Florae Australiae Occidentalis XI. *Journal of the Royal Society of Western Australia* **27**, 184-187.

Gardner, C.A. (1964). Contributiones Florae Australiae Occidentalis XIII. *Journal of the Royal Society of Western Australia* **47**, 60.

Gardner, C.A. (1979). *Eucalypts of Western Australia*. Compiled, edited and revised by T.E.H. Aplin. Government Printer, Perth.

Grayling, P. M. (1989). An Investigation of Taxonomy, Reproductive Biology and Hybridity in Four Taxa of *Eucalyptus* of Extreme Rarity. Honours Thesis, Department of Botany, University of Western Australia.

Grayling, P.M. and Brooker, M.I.H. (1992). Four new species of *Eucalyptus* (Myrtaceae) from Western Australia. *Nuytsia* **8**, 209-218.

Hall, N. and Brooker, M.I.H. (1973a). Smooth Stemmed Bloodwood *Eucalyptus bleeseri* Blakely. Forest Tree Series No. 118. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Hall, N. and Brooker, M.I.H. (1973b). Apple Gum *Eucalyptus clavigera* A. Cunn. ex Schau. Forest Tree Series No. 116. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Hall, N. and Brooker, M.I.H. (1973c). Salmonbark Wandoo *Eucalyptus lanepoolei* Maiden. Forest Tree Series No. 75. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Hall, N. and Brooker, M.I.H. (1974a). Rate's Tingle *Eucalyptus brevistylis* Brooker. Forest Tree Series No. 153. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Hall, N. and Brooker, M.I.H. (1974b). Hamelin Bay Mallee *Eucalyptus calcicola* Brooker. Forest Tree Series No. 154. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Hall, N. and Brooker, M.I.H. (1974c). Silver-leaved Bloodwood *Eucalyptus collina* W.V. Fitzg. Forest Tree Series No. 172. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Hall, N. and Brooker, M.I.H. (1974d). Boyagin Mallee *Eucalyptus exilis* Brooker. Forest Tree Series No. 155. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Hall, N. and Brooker, M.I.H. (1974e). Kalumburu Gum *Eucalyptus herbertiana* Maiden. Forest Tree Series No. 163. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Hall, N. and Brooker, M.I.H. (1975). Tropical Red Box *Eucalyptus brachyandra* F. Muell. Forest Tree Series No. 190. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Hall, N. and Brooker, M.I.H. (1977a). Woolbernup Mallee *Eucalyptus acies* Brooker. Forest Tree Series No. 194. Division of Forest Research, CSIRO, Melbourne.

Hall, N. and Brooker, M.I.H. (1977b). Lake King Mallee *Eucalyptus deflexa* Brooker. Forest Tree Series No. 201. Division of Forest Research, CSIRO, Melbourne.

Hall, N. and Brooker, M.I.H. (1977c). Rough-barked Gimlet *Eucalyptus effusa* Brooker. Forest Tree Series No. 202. Division of Forest Research, CSIRO, Melbourne.

Hall, N. and Brooker, M.I.H. (1977d). Cape Range Mallee *Eucalyptus prominens* Brooker. Forest Tree Series No. 204. Division of Forest Research, CSIRO, Melbourne.

Hartley, W. and Leigh, J. (1979). Plants at Risk in Australia. *Australian National Parks and Wildlife Service Occasional Paper No. 3*. Commonwealth of Australia, Canberra.

Hill, K.D. and Johnson, L.A.S. (1992). Systematic studies in the eucalypts. 5. New taxa and combinations in *Eucalyptus* (Myrtaceae) in Western Australia. *Telopea* 4(4), 561-634.

Holliday, I. and Watton, G. (1980). *A Gardener's Guide to Eucalypts*. Rigby, Adelaide.

Hopper, S.D. (1979a). Biogeographical aspects of speciation in the south west Australian flora. *Annual Review of Ecology and Systematics* **10**, 399-422.

Hopper, S.D. (1979b). Threatened vascular plants in Western Australia. In :*A Vanishing Heritage, The Problem of Endangered Species and their Habitats.* pp. 46-64. Nature Conservation Council, Wellington.

Hopper, S.D. (1990). Conservation status of mallee eucalypts in southern Western Australia. In : Noble, J.C., Joss, P.J. and Jones, G.K. (eds.) (1990). *The Mallee Lands: A Conservation Perspective.* pp. 21-24. Commonwealth Scientific and Industrial Research Organisation, Melbourne.

Hopper, S.D. (1992). In the footsteps of Giles. *Landscope* (Autumn edn). Department of Conservation and Land Management, Como, Western Australia.

Hopper, S.D. and Burgman, M.A. (1983). Cladistic and phenetic analyses of phylogenetic relationships among populations of *Eucalyptus caesia*. *Australian Journal of Botany* **31**, 35-49.

Hopper, S.D., Coates, D.J. and Burbidge, A.H. (1978). Natural hybridisation and morphometric relationships between three mallee eucalypts in the Fitzgerald River National Park, W.A. *Australian Journal of Botany*, **26**, 319-333.

Hopper, S.D. and Moran, G.F. (1981). Bird pollination and the mating system of *Eucalyptus stoatei*. *Australian Journal of Botany* **29**, 625-638.

Hopper, S.D., van Leeuwen, S., Brown, A.P. and Patrick, S.J. (1990). *Western Australia's Endangered Flora and Other Plants in Need of Special Protection.* Department of Conservation and Land Management, Como, Western Australia.

Jessop, J.P. (ed.) (1985). *Flora of Central Australia.* Reed Books Pty Ltd, Sydney.

Johnson, L.A.S. and Hill, K.D. (1991). Systematic studies in the eucalypts - 2. A revision of the gimlets and related species : *Eucalyptus* extracodical series *Salubres* and *Annulatae* (Myrtaceae). *Telopea* **4(2)**, 201-222.

Keighery, G.J. (1983). Eucalypts with Tubular Flowers. *Australian Plants* 12(95), 129-130, 140.

Kelly, S. (1983). *Eucalypts.* Vols 1 and 2. Revised Editions. Van Nostrand Reinhold, New York.

Lang, P.J. (1988). *Eucalyptus. Flora of Australia* Vol. 19, p. 510. Australian Government Publishing Service, Canberra.

Lehmann, J.G.C. (1844). *Plantae Preissianae* Vol. 1, pp. 130-131. Meissner, Hamburg.

Leigh, J., Boden, R. and Briggs, J. (1984). *Extinct and Endangered Plants of Australia.* Macmillan Co. Pty Ltd, Melbourne.

Leigh, J., Briggs, J. and Hartley, W. (1981). Rare or Threatened Australian Plants. *Australian National Parks and Wildlife Service Special Publication 7.* Commonwealth of Australia, Canberra.

Lievense, D. (1981). Rare and Geographically Restricted Plants of Western Australia. Department of Fisheries and Wildlife Western Australia Unpublished Report No. 7.

Lucas, G. and Synge, H. (eds.) (1978). *The IUCN Plant Red Data Book.* International Union for Conservation of Nature and Natural Resources. Morges, Switzerland.

Luehmann, J.G. (1897). Reliquiae Muellerianae: Descriptions of New Australian Plants in the National Herbarium, Melbourne. *The Victorian Naturalist* **13**, 168.

Maiden, J.H. (1903-1933). *A Critical Revision of the Genus* Eucalyptus. 8 Vols. Government Printer, Sydney.

Maiden, J.H. (1910). On two new Western Australian species of *Eucalyptus*. *Journal of the Natural History and Science Society of Western Australia* **3**(1), 42-44.

Maiden, J.H. (1911). Notes on Western Australian Eucalypts, including description of new species. *Journal of the Natural History and Science Society of Western Australia* **3**(2), 180-184.

Maiden, J.H. (1914). *Journal and Proceedings of the Royal Society of New South Wales* **47**, 219-221.

Maiden, J.H. (1916). Notes on *Eucalyptus* (with descriptions of new species) No. IV. *Journal and Proceedings of the Royal Society of New South Wales* **49**, 309-321.

Maiden, J.H. (1917). Notes on *Eucalyptus* (with description of a new species), No. V. *Journal and Proceedings of the Royal Society of New South Wales* **51**, 457-461.

Maiden, J.H. (1919a). Notes on *Eucalyptus*, No. VII. (with descriptions of four new species.) *Journal and Proceedings of the Royal Society of New South Wales* **53**, 61.

Maiden, J.H. (1919b). Notes on *Eucalyptus*, No. VIII. (with descriptions of two new Western Australian species.) *Journal and Proceedings of the Royal Society of New South Wales* **53**, 107.

Maiden, J.H. and Blakely, W.F. (1925). Descriptions of sixteen new species of *Eucalyptus*. *Journal and Proceedings of the Royal Society of New South Wales* **59**, 156-199.

Marchant, N.G. and Keighery, G.J. (1979). Poorly collected and presumably rare vascular plants in Western Australia. *Kings Park Research Notes No. 5.*

McNee, S. (1986). Pollination biology of *Eucalyptus rhodantha*. Graduate Diploma in Natural Resources Thesis, Curtin University, Perth.

McNee, S. (1989). The pollination biology of *Eucalyptus rhodantha*. M. Appl. Sc. Thesis. Curtin University, Perth.

Moran, G.F. and Hopper, S.D. (1983). Genetic diversity and the insular population structure of the rare granite rock species *Eucalyptus caesia* Benth. *Australian Journal of Botany* **31**, 161-172.

Mueller, F. (1859). Monograph of the Eucalypti of tropical Australia. *Journal of the Linnean Society, Botany* **3**, 97.

Mueller, F. (1860-61). *Fragmenta Phytographiae Australiae.* Volume 2. Government Printer, Melbourne.

Mueller, F. (1863-64). *Fragmenta Phytographiae Australiae*. Volume 4. Government Printer, Melbourne.

Mueller, F. (1865-66). *Fragmenta Phytographiae Australiae*. Volume 5. Government Printer, Melbourne.

Mueller, F. (1876-77). *Fragmenta Phytographiae Australiae*. Volume 10. Government Printer, Melbourne.

Mueller, F. (1882). *Eucalyptographia : a descriptive atlas of the eucalypts of Australia and the adjoining islands.* Decade 8. Government Printer, Melbourne.

Mueller, F. (1895). Description of a new *Eucalyptus* from south-western Australia. *The Australasian Journal of Pharmacy* **10**, 233.

Patrick, S.J. and Hopper, S.D. (1982). A Guide to the Gazetted Rare Flora of Western Australia. Supplement 1 to Report No. 42. Department of Fisheries and Wildlife Western Australia Report 54.

Pryor, L.D. (1981). Australian Endangered Species : Eucalypts. *Australian National Parks and Wildlife Service, Special Publication 5.* Australian Government Publishing Service, Canberra.

Pryor, L.D. and Johnson, L.A.S. (1962). The status and significance of the hybrid *Eucalyptus marginata* Sm. x *E. megacarpa* F. Muell. *Australian Journal of Botany* **10**(2), 129-133.

Robinson, C.J. (1984) *Eucalyptus stoatei* as a subspecies of *Eucalyptus forrestiana*. *Nuytsia* **5**, 195-200.

Rye, B.L. (1980). Chromosome numbers, reproductive biology and evolution in the Myrtaceae. PhD Thesis, University of Western Australia, Perth.

Rye, B.L. (1982). Geographically restricted plants of Southern Western Australia. Department of Fisheries and Wildlife Western Australia Report 49.

Rye, B.L. and Hopper, S.D. (1981). A guide to the Gazetted Rare Flora of Western Australia. Department of Fisheries and Wildlife Western Australia Report 42.

Sampson, J.F. (1988). The Population Genetic Structure of *Eucalyptus rhodantha* Blakely & Steedman and its allies *Eucalyptus crucis* Maiden and *Eucalyptus lane-poolei* Maiden. PhD Thesis, University of Western Australia, Perth.

Sampson, J.F., Hopper, S.D. and James, S.H. (1988). Genetic divesity and the conservation of *Eucalyptus crucis* Maiden. *Australian Journal of Botany* **36**, 447-460.

Sampson, J.F., Hopper, S.D. and James, S.H. (1989). The mating system and population genetic structure in a bird-pollinated mallee, *Eucalyptus rhodantha*. *Heredity* **63**, 383-393.

Sampson, J.F., Hopper, S.D. and Coates, D.J. (1990). *Eucalyptus rhodantha*. Western Australian Wildlife Management Program No. 3. Department of Conservation and Land Management, Como, Western Australia.

Specht, R.L., Roe, E.M. and Broughton, V.H. (1974). Conservation of major plant communities in Australia and Papua New Guinea. *Australian Journal of Botany Supplement No. 7.*

Taylor, A. and Hopper, S.D. (1984). *Banksia Atlas Instruction Booklet and Supplementary Field Guide.* Government Printer, Western Australia.

Taylor, A. and Hopper, S. (1988). *The Banksia Atlas.* Australian Flora and Fauna Series No.8. Australian Government Publishing Service, Canberra.

Turczaninow, P.K.N.S. (1847). Decas tertia generum adhuc non descriptorum adjectis descriptionibus nonnullarum specierum Myrtacearum xerocarpicarum atque Umbelliferarum imperfectarum. *Bulletin de la Societe Imperiale des Naturalistes de Moscou* **20**(1), 163.

Turnbull, J. and Hall, N. (1973a). Kimberley Gum *Eucalyptus confluens* W.V. Fitzg ex Maiden. Forest Tree Series No. 103. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Turnbull, J. and Hall, N. (1973b). Halls Creek White Gum *Eucalyptus cupularis* C.A. Gardner. Forest Tree Series No. 102. Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

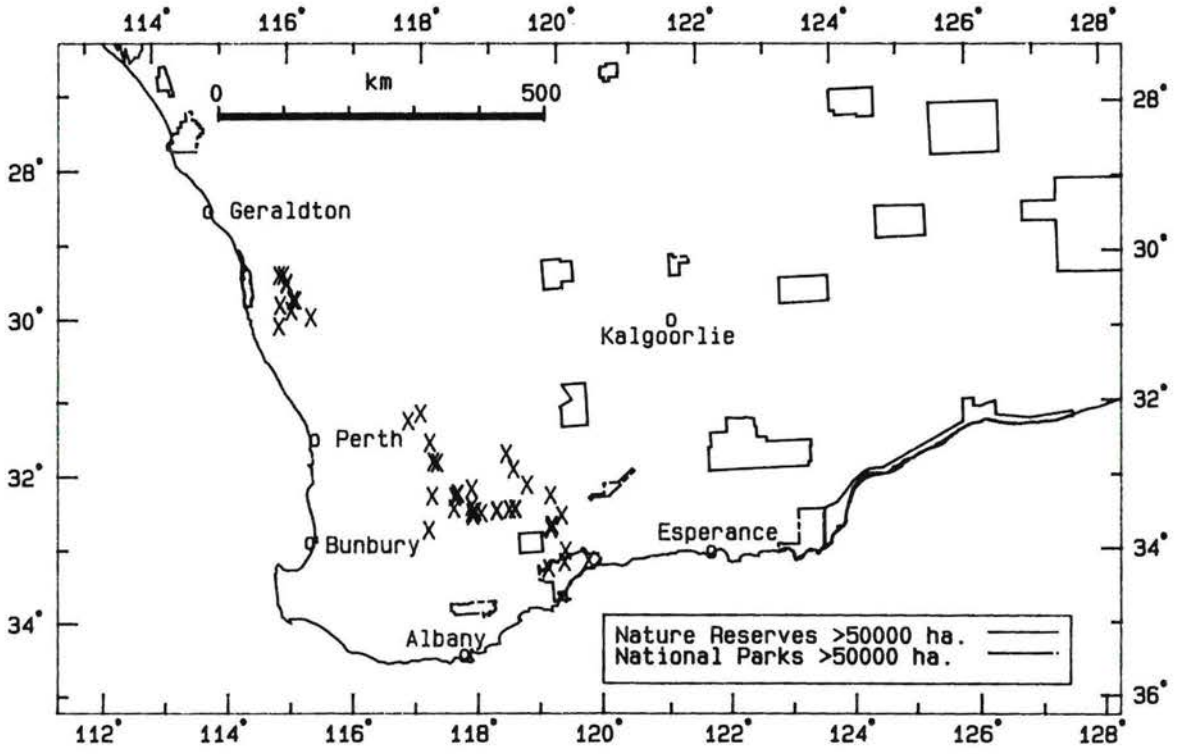
## GLOSSARY

| | |
|---|---|
| acute | ending in a sharp point |
| anthesis | the process of flowering |
| axillary | in the leaf axil; from where the leaf joins the branchlet |
| concolorous | leaf with upper and lower sides the same colour |
| disc | the band of tissue between the raised rim which bears the stamens and the top of the ovary |
| discolorous | leaf with upper and lower sides a different colour |
| exserted | protruding from the top or opening of the fruit |
| fertile | (of stamens) having an anther |
| flanged | a projecting flat rim, collar or rib |
| glaucous | with a waxy coating giving a white, grey or blue-grey appearance |
| hypanthium | the flower receptacle or lower part of the bud |
| inflorescence | cluster of flowers |
| mallee | shrub-mallee - has more than one trunk and each trunk is less than 10 cm in diameter |
| | tree-mallee - has more than one trunk and each trunk is more than 10 cm in diameter |
| mallet | small to medium sized tree, usually of steep-branching habit, sometimes fluted at the base of the trunk, and often with a conspicuously dense, terminal crown |
| marlock | an effuse non-lignotuberous mallee or small tree |
| obtuse | blunt or rounded at the apex |
| oil glands | minute oil containing structures seen near the surface of young stems, leaves, buds and fruits |
| operculum | the bud cap, the upper part of the bud which joins the hypanthium and covers the stamens |
| panicle | a much-branched inflorescence with flowers on stalks |
| pedicel | the stalk of a bud, flower or fruit |
| peduncle | the stalk witch holds the cluster of buds; may be terete, stout or flattened |
| pendulous | weeping habit or downturned |
| petiole | stalk joining the leaf to the branchlet |
| pith | the inner core of tissue of a plant stem |
| reticulation | the pattern of leaf veins |
| scar | the marking left on the bud when the first operculum is shed. If only one operculum is present no true scar is formed although a line of dying tissue witch resembles a scar may appear near to flowering |
| sessile | without a stalk |
| staminode | a sterile stamen, one without an anther or with a reduced, non-functional anther |
| striated | marked with almost parallel longitudinal ridges |
| terete | rounded; used when describing stems, peduncles and petioles and referring to a cross-section |
| tessellated | occurring in small thick flakes |
| truncate | slightly cut off |
| venation | refers to the pattern of veins in the leaf |

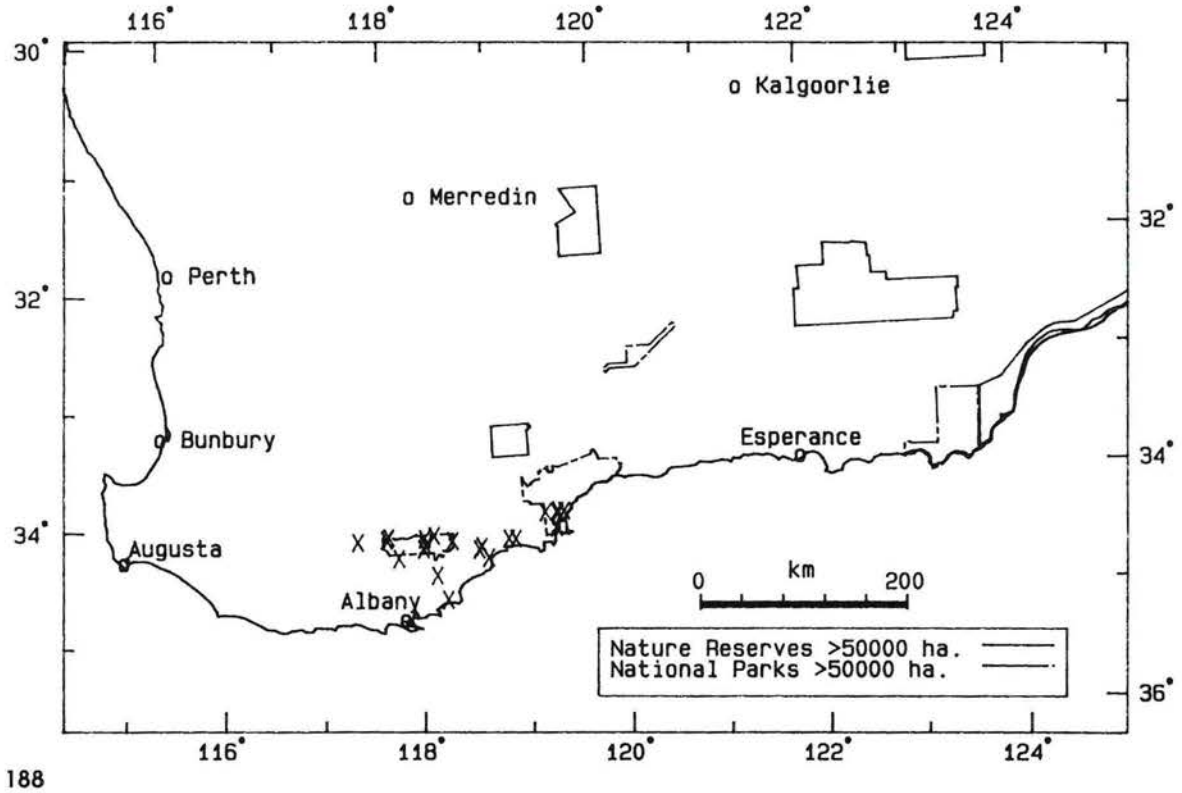
APPENDIX 1

Maps of WA eucalypt taxa believed to be threatened but subsequently found to be common.

## *Eucalyptus albida*

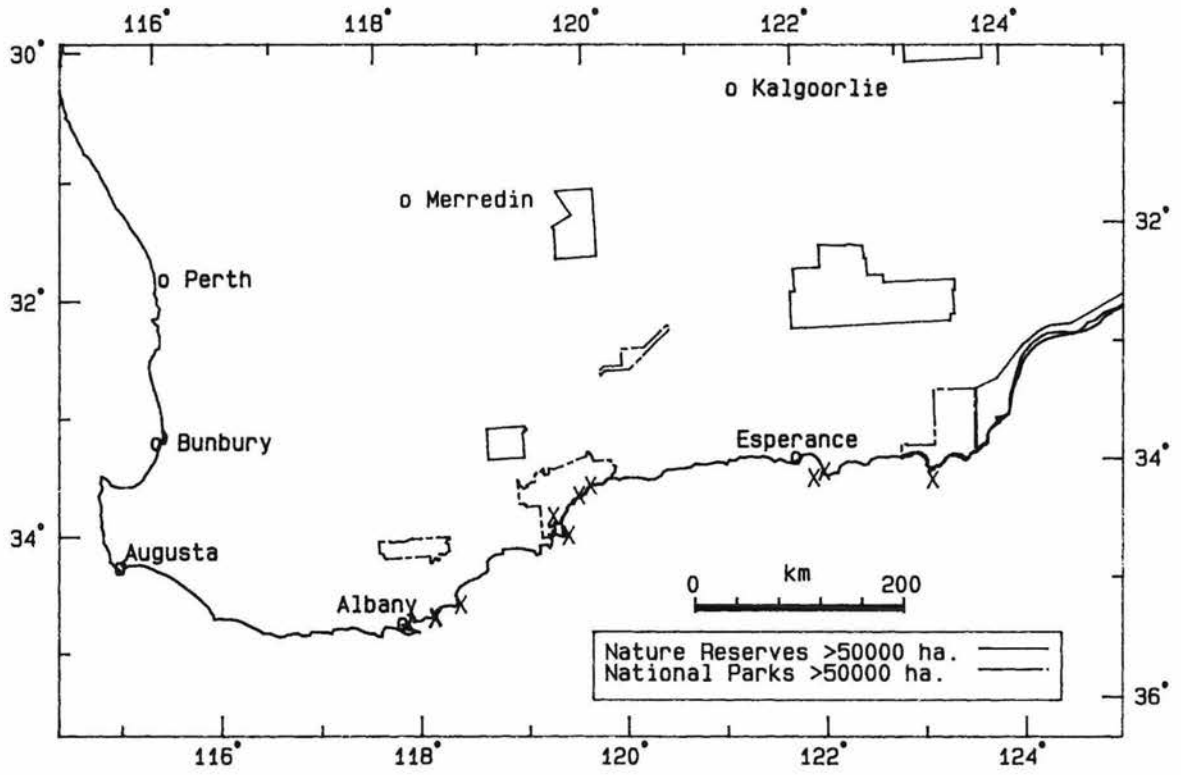



## *Eucalyptus buprestium*

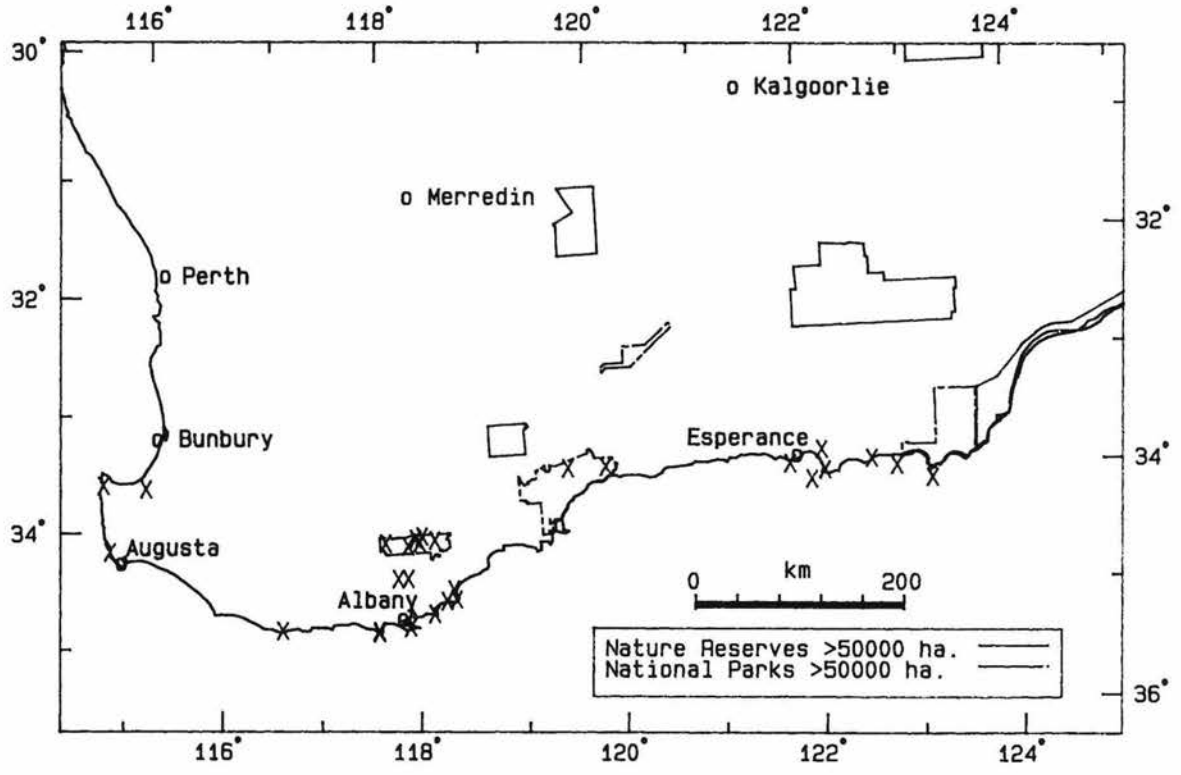


Appendix 1 (continued)

*Eucalyptus conferruminata*

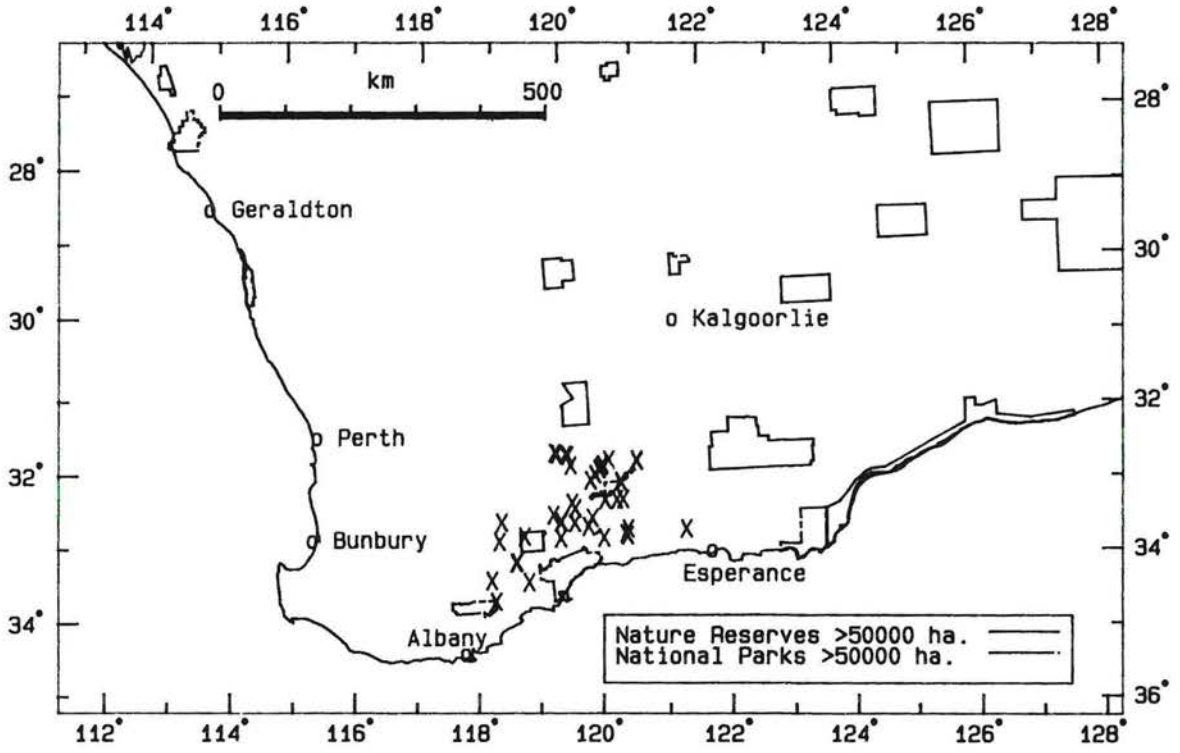



*Eucalyptus cornuta*

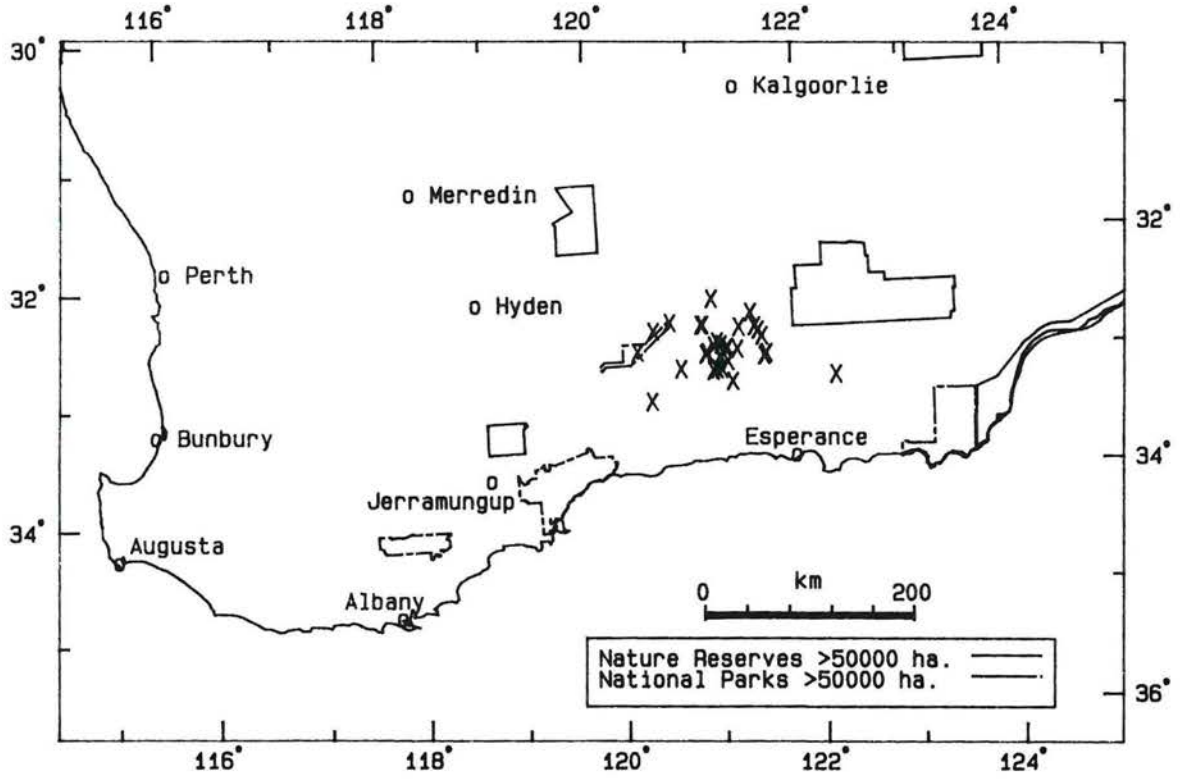


Appendix 1 (continued)

*Eucalyptus densa* ssp. *densa*

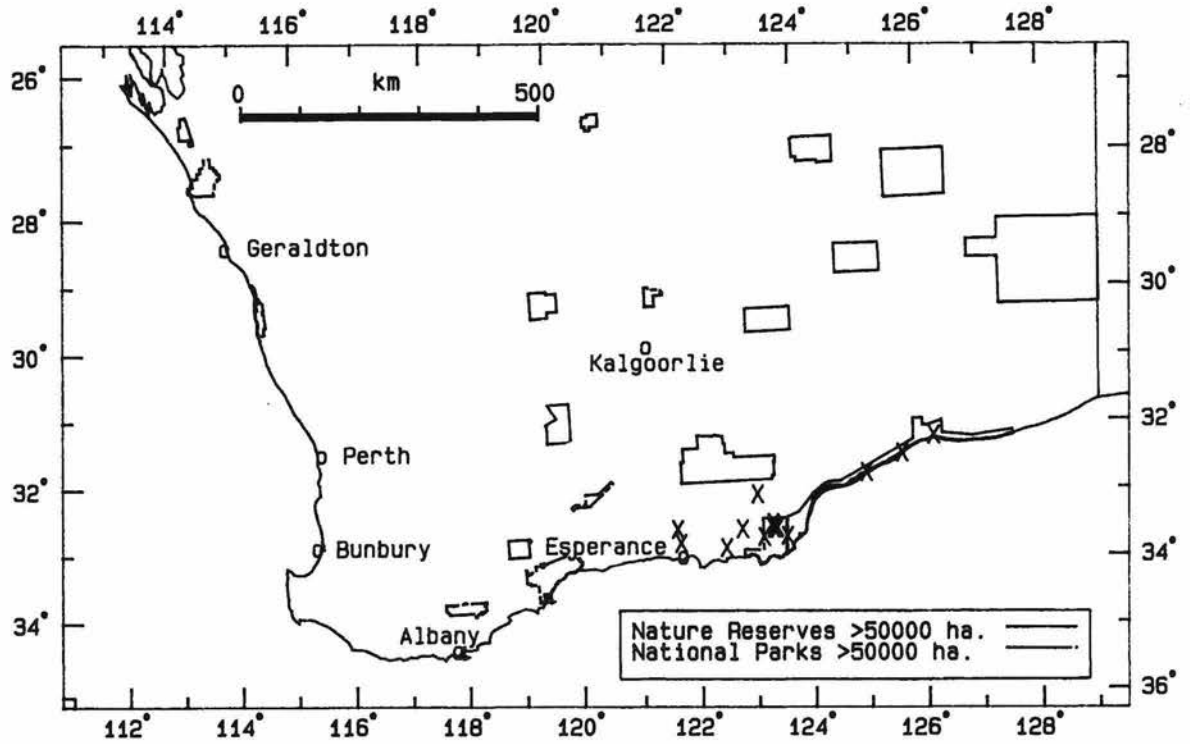



*Eucalyptus diptera*

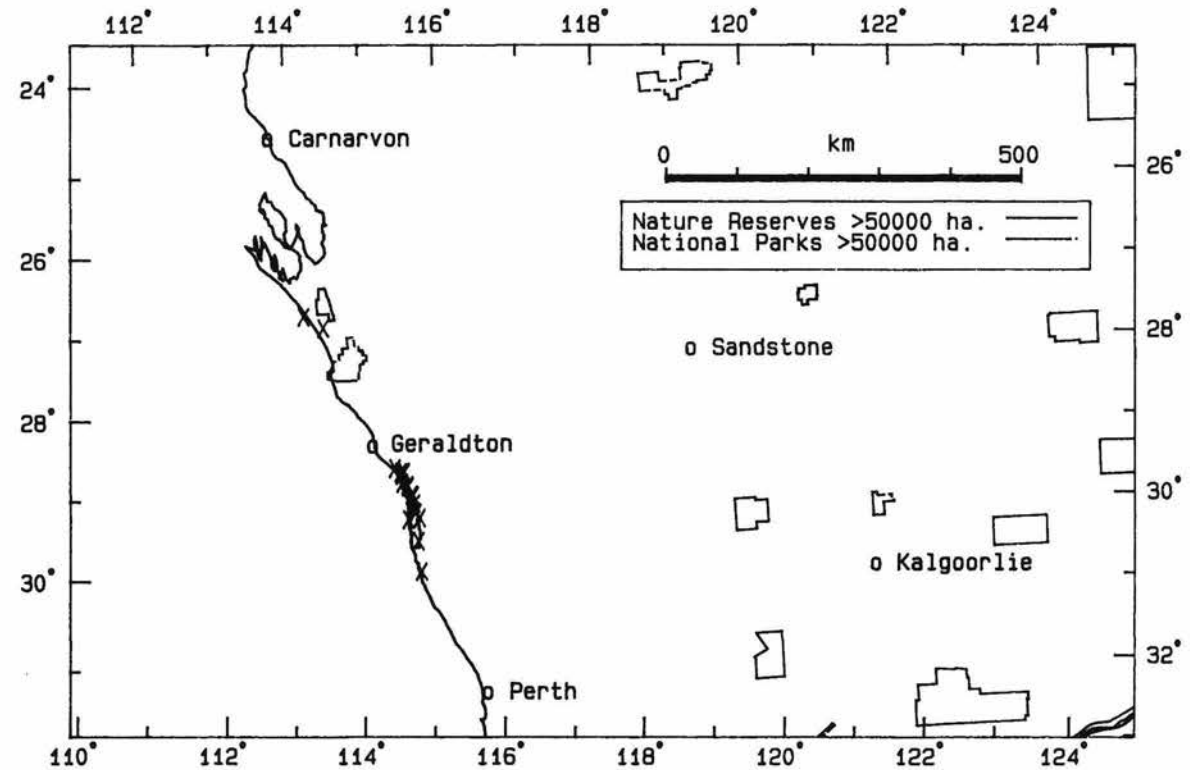


Appendix 1 (continued)

*Eucalyptus discreta*

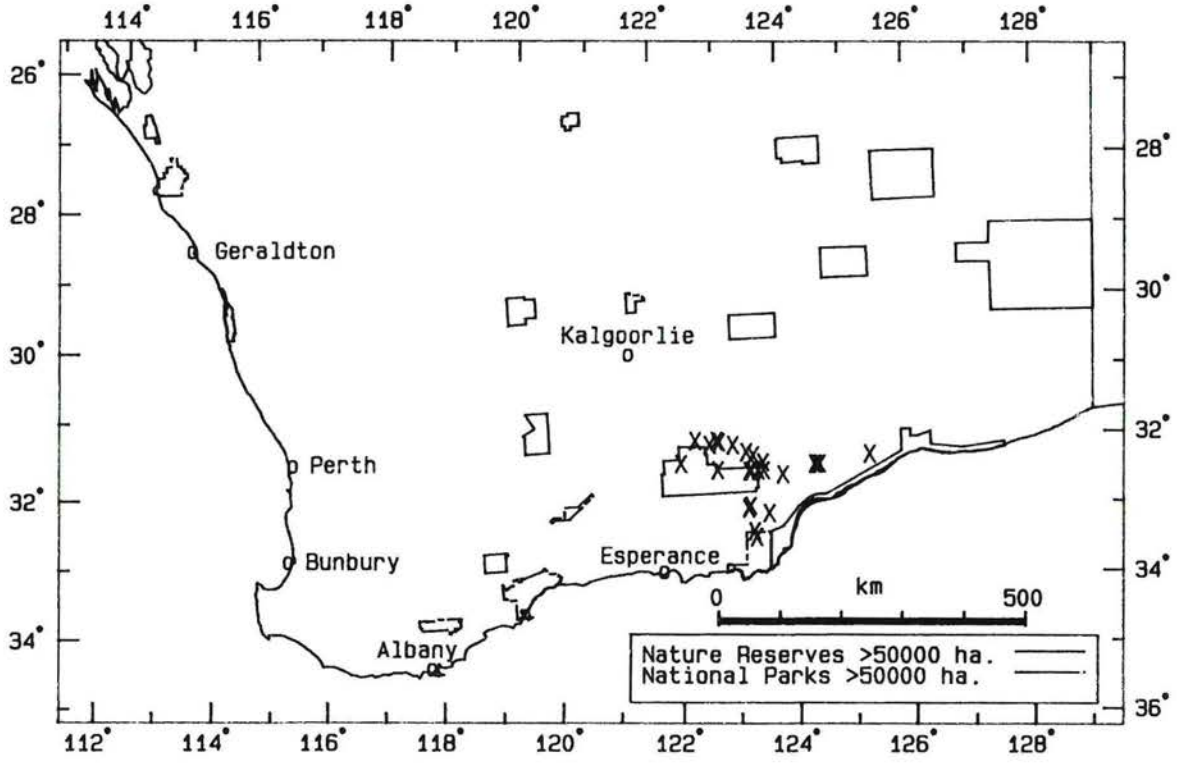



*Eucalyptus erythrocorys*

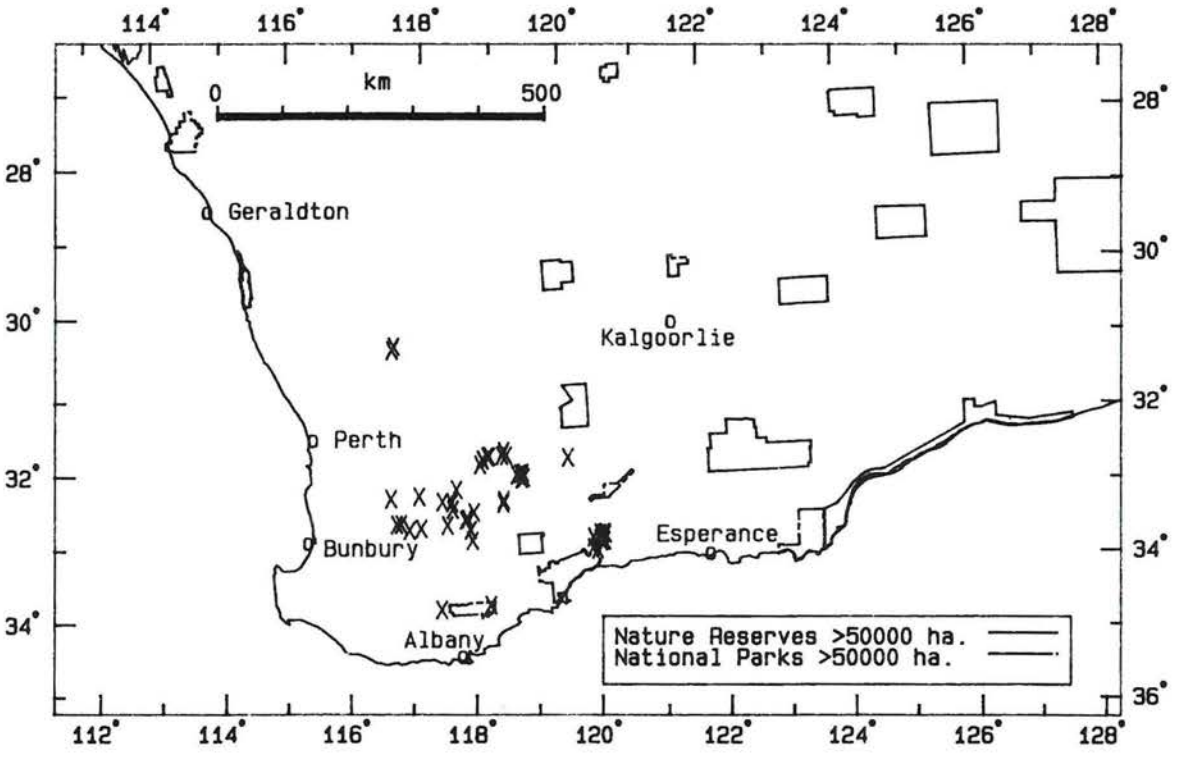


Appendix 1 (continued)

*Eucalyptus fraseri* ssp. *fraseri*

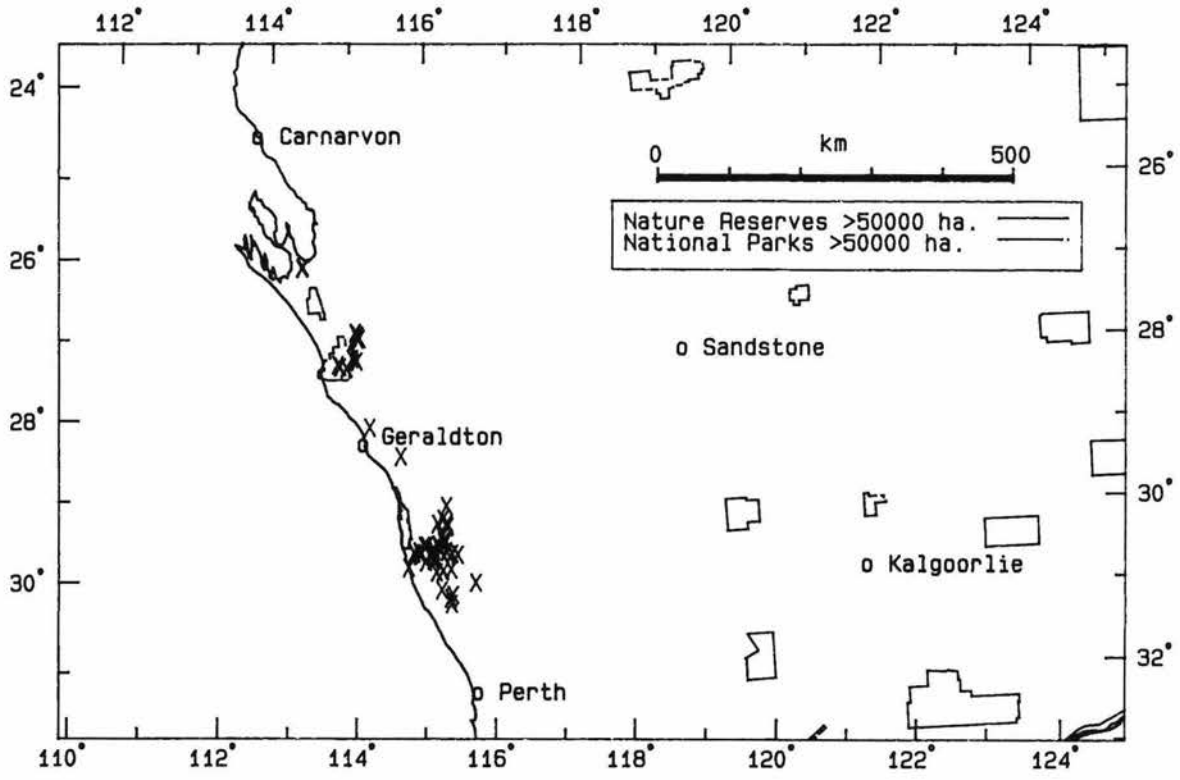



*Eucalyptus gardneri*

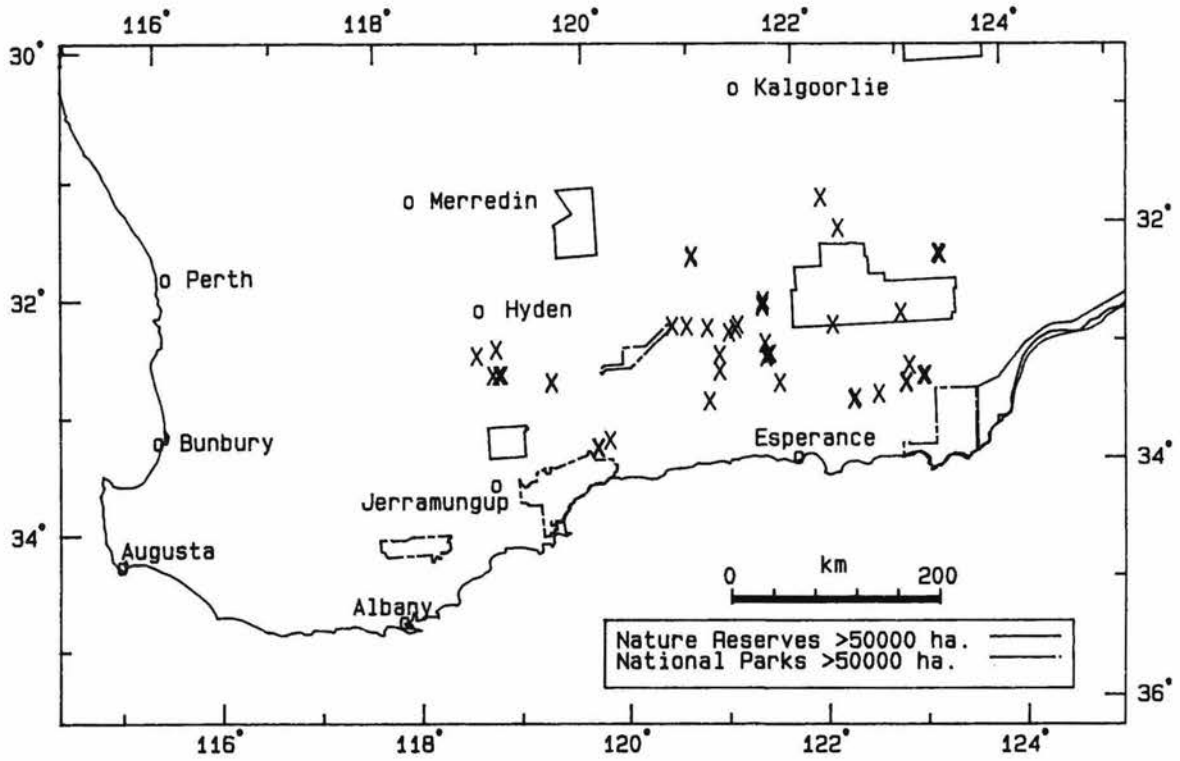


Appendix 1 (continued)

*Eucalyptus gittinsii*

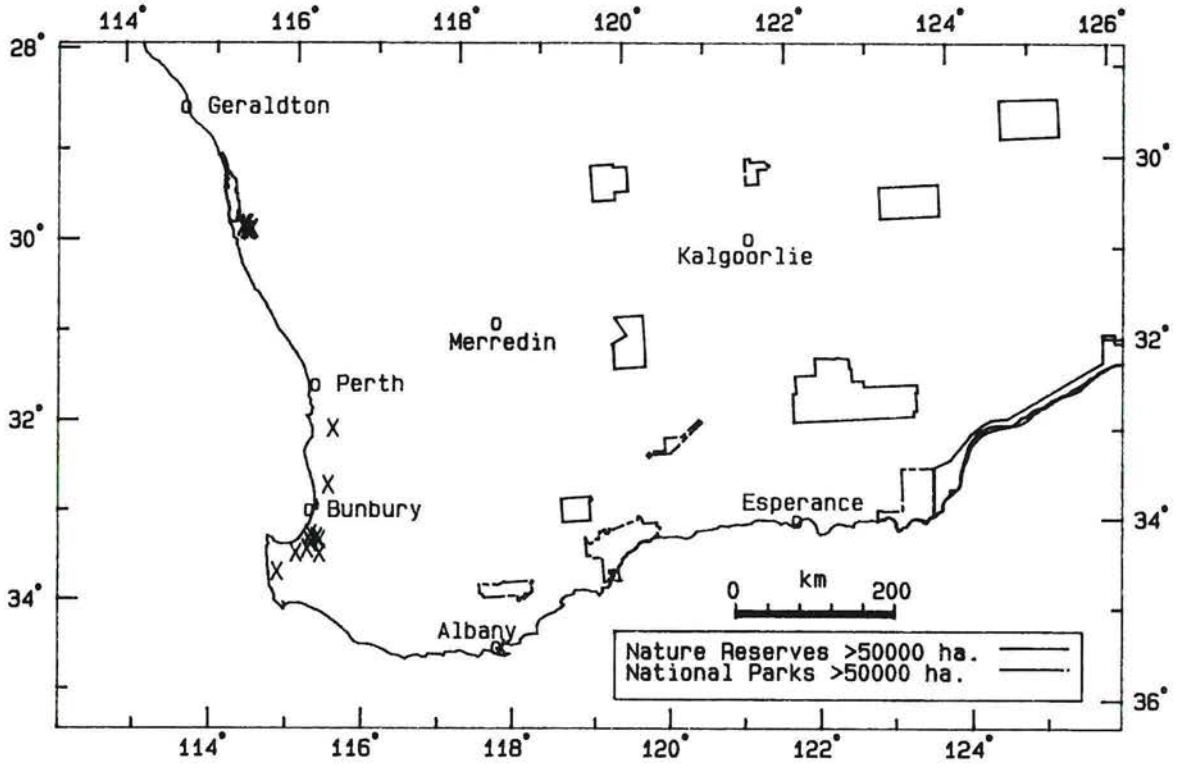



*Eucalyptus grossa*

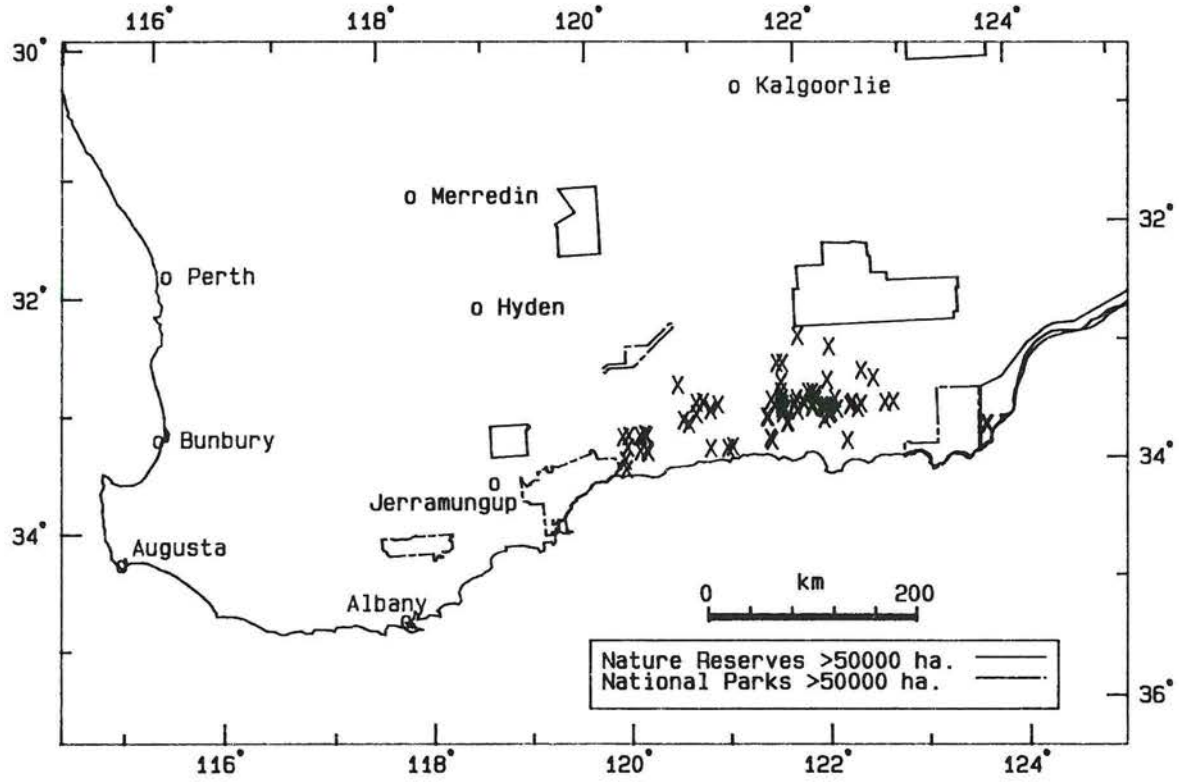


Appendix 1 (continued)

*Eucalyptus haematoxylon*

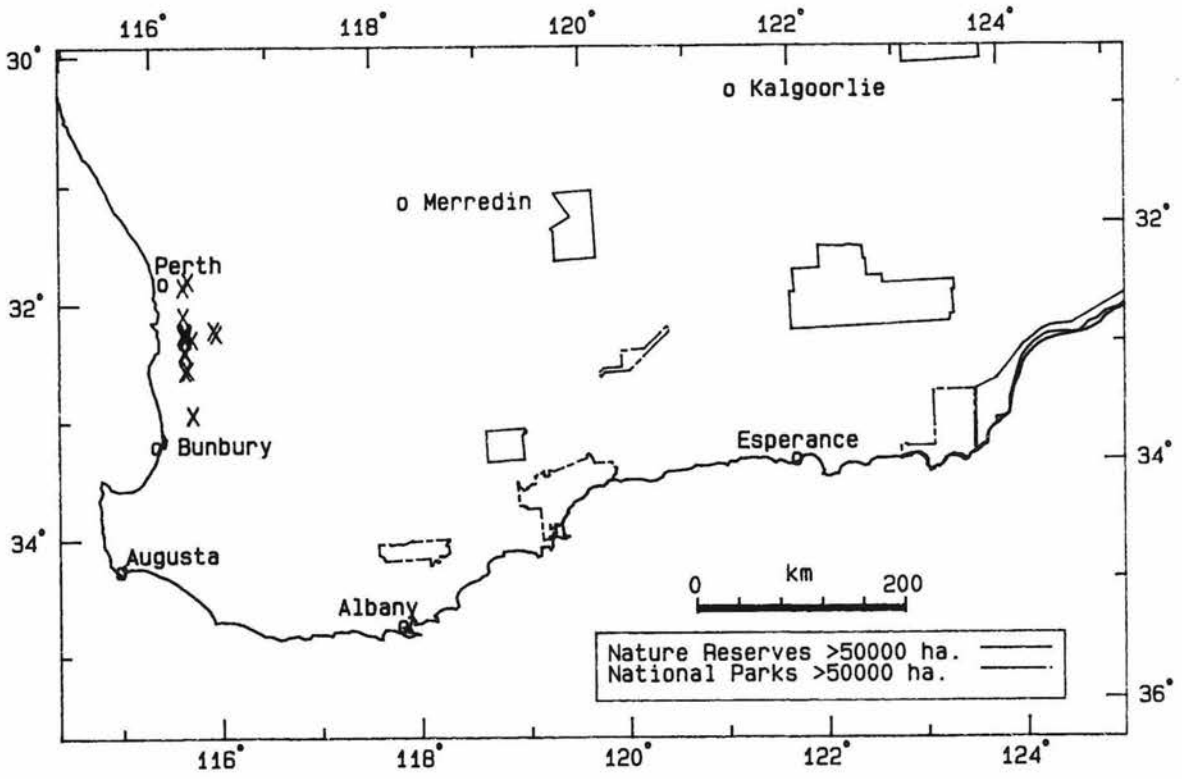



*Eucalyptus kessellii*

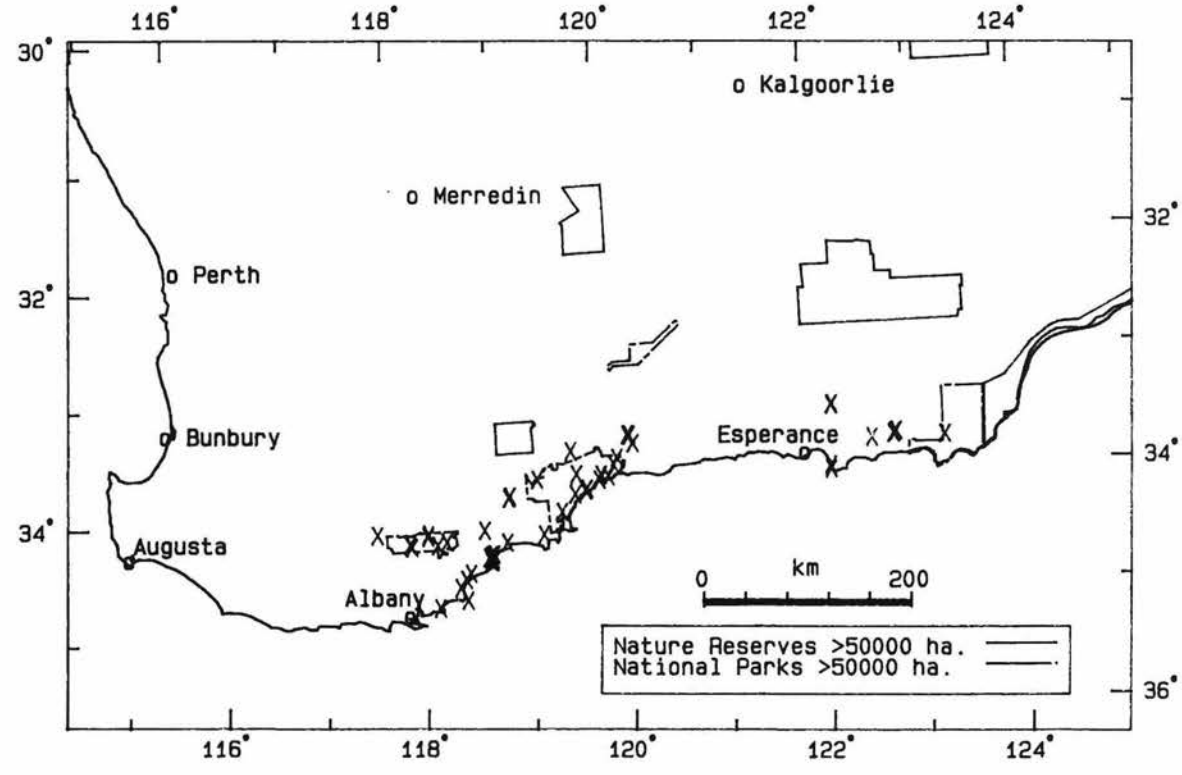


Appendix 1 (continued)

*Eucalyptus laeliae*

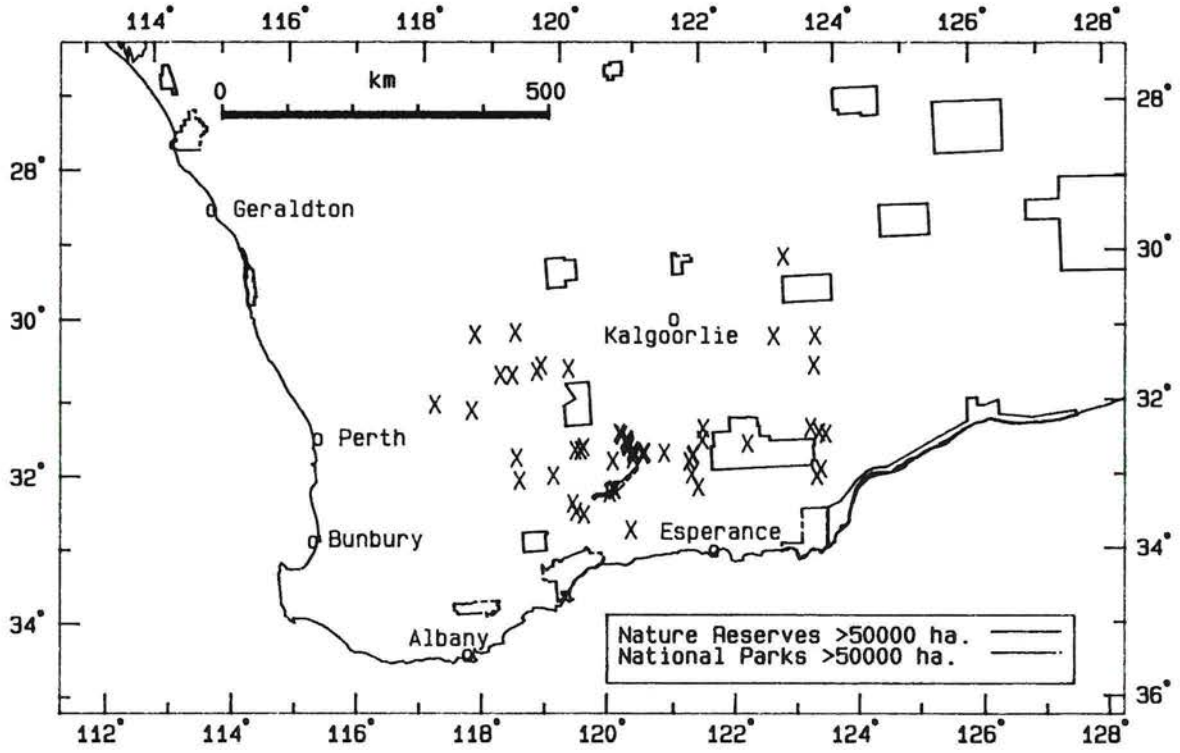



*Eucalyptus lehmannii*

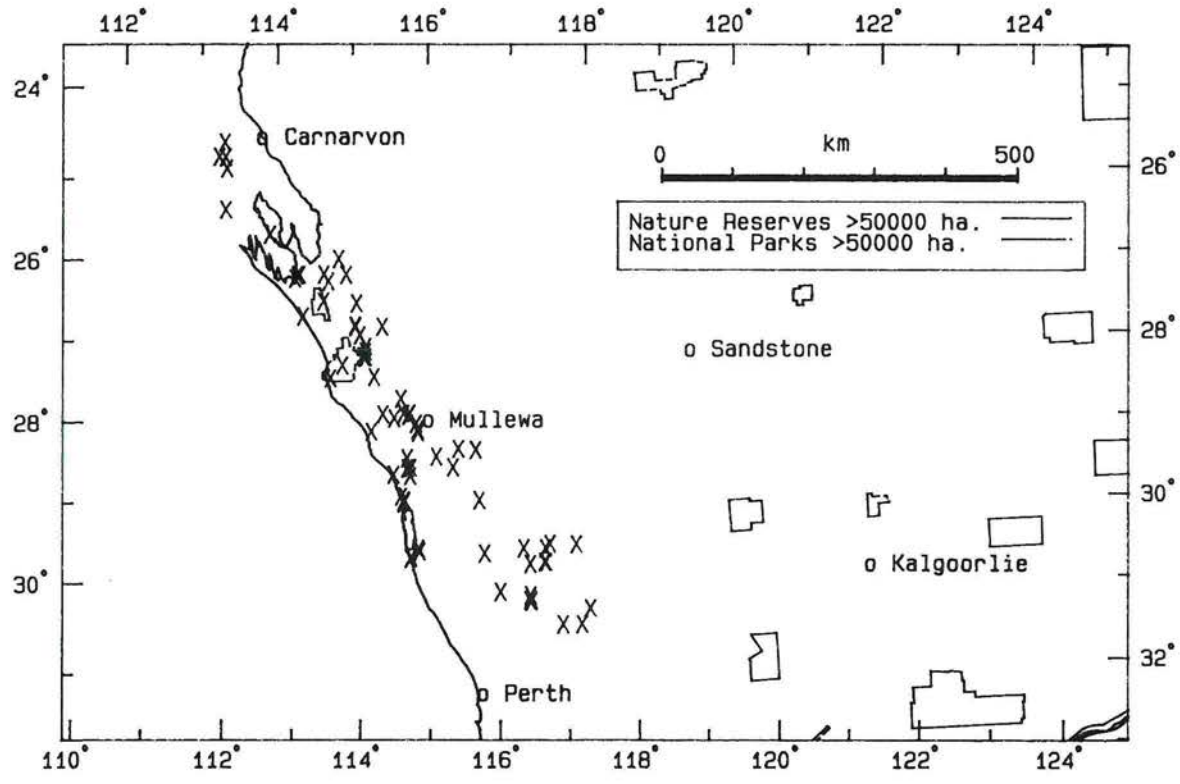


Appendix 1 (continued)

*Eucalyptus melanoxylon*

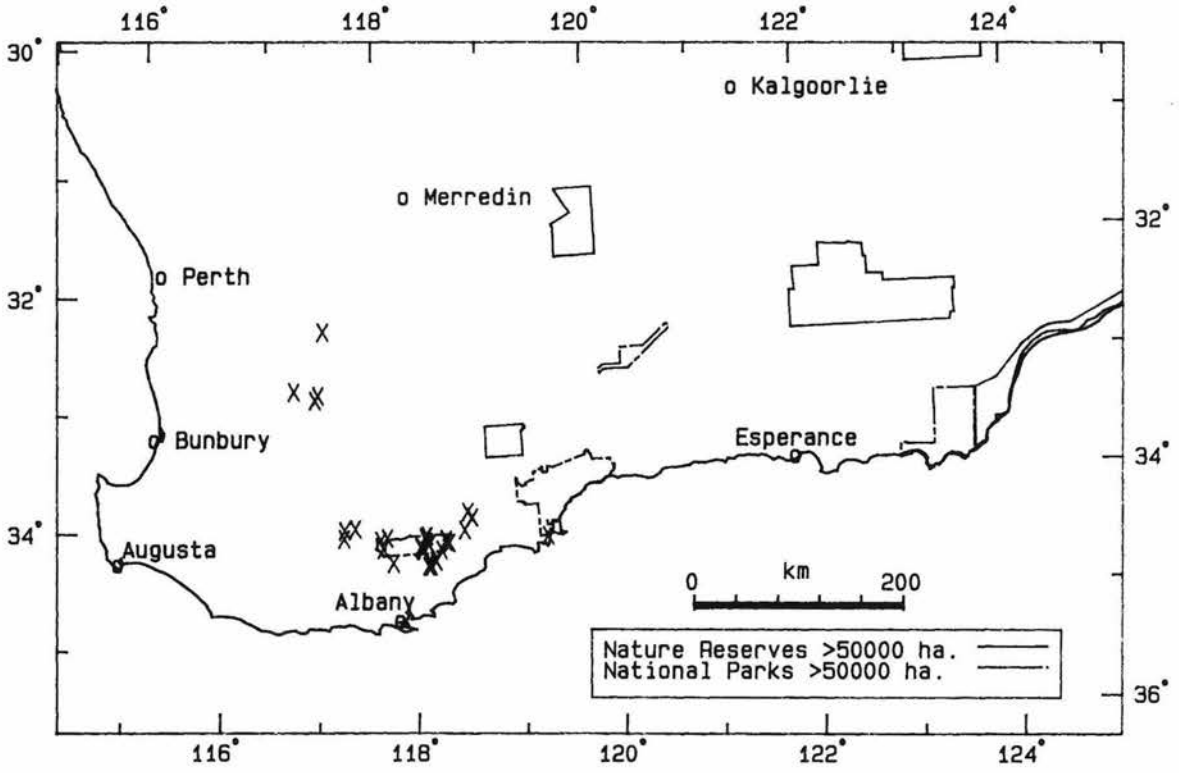



*Eucalyptus obtusiflora*

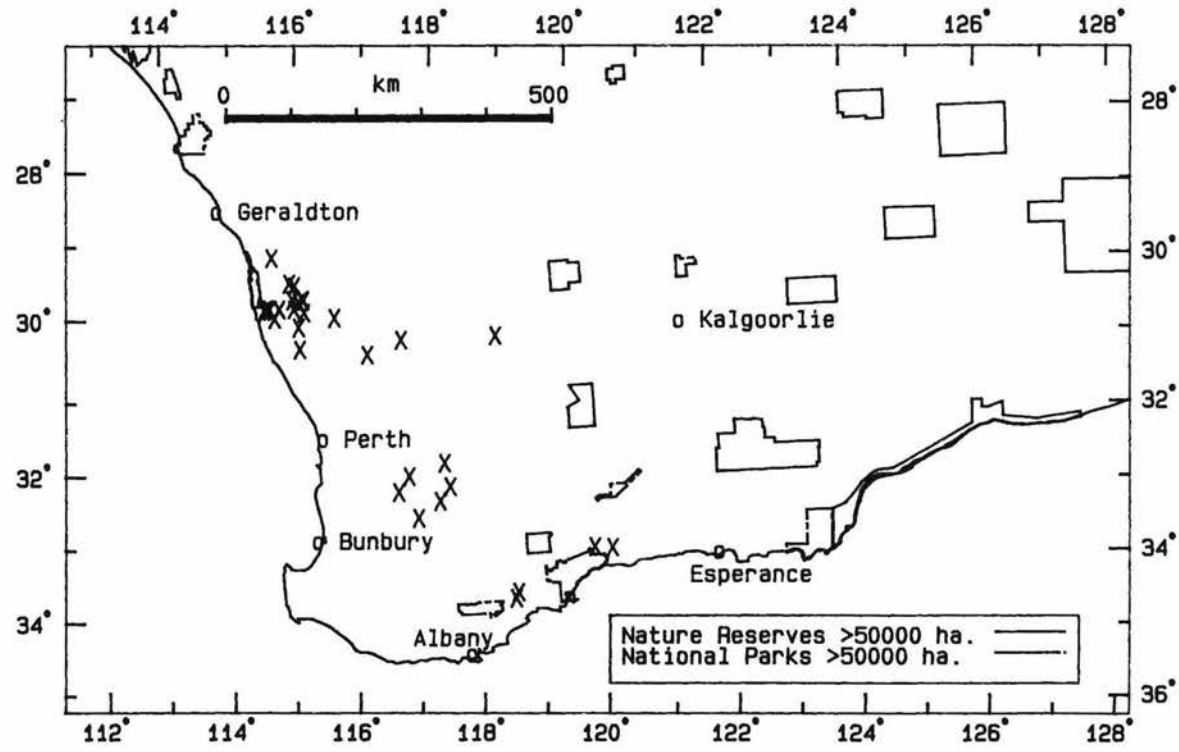


Appendix 1 (continued)

*Eucalyptus pachyloma*

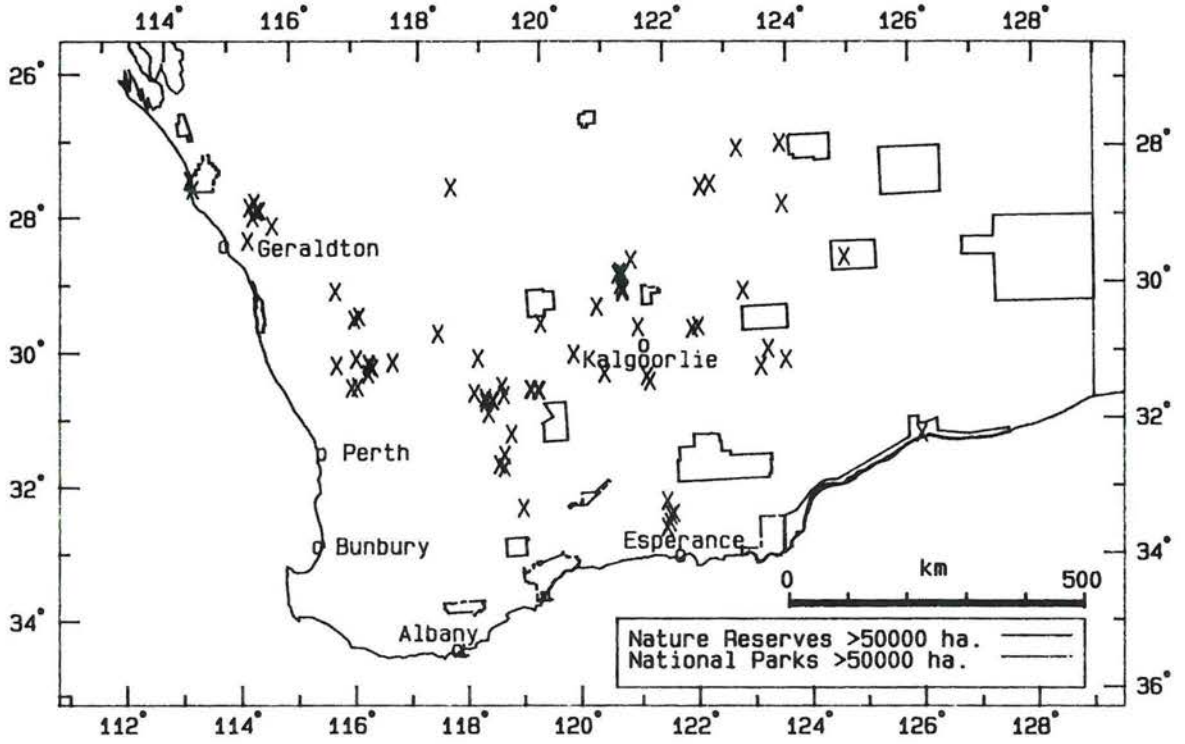



*Eucalyptus pluricaulis*

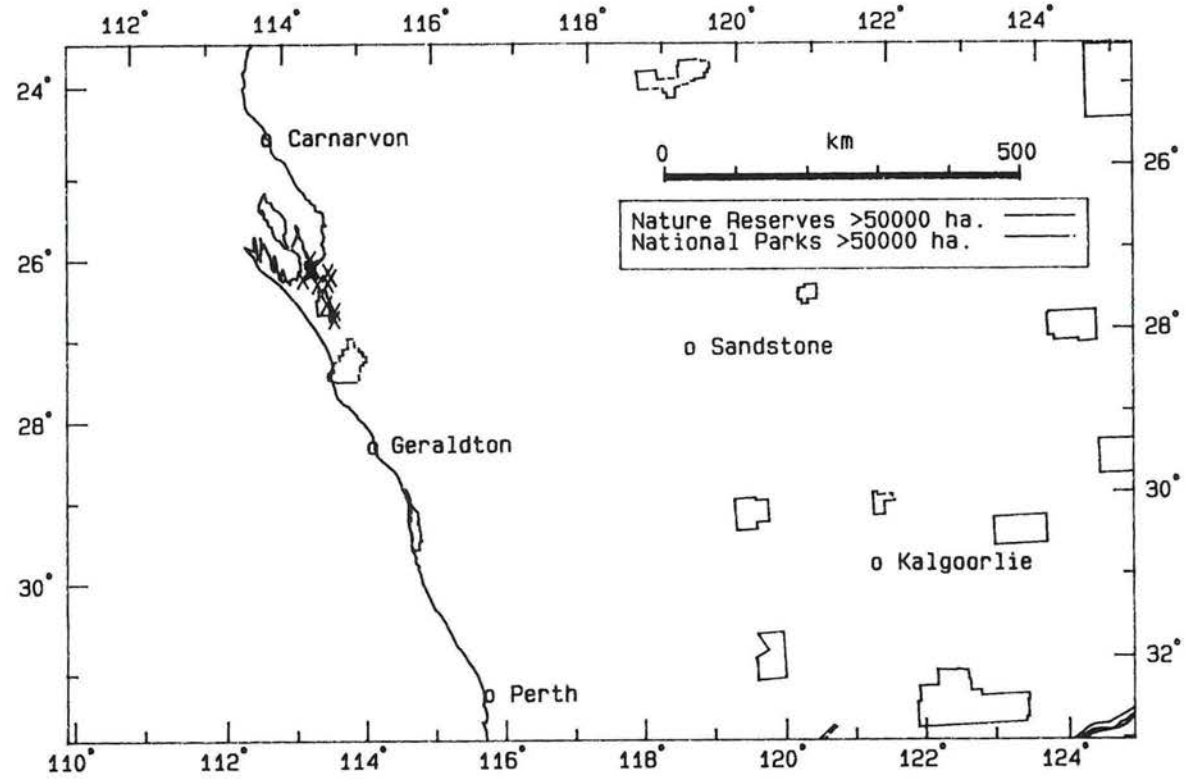


Appendix 1 (continued)

*Eucalyptus rigidula*

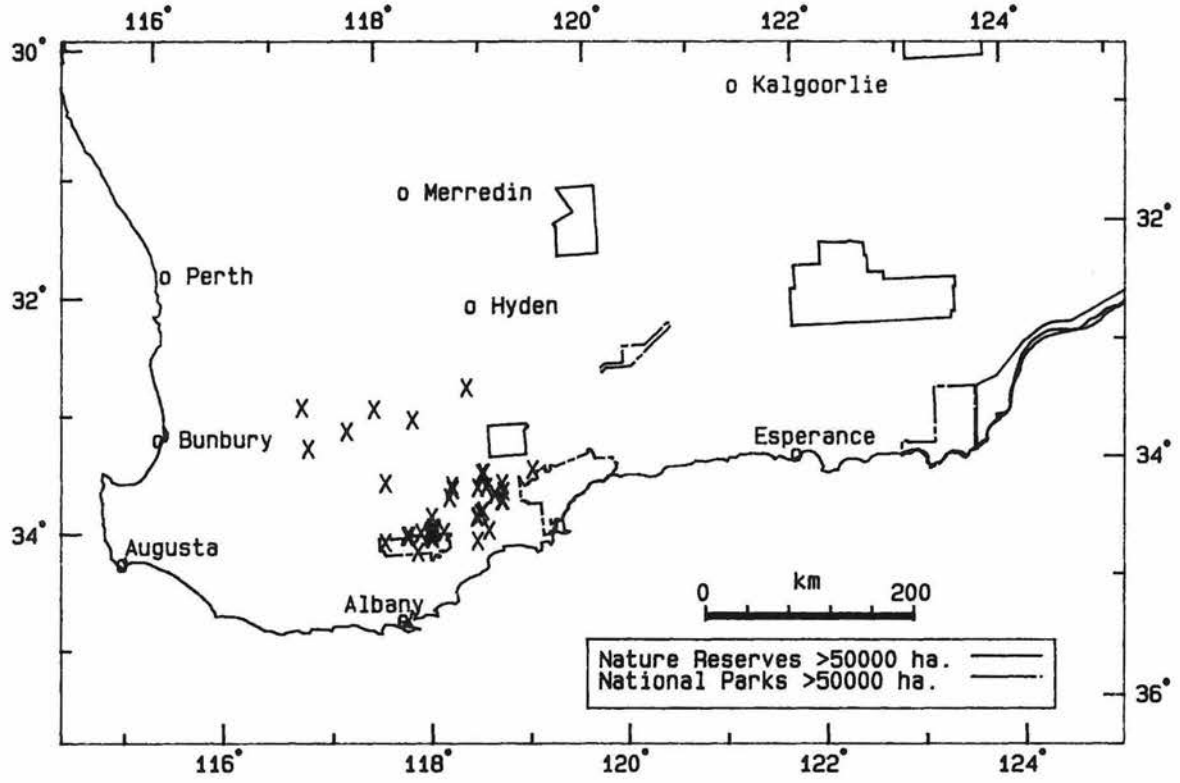



*Eucalyptus roycei*



Appendix 1 (continued)

*Eucalyptus xanthonema*



APPENDIX 2

Eucalypts listed in the 1991 Schedule of Declared Rare Flora.

*Eucalyptus absita*
*Eucalyptus argutifolia*
*Eucalyptus articulata*
*Eucalyptus balanites*
*Eucalyptus beardiana*
*Eucalyptus bennettiae*
*Eucalyptus blaxellii*
*Eucalyptus brevipes*
*Eucalyptus burdettiana*
*Eucalyptus ceracea*
*Eucalyptus cerasiformis*
*Eucalyptus coronata*
*Eucalyptus crispata*
*Eucalyptus crucis* ssp. *crucis*
*Eucalyptus crucis* ssp. *praecipua*
*Eucalyptus cuprea*
*Eucalyptus dolorosa*
*Eucalyptus erectifolia*
*Eucalyptus goniantha* ssp. *goniantha*
*Eucalyptus graniticola* ms
*Eucalyptus impensa*
*Eucalyptus insularis*
*Eucalyptus johnsoniana*
*Eucalyptus lateritica*
*Eucalyptus leprophloia*
*Eucalyptus merrickiae*
*Eucalyptus mooreana*
*Eucalyptus olivacea* ms
*Eucalyptus phylacis*
*Eucalyptus pruiniramis*
*Eucalyptus rameliana*
*Eucalyptus rhodantha*
*Eucalyptus steedmanii*
*Eucalyptus suberea*
*Eucalyptus synandra*
*Eucalyptus* sp. *Norseman (S.D. Hopper* 2736)

APPENDIX 3

Article about the survey published in *CALM News* Vol. 3 No. 25, March 1987.

# ANPWS BACKS EUCALYPT STUDY IN WA

**A grant of $12,000 from the Australian National Parks and Wildlife Servide will be used by CALM to survey rare WA eucalypts.**

Research Officer Dr Steve Hopper said some eucalypt species in WA, especially those found in the Wheatbelt, were rapidly disappearing.

WA has about half of the 2206 plant species listed as rare and threatened in Australia.

The funding would enable the survey of the endangered eucalypts and a mapping of their locations to assess any environmental aspects that may threaten their existence.

Steve said that because botanical survey in WA is uncoordinated, each year many populations of endangered flora are destroyed in ignorance by clearing for agriculture, and more than 50 species are now presumed extinct.

The project aims to provide effective coordination and increase the level of survey for WA's large number of rare and endangered eucalypts, Steve said.

The project will make extensive use of the newly developed computer system FLORAPLOT, which enables point location plotting of precise geographic data for species.

The grant money will be used to hire a botanical consultant for two years to coordinate rare eucalypt surveys by CALM staff and others, including interested volunteers, and to ensure that their data are recorded and accessed onto FLORAPLOT.

"Conservation of WA's rare and endangered eucalypts is an immediate problem of national and international significance," Steve said.

"There are few areas in the world with such a large number of restricted endemic trees and mallees that are threatened by such widespread destruction of their habitat."

APPENDIX 4
Kalgoorlie field trip publicity.

*The Kalgoorlie Miner,*
Wednesday 29th March 1989

# Tree surveying discussion

Keen naturalists will have the opportunity to hear the coordinators of the Conservation and Land Management 'Rare and Poorly Known Eucalypts Survey' discuss their work at Kalgoorlie College this week.

Anna Napier and Anne Kelly will talk about mapping and recording some of the area's unusual trees during a Goldfields Naturalists Club meeting at the college on Friday night.

Members of the public are welcome to participate both in the discussion and two field trips that will be held over the weekend to view some of the trees in the local area.

Forty people attended a club camp-out at Victoria Rock, 45 km south of Coolgardie, over the Easter weekend.

Numerous plants were identified and animals trapped, recorded and released.

*The Kalgoorlie Miner,*
Wednesday 5th April 1989

# Naturalists meet

A packed crowd attended a Goldfields Naturalists Club meeting on Friday to listen to an address from coordinators of the CALM Rare and Poorly Known Eucalypts Survey.

Anna Napier and Anne Kelly spoke to the assembly and provided expert advice to volunteer recorders on two weekend excursions to find uncommon trees.

A field trip to the east ot Kalgoorlie on Saturday covered some 400 km while on Sunday the group travelled north to the Goongarrie-Comet Vale area.

Leader of both excursions was CALM regional manager Ian Kealley with the body of the group made up of local naturalists and volunteer recorders from as far afield as Bodallin and Leonora.

Many observations and recordings of local species were made over the weekend. Ms Napier said the excercise was very rewarding.

APPENDIX 5

## WELCOME TO THE SURVEY OF RARE AND POORLY KNOWN EUCALYPTS

The aim of this survey, which is funded by the Australian National Parks and Wildlife Service and the WA Department of Conservation and Land Management (CALM), is to extend the knowledge of the locations of those *Eucalyptus* species in Western Australia which have been gazetted as Declared Rare Flora, which are known to be geographically restricted or for which there has been insufficient survey to assess their conservation status. The idea of the survey is to involve CALM staff as much as possible because they have a good knowledge of their own districts and are constantly out and about in them. We are also intending to include a selected number of keen and knowledgeable people from other areas who may or may not have participated in the Banksia Atlas but who are actively interested in field survey work on eucalypts.

A list of some 160 *Eucalyptus* species was initially chosen to be included in the survey. These were taken from lists of possibly rare and vulnerable species compiled by Pryor (1981), Marchant and Keighery (1979), Rye (1982) and Leigh *et al.* (1981) and were supplemented with species suggested by Mr M.I.H. Brooker (CSIRO) and Dr S.D. Hopper (CALM) who have done much work on *Eucalyptus* survey and taxonomy.

The final list was then divided into CALM Management Regions in order to reduce the survey number in the first instance to a more manageable number. Table 1 below shows the breakdown of species numbers by region and rarity value. Figure 1 shows the CALM Management Regions in WA. The CALM South Coast Region was found to have the largest number of species to be examined and also the greatest percentage of vulnerable and rare species. On this basis, it was chosen as the first region to be surveyed. Field Guide No. 1 is a comprehensive identification guide to the 65 rare eucalypts which occur in this region. Field Guides 2 and 3 are planned to cover the Wheatbelt and Greenough Regions.

TABLE 1

Numbers of rare, threatened or poorly known eucalypts in CALM's eleven operational regions in Western Australia.

| | IUCN CATEGORY | | | | | | |
|---|---|---|---|---|---|---|---|
| REGION | EXTINCT | ENDANGERED | VULNERABLE | RARE | POORLY KNOWN | *COMMON | TOTAL |
| South Coast | - | 1 | 14 (31.8%) | 36(40.4%) | 14(31.8%) | 14(41.2%) | 79 |
| Wheatbelt | - | - | 5(11.3%) | 16(19.5%) | 5(11.3%) | 9(26.5%) | 34 |
| Greenough | - | 2 | 14(31.8%) | 8(9.2%) | 3(6.8%) | 4(11.7%) | 31 |
| Goldfields | 1 | - | 2(4.6%) | 15(17.2%) | 4(9.1%) | 2(5.9%) | 24 |
| Kimberley | - | - | 2(4.6%) | 1(1.1%) | 14(31.8%) | - | 17 |
| Pilbara | - | - | 1(2.3%) | 1(1.1%) | 3(6.8%) | 1(2.9%) | 6 |
| Gascoyne | - | - | 1(2.3%) | 1(1.1%) | 2(4.5%) | 2(5.9%) | 6 |
| Northern Forest | - | - | 3(7.0%) | 3(3.4%) | 1(2.3%) | - | 7 |
| Central Forest | - | - | 3(7.0%) | 2(2.3%) | 2(4.5%) | - | 7 |
| Southern Forest | - | - | - | 4(4.6%) | - | - | 4 |
| Metropolitan | - | - | - | 3(3.4%) | - | - | 3 |
| TOTAL | 1 | 3 | 44(100%) | 89(100%) | 44(100%) | 34(100%) | 214 |

*Considered in previously published works to be rare or threatened but actually common and at no risk on the basis of recent survey.

### How the survey will work

We are relying heavily on the previous work of the Banksia Atlas for this survey, both as a source of record sheets and 'how to' books and as an indicator of the possible pitfalls. We ask contributors to the Rare Eucalypt Survey to fill out record sheets indicating species, location and habitat details and to send them to us for checking and incorporation onto the computer. Detailed species maps will be able to be generated rapidly on computer and copies sent to contributors regularly. Where possible, liaison with contributors in the field or at base will be carried out in order to follow up leads for sightings or check identifications.

Appendix 5 (continued)

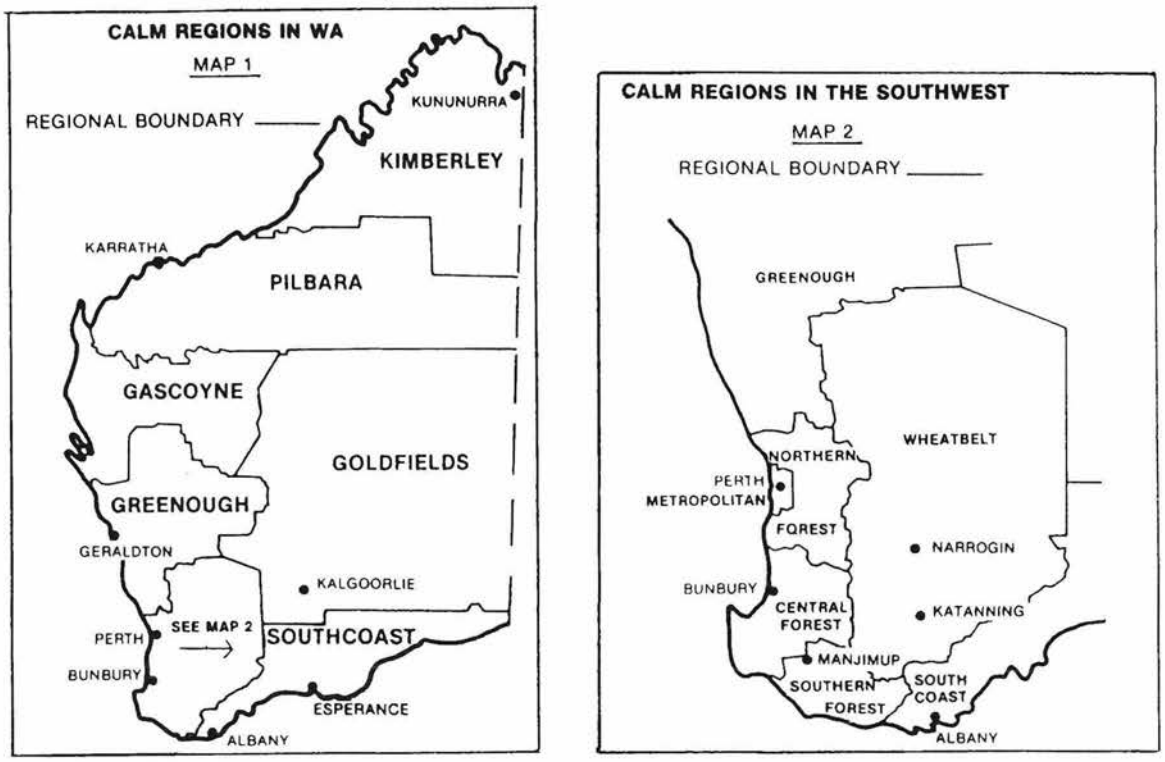



*Figure 1*

## Using the Banksia Atlas record sheets for the Rare Eucalypt Survey

The sight record sheets developed for the Banksia Atlas have proven to be useful and easily understood by most volunteers. These are being used as record sheets for the Eucalypt Survey:

(a) because there were a number left over from the Banksia Atlas; and

(b) because little change is required to adapt them for the current purpose.

Instructions for completing the sight record sheets are provided in the Banksia Atlas instruction booklet (Taylor and Hopper 1984). However, a few changes and additions to coding are necessary for the Eucalypt Survey. Some of these are the result of problems which became apparent during the Banksia Atlas. Others were seen as necessary adaptations.

## How to fill in a record sheet

**General Instructions** - as in Banksia Atlas booklet (p 7) except for items 5 and 3.

5. Since eucalypts are harder to identify than banksias and also, since we are focussing on rare species for which a confirmed indentification is essential, we will require voucher specimens for many records. Full details of when and how to collect voucher specimens are provided in the accompanying field guide.

3. This section needs to be qualified since to many Banksia Atlas volunteers it suggested that incomplete record sheets were not acceptable. Incomplete sheets may be submitted as long as they contain the following core data - observer code, date, location details (including latitude and longitude), name of eucalypt.

**Observer code** - unless otherwise informed this will simply be your 3 initials. If you do not have a middle name use 'X'.

**State code** - although the survey will only be carried out in Western Australia, please put WA in the box provided.

Appendix 5 (continued)

**Date of observation, locality number for day, map used and scale** - as in Banksia Atlas booklet (p 9).

**Map used and scale** - as accuracy is important it is hoped to base map readings on maps of 1:100 000 or better. The NATMAP 1: 100 000 series is now available for all of the South Coast Region. Maps may be obtained from:

Central Map Agency
Dept. of Land Administration
Cathedral Avenue
Perth ph. 323 1344

For mail orders you will need to state the individual map number. This is easily worked out from the index leaflet (enclosed).

**Locality** - see Banksia Atlas booklet (pp 9-13). Since there is a necessity for detail with rare flora mapping, a resolution code of at least 3 should be aimed at.

**Habitat** - (p 13) the only changes here are the addition of extra soil type codes and one extra vegetation code. As soil type variations appear to be almost infinite it is recommended that contributors choose the most accurate description of the soil at a record location but use XX in the boxes and elaborate below if the soil is particularly unusual.

Extra soil types

| | | |
|---|---|---|
| Z | = | sandy loam |
| F | = | sandy gravel |
| A | = | sandy clay |
| W | = | clay loam |
| B | = | clay gravel |
| Y | = | gravelly loam |
| E | = | peaty sand |
| M | = | loam over rock |

Extra vegetation code

MH = mallee-heath.

May be low or tall shrubland with emergent mallee-eucalypts. Where there is only the odd scattered mallee, use SS or LS; where mallee's are predominant, use MA.

**Banksias Present** - (p 18) this should read Eucalypts present!

Obviously a whole new list of eucalypt codes is required to replace those of the banksias. The codes for the species being particularly examined are generally (but not always) the first three letters of the species name plus the first letter of the subspecies name if applicable. Please keep referring to the code though as they are not always straight forward. Codes of the rare and poorly known eucalypts of the South Coast Region are printed on the inside front cover of the sight record sheet pad. A few additional species are included and are marked with an asterisk. In previously published works these had been considered to be rare or threatened but recent surveys suggest that they may be quite common. Please record them on the sight record sheets as for the listed rare species. Such information will be of great assistance in assessing their true status.

When filling in a sight record sheet for any of the above species (those with codes), please also include any other eucalypt species which are present at the same site. In this case just write the name of the species in the space provided and we will add the code later. Again if you are not totally sure of the identification of non-rare species send in material or leave it out altogether.

**Shrub or Tree**

In the case of eucalypt species "shrub" may or may not be applicable. Some mallee forms are shrub-like but for our purposes all mallee forms are to be recorded as 'S'. Mallees are generally shorter than tree forms and have multiple stems arising from ground level.

Appendix 5 (continued)

**Population code**

For mallee species the accurate assessment of population numbers can be difficult. Often a genetically distinct individual may form many stems which are quite a distance apart and which may look like a stand of saplings. Generally a closely grouped stand of stems is a single plant unless fire or logging has caused obvious re-seeding or suckering to occur. Record the number of "clumps" unless you are certain that the stems are from individual plants.

For this project the population codes used in the Banksia Atlas were considered to be inadequate. For rare plants, more detailed information is required.

**New population codes**

| | |
|---|---|
| When population is < 10 | - specify actual number (e.g. 1-9) |
| When population is 10-20 | - use code A |
| When population is 21-50 | - use code B |
| When population is 51-100 | - use code C |
| When population is 101-500 | - use code D |
| When population is > 500 | - use code E |

**Flower code**

These have been modified slightly due to experience of the Banksia Atlas and the requirement for different terminology.

| | | |
|---|---|---|
| B | = | More than 10% of plants in population in **bud** |
| F | = | More than 10% of plants in population **in full flower** |
| A | = | More than 10% of plants in population with **old flowers and/or immature fruits** |
| C | = | Majority of plants **not flowering** (i.e. less than 10% are in bud, full flower or with old flowers). |

The remainder of the instructions for filling out boxes can be found in the Banksia Atlas booklet and are applicable to the current survey.

The general rule is for "Banksia" read "Eucalypt".

## REFERENCES CITED

Leigh, J., Briggs, J. and Hartley, W. (1981). Rare or Threatened Australian Plants. *Australian National Parks and Wildlife Service, Special Publication 7.* Commonwealth of Australia, Canberra.

Marchant, N.G. and Keighery, G.J. (1979). Poorly collected and presumably rare vascular plants in Western Australia. *Kings Park Research Notes, No. 5.*

Pryor, L.D. (1981). Australian Endangered Species: Eucalypts. *Australian National Parks and Wildlife Service, Special Publication 5.* Australian Government Publishing Service, Canberra.

Rye, B.L. (1982). Geographically restricted plants of southern Western Australia. Department of Fisheries and Wildlife, Report No. 49.

Taylor, A. and Hopper, S.D. (1984). *Banksia Atlas Instruction Booklet and Supplementary Field Guide.* Government Printer, Western Australia.

APPENDIX 6

Conservation Codes for CALM's Declared Rare and Priority Flora List

DRF: Declared Rare Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.

PE: Declared Rare Flora - Presumed Extinct Flora

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.

P1: Priority One - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either owing to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

P2: Priority Two - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

P3: Priority Three - Poorly Known Taxa

Taxa which are known from several populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

P4: Priority Four - Rare Taxa

Taxa which are considered to have been adequately surveyed and which, while being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

P8: Priority Eight - Proposed DRF

Taxa for which adequate surveys have been completed. These taxa are being considered for inclusion on the list of Declared Rare Flora, but are currently outside of the policy for taxa to be declared, e.g. hybrids.

Conservation codes follow CALM's Declared Rare and Priority Flora list (21 November 1991). In Hopper *et al.* (1990) presumed extinct taxa were listed as priority four, and priority four taxa as priority five.

## NOTES ON CONTRIBUTORS

Anne Kelly has been employed as a consultant by CALM since 1988. Anne has worked at the WA Herbarium in the area of rare flora conservation and rare flora management and surveys. She can be contacted on (09) 334 0503.

Anna Napier worked as a consultant with CALM over several years. Anna joined Main Roads Western Australia in 1990 as the Roadside Environmental Officer. She can be contacted on (09) 323 4292.

Stephen Hopper is the Director of Kings Park and Botanic Garden. Stephen was formerly Senior Principal Research Scientist at CALM's Wildlife Research Centre, Woodvale. He can be contacted on (09) 480 3600.

## INSTRUCTIONS TO AUTHORS

*CALMScience* publishes scientific research and technical investigations carried out by CALM or under the direction and authority of CALM. All papers are refereed outside the Department of Conservation and Land Management.

Editorial correspondence and submissions should be addressed to The Editor, *CALMScience*, Department of Conservation and Land Management, PO Box 104, COMO 6152, Western Australia.

All scientific and technical manuscripts submitted to the editor for publication must be accompanied by a completed *Science and Information Division Publications Submission Form*.

Papers must be of a high standard. Submission of a paper implies that the material has not been published or submitted elsewhere. The journal assumes that all authors of a multi-authored paper agree to its submission and accept intellectual responsibility for it.

Authors are required to forward three hard copies of the manuscript and all accompanying material to the editor, word processed and double spaced in draft format (single spacing may only be used where it is necessary to make a table fit a page). Word for Windows or MS WORD software should be used, and authors are required to provide floppy disks readable by IBM computer.

Manuscripts must NOT be desktop published.

Manuscripts must be on quality A4 white paper printed on one side of the paper only. The characters must be clear and black and all margins must be at least 3 cm. The pages of the manuscript must be numbered consecutively, throughout the entire paper, beginning at the title page, and including those pages containing references, appendices, tables, illustrations, captions, all of which are placed after the text.

Spelling should conform with the preferred (i.e. first-cited) spelling of the Oxford English Dictionary, with the single exception of the word 'program'.

SI units should be used for exact physical quantities and measurements. Authors who are unfamiliar with the SI units should consult AS 1000-1979 *The International System of units (SI) and its Application* issued by the Standards Association of Australia (1979).

Numbers referring to unit of measurement (e.g. 10 cm) are never spelt out unless forming the beginning of a sentence. All numbers under 10 not referring to units of measurement are spelt out.

Abbreviations should be identified the first time they are used.

The Harvard system (name and year in text, alphabetical listing) for the citation of references is to be used in all manuscripts. References must be cited in full – no abbreviations will be used in the Reference list. No editorial responsibility can be taken for the accuracy of the references: authors are requested to check these with special care.

References to personal communication in the text should be footnoted with the affiliation and location of the person. The words 'personal communication' should be spelt out in full.

Papers for publication must be mailed flat; do not bend or roll. Fasten with clips or clamps: do not staple or bind.

Manuscripts that do not meet submission requirements will be returned to the author.

Authors must retain a complete copy of the manuscript to ensure against loss in the mail, and for their own use. Prior to final publication and distribution, it is the author's responsibility to handle any requests or enquiries concerning the manuscript, other than those arising from the normal publishing procedure.

Manuscripts received by the editor are submitted to two referees for critical comment. If both referees consulted agree on whether the manuscript is acceptable or unacceptable this will be passed on to the senior author. If the referees disagree a third referee will be sought. If there is still doubt the Editorial Advisory Board will decide.

Following refereeing, the authors must return a revised manuscript within six months, otherwise it will be rejected or treated as a newly submitted manuscript requiring refereeing.

The editor may amend the text of a contribution in order to make it more generally comprehensible

Authors are required to proofread their papers. The set of proofs forwarded to the author must be corrected (not revised) and returned to the editor within 48 hours of receipt.

Twenty offprints will be forwarded free of charge to authors. No additional reprints will be available.

For more detailed information regarding submission requirements refer to *Guide to Authors* by M. Lewis.

4085-0395-300

IN THIS ISSUE

Survey of rare and poorly known eucalypts of Western Australia

ANNE E. KELLY, ANNA C. NAPIER AND STEPHEN D. HOPPER

CALM science
SUPPLEMENT TWO FEBRUARY 1995