THREATENED FLORA IN W.A.

TRAINING NOTES

Prepared by Dr K Atkins
Wildlife Branch
Department of Conservation and Land Management
Locked Bag 104
BENTLEY DELIVERY CENTRE WA 6983

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Western Australian Flora

Western Australia has a rich flora, with some 12,000 vascular plant species, about 9,000 of which are formally named. This is about half of the total Australian flora. Some areas are particularly rich, for example, over 800 species are known from the Lesueur area near Jurien Bay, over 1,200 from the Stirling Range National Park, and about 1,400 species from the Fitzgerald River National Park. These three areas are the most species rich, and represent over a quarter of the flora of Western Australia.

On an international scale, by comparison the flora of Western Australia is ten times the total British vascular flora of 1200, and represents some 4.8% of the estimated world vascular flora of 250,000 species.

The Western Australian flora is also unique, with the majority of species being endemic, that is, found nowhere else in the world. 75% of the 6,000 species in the south-west, for example, are endemics.

Part of the reason for the high level of species diversity and uniqueness, especially in the south west agricultural region, is because this landform is extremely old, and has largely weathered in-situ. This has meant that the soils and habitats in the region tend to be a mosaic, and the flora in them have evolved in isolation over a very long time period. The result is a complex series of different evolutionary paths across the landscape.

Threatened Flora

Western Australia also has a large number of plant species that are threatened, or potentially threatened, with becoming extinct. A third of Australia's total of threatened plant species are from Western Australia, while the proportion rises to 46% if rare and poorly known species are included.

There are many reasons for the occurrence of threatened flora. These may relate to natural or evolutionary factors, or to artificial influences resulting from human activity.

Species that are very rare may be threatened as a consequence of their low numbers, that is, they may become extinct through the chance loss of some individuals. Species may be naturally rare because they are dependant on specific, limited habitats, or because they are part of an evolutionary process: either newly evolving species (it is estimated that 40% of W.A.'s flora has evolved from hybridisation), or species that are naturally declining through changed environmental conditions (e.g. relict Gondwanan flora).

The clearing or degrading of bushland is a major threatening process - referred to as habitat loss. Not only does this threaten existing populations, but it also limits the opportunities for the establishment or expansion of populations. Degradation processes include grazing, fertilizer and herbicide drift, weed competition, inappropriate fire regimes and the introduction of pests and diseases. One of the most significant threats to species and habitats is *Phytophthora* dieback.

Given the great species and habitat diversity of the southwest agricultural region, it is not surprising to find that many of the threatened species in this State are from this region. This can be seen from the table of comparison of threatened, poorly known and rare species between CALM regions (Attachment 1), whereby the Midwest, Wheatbelt and South Coast Regions account for nearly three quarters of the species. The State map of the distribution of the threatened flora (Attachment 2) shows that the concentration of populations is in the agricultural regions of the wheatbelt and the western coastal plain - both extensively cleared landscapes.

Roadside Vegetation

Uncleared roadverges represent tracts across the landscape of the original vegetation. In areas that have been extensively cleared, as in the wheatbelt, these vegetation strips represent significant areas of remnant vegetation. More importantly they contain a random selection of vegetation types, whereas remnants on adjoining lands tend to be more selective, with specific vegetation types associated with arable soils in particular being poorly conserved.

Road verges hence have a proportionately higher number of restricted habitats and rare species of flora. The narrowness of many of these road reserves, coupled with the road maintenance activities to which they are subjected also means that many of these rare species are also threatened.

A quarter of threatened flora populations in Western Australia are found on road verges, with over three quarters of these being along roads managed by local authorities, the remainder being along main roads. Population sizes along the local authority-managed roads tend to be several-fold smaller than those found on other land tenures, including main roads, which demonstrates the difficult task in managing rare flora on these roadsides, where a large number of small populations are involved.

Declared Rare Flora

Existing legislation uses the term "rare flora". It is necessary to continue to use the term "declared rare flora" when quoting the legislation until it is changed, but the term is used for species that are threatened, rather than just rare in numbers. CALM Policy Statement No 9 (Conservation of Threatened Flora in the Wild) lists the policies and strategies for the management of declared rare flora.

Legislation

Rare flora is defined in subsection 23F(1) of the Wildlife Conservation Act as "flora for the time being declared to be rare flora for the purposes of this section." Further clarification is provided in subsection 23F(2):

> "Where the Minister is of opinion that any class or description of protected flora is likely to become extinct or is rare or otherwise in need of special protection, he may, by notice published in the Government Gazette declare that class or description of flora to be rare flora for the purposes of this section throughout the State".

The Schedule of Declared Rare Flora

The Schedule (list) of Declared Rare Flora is reviewed annually.

Plants which are protected flora declared under the Wildlife Conservation Act may be recommended for gazettal as declared rare flora if they satisfy the following criteria:

i) The taxon (species, subspecies, variety) is well-defined, readily identified and represented by a voucher specimen in a State or National Herbarium. It need not necessarily be formally described under conventions in the International Code of Botanical Nomenclature, but such a description is preferred and should be undertaken as soon as possible after listing on the schedule.

ii) Have been searched for thoroughly in the wild by competent botanists during the past five years in most likely habitats, according to guidelines approved by the Executive Director of CALM.

iii) Searches have established that the plant in the wild is either:

a) rare;

or

b) in danger of extinction (including presumed extinct);

or

c) deemed to be threatened and in need of special protection.

(Plants which occur on land reserved for nature conservation may be considered less in need of special protection than those on land designated for other purposes).

or

d) presumed extinct.

iv) In the case of hybrids, or suspected hybrids, the following criteria must also be satisfied:

a) they must be a distinct entity, that is, the progeny are consistent within the agreed taxonomic limits for that taxon group;

b) they must be [capable of being] self perpetuating, that is, not reliant on the parent stock for replacement; and

c) they are the product of a natural event, that is, both parents are naturally occuring and cross fertilisation was by natural means.

That status of a rare plant in cultivation has no bearing on this matter. The legislation refers only to the status of plants in the wild.

Plants may also be deleted from the schedule of declared rare flora.

There are currently 318 extant, plus 23 presumed extinct, taxa of declared rare flora as listed in the 1998 schedule. Some extant taxa are further subdivided to infraspecific levels, and are managed at these levels. There are 327 extant taxa in total.

"Taking" Declared Rare Flora

In the Wildlife Conservation Act (subsection 6(1)) the following definition is given:

> ""to take" in relation to any flora includes to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means;"

Thus, taking declared rare flora would include not only direct injury or destruction by human hand or machine but such activities as allowing stock to graze on the flora, introducing pathogens that attack it, altering soil moisture or is inundated, allowing air pollutants to harm foliage etc.

In the case of declared rare plants which need fire or disturbance for regeneration, burning or disturbance at an appropriate time may not adversely affect the survival of the population. However, if existing plants would be injured, it constitutes "taking" under the Act. Therefore, Ministerial approval is required prior to causing a disturbance which affects any species of rare flora.

The Department of Conservation and Land Management has statutory responsibilities for rare flora conservation. This is a major commitment because:

i) Western Australia has a flora that is exceptionally rich in localised and rare endemic plant species. Moreover, areas where rare species are concentrated coincide predominantly with the wheatbelt and other areas where there has been extensive clearing or modification of the native flora.

ii) Section 23F of the Wildlife Conservation Act prohibits the taking (injury or destruction) of declared rare flora by any person on any land throughout the State without the consent in writing of the Minister. A breach of this provision may lead to a fine of up to $10,000. The flora provision of the Act are binding on the Crown.

iii) The Act prescribes that declared rare flora be protected on all categories of land throughout the State.

Priority Flora

In addition to the schedule of DRF, CALM maintains a supplementary listing referred to as the Priority Flora List. This lists those flora which may be rare or threatened but for which there is insufficient survey data available to accurately determine their true status, and those taxa which have been determined as being rare, but are currently not threatened. 1,959 taxa were listed as priority flora in 1998.

The Priority Flora are ordered according to the perceived urgency for further survey.

The Priority List assigns top priority for survey to those plants whose known populations are few and on land under threat (Priority 1). Second are taxa with few populations known, and which occur on lands considered secure for conservation (eg. nature reserves, national parks, water reserves - Priority 2). Priority 3 taxa have several known populations, some of which occur on secure conservation lands, or the taxa is deemed to be not under immediate threat. And lastly, taxa that have been adequately surveyed and found to be secure but require monitoring to check that their conservation status doesn't change are assigned Priority 4. Full definitions are provided in Attachment 3.

Priority Flora do not have the same level of protection as Declared Rare Flora, but should be managed in a similar manner until their status has been confirmed as being not rare or threatened.

The Need to Conserve Rare Flora

Western Australia's rare flora needs to be conserved for many reasons under the broad headings of ultruism, aesthetics and economics.

Ultruistically we should conserve all species of flora because they are discrete entities and deserve to persist. Such an argument, however, depends solely on the beliefs of the individual.

From an aesthetical point of view, species conservation means that the public is able to keep seeing the species, and enjoying the sight in itself, and the total landscape effect. Again beauty is in the eye of the beholder.

In an economical sense, rare flora represent a largely untouched resource with unknown potential. The value of most of our species of rare flora (and more common species) for drugs and medicines, foods, genetic additives, horticultural species etc is unknown. This resource should therefore be maintained for its future potential.

Species abundance changes through time. Rare species may either be declining towards extinction, or they may be in early developmental stages and could eventually become relatively common as climatic changes occur. Thus the rare flora of today may be essential elements of future vegetation structures.

Such vegetation - climatic changes normally occur over extended periods, measured in geological time. With current unnatural global climatic changes being predicted, however, such vegetation changes will need to occur at a rate faster than can be naturally accommodated by speciation. Thus there will be a selection pressure on existing species to maintain vegetation compositions. Rare species will have as much chance of being able to persist under new climatic regimes as more common species. It is therefore imperative in areas of remnant vegetation such as in the wheatbelt, and along isolated road reserves, that options for future vegetation development be maintained by retaining the current diversity of species.

Wildlife Management Programs

CALM's Policy Statement No 44 deals with Wildlife Management Programs. Such Programs are prepared for the management of individual species or groups of species. For threatened flora mangement, two types of Wildlife Management Programs have been prepared:

CALM Region or District summary status programs which document the current population status of the species in an area, and recommend management and research actions. These have been prepared for the former Northern Forest Region, the former Metropolitan Region, and Merredin District. Programs are currently being prepared for Albany, Esperance, Geraldton, Katanning, Moora and Narrogin Districts, and the Central and Southern Forest Regions; and

Species Recovery Plans (and Interim Wildlife Management Guidelines) which document the current knowledge for a species and provide detailed strategies for the management or recovery of the species. Recovery Plans have been prepared for *Acacia anomala*, *Banksia cuneata*, *Eucalyptus rhodantha* and *Stylidium coroniforme*. Interim Wildlife Management Guidelines have been prepared for *Grevillea scapigera* and *Pityrodia scabra*. Research is continuing on a range of other species to provide the necessary detailed information required to prepare a Recovery Plan.

Threatened flora are ranked into the categories Critically Endangered, Endangered and Vulnerable (refer to CALM's Policy Statement No 50 - Setting Priorities for the Conservation of Western Australia's Threatened Flora and Fauna), depending on the degree of threat to the taxon, and hence the urgency for management action. Taxa ranked as Critically Endangered have priority for the preparation of Recovery Plans.

Management Strategies

Many remnants are on lands set aside for purposes other than flora conservation. Flora conservation can thus be a potential inhibition to the normal operation of that land, whether it be a road reserve, farmland, urban area or other land purpose. Good planning and land management can however achieve flora conservation without inhibiting the other uses, and at the same time provide soil conservation, aesthetics and other valuable benefits. Current Main Roads practices are a good example of this.

Rare flora management on road verges presents some specific problems. These problems are related to the purpose to which these reserves are set aside, and to the constraints presented by their size and shape. Such management constraints are also found with many other vegetation remnants.

The shape and size of many remnants results in an insidious, but equally threatening, impact on the flora as does inappropriate landuse practices. Weeds, fertilizer, herbicides, feral animals and fire are some of the major influences on remnants, over which the land manager may have limited control.

Again the use of appropriate procedures to deal with incursions or reduce the incidence of incursions from adjoining lands will reduce their impact.

Weeds and feral animals are perhaps the more difficult management problems in terms of preventing incursions and treating areas after colonization has occurred. Methods are being developed for managing these problems, but there is still a long way to go in developing management techniques that are sensitive to the environment that is being protected.

Some management notes are:

Grazing - fence areas off.

Fire - ensure fire frequency and seasonality is ecologically based, that is, is not too frequent to promote exotic weeds, and allows the native plants to set seed etc. Areas of native bush do not need to be regularly 'cleaned up'.

Rabbits - use of explosives to destroy warrens without damaging the vegetation.

Weeds - minimise disturbance (including fire) and fertilizer drift to reduce weed growth. Use of selective herbicides that do not affect the native flora. Careful use of sprays when treating encroaching weeds such that the native vegetation and rare flora is not affected.

Accidental destruction - mark areas, especially where works are undertaken, e.g. roadsides or firebreaks. Rationalise, and block off, access tracks.

Exposure - maintain a healthy area of bush, especially around the rare flora, to provide protection and ensure a continuation of the remnant.

Fungal pathogens (dieback) - restrict access, promote hygiene.

One specific aspect of threatened flora conservation and recovery is the collection and storage of propagating material, the propagation of such material, and the establishment of new populations in the wild, or enhancement of existing populations. This is addressed in CALM's Policy Statement No 29 - Captive Breeding and Cultivation of Threatened Species and their Re-establishment or Translocation in the Wild. CALM collaborates with Kings Park and Botanic Garden in this area. Research is being undertaken into storage techniques (including cryostorage), and methods of propagating some of the species.

Management strategies being undertaken by CALM also include the searching for, documentation and monitoring of rare flora populations; the maintenance of a rare flora database; land acquisition; and research into the biology, ecology and management of rare flora.

Confidentiality

The precise location of rare flora populations is kept confidential. This is designed to protect the plants from illicit taking, and from damage either to the plants or the habitat by people wishing to view them. Rare flora locations on private property especially are treated confidentially to safeguard the rights of the property owner who might otherwise be subject to enquires from interested individuals.

Locations of rare flora are provided where this is deemed to be in the better interests of the plants. Thus, for example, land owners/managers, mining tenements holders, local authorities etc. are informed of rare flora populations on, or adjacent, to their operations. Requests for rare flora locality data should be directed to CALM so that the reason can be vetted, and a record kept of such requests.

POPULATION MONITORING

Rare Flora Report Forms

CALM has a standard report form (RFRF) used to record flora population details (Attachment 4). This form is in four main sections: location, habitat, biology and management/administration. The standard form is used to facilitate the computerisation of the data, and also allows the observer to omit re-recording data previously gathered.

Certain information in the form is regarded as essential to be filled in, while other information may be omitted if the observer does not have the time, or if the information has been previously recorded and no change is evident. For example, information that may be omitted includes site and habitat details where previously recorded. Essential information includes location details (for identifying the population being monitored), the condition of the population and any threats observed. Population size counts should also be included, but if time does not allow this, then a report on only the condition and threats is preferable to no report at all.

Information from the RFRF's is entered into CALM's threatened flora database. This database can then be used for determining what threatened flora populations occur in an area, whether it be a grid square, a shire or a CALM District. Data manipulations based on location, habitat, biology or management considerations can also be undertaken for research or management purposes.

What Constitutes a Population?

A population is a discrete group of interbreeding individuals of a species. In the current situation of fragmented vegetation remnants, it is difficult to say what groups of individuals were once interconnected as a population, and which were not.

For the purpose of rare flora management and monitoring, populations are defined as management units of closely associated plants. It is largely up to the observer whether another group of plants nearby are also in the population, are a subpopulation, or are a separate population.

Each population or subpopulation should have a separate RFRF filled in. It should thus be considered when deciding on populations whether it is warranted filling in a separate form, and whether the populations would be distinguishable on a larger scale plan, or in the database by their latitudes and longitudes.

Where populations extend over different land purposes they are divided into subpopulations to allow interpretation of rare flora data on a landuse basis. For example, a single population extending from a road reserve into adjacent private property or a national park will be separated into subpopulations to record the occurrence on these different land management areas, and hence this will provide a clearer picture of the conservation status of this population.

Methods of Counting Plants

Where few plants are present, the individuals should be counted. As the number of plants increases, the ease of counting depends on the size/distinctiveness of the plants, the nature of the terrain, and the density of the associated vegetation. Once all individuals cannot be counted, an estimate needs to be taken.

Estimates can be done by several means, but the most reliable is to delineate the area covered by the population (in m^2) and then record the plant density. The product of these will then give the estimate of population size. Plant density can be calculated by traversing the population and estimating the number of plants per unit area, or by counting the number of plants in a selection of set areas and then multiplying the average of these to give the total population estimate.

Population Location

Locations should be described in relation to known features, such as towns, roads, named hills, named lakes etc. (e.g. 3.5km SW of Moora, and 250m east along Smith Road from the intersection with Brown Road). Vehicle trip meters should be used to calculate distances from these features where roads exist. Estimates should be as accurate as possible, and preferrably have the site referenced to a local marker to assist rediscovery (e.g. near the corner fence post, or adjacent to rock outcrop). Where a population is found along a road, the individuals or clumps may be recorded as trip meter readings from a given point (e.g. a road intersection) and appended to the report form.

Population location information needs to be detailed enough to not only allow relocation, but to permit the determination of land ownership or vesting. This is essential for management purposes, as the land manager needs to be informed of the presence of rare flora if it is to be protected and managed.

Populations should be marked on maps, and the latitude and longitude (map grid reference) calculated. Latitudes are found on the sides of the map, and give the values south of the equator. Longitudes are found on the top and bottom of the map, and give the values east of the Greenwich mean line. On some maps Australian Map Grid (AMG) references may be given. These are similar to latitude and longitude, but are measured in metres, rather than degrees. While latitude and longitude are preferred, if they are not available, AMG may be used.

The grid reference is determined by measuring out horizontally to the side of the map to get the latitude, and then measuring vertically to get the longitude. The exact value is estimated by subdividing the distance between the given values. Each degree is made up of 60 minutes ('), and each minute is made up of 60 seconds ("). Thus, Perth for example, is at the coordinants 31° 57' 00", 115° 52' 00".

Access to Private Property and Other Lands

The owners or managers of private property and other lands have the right to control access to their property and to know who and why people are enterring their property. CALM staff should take these rights very seriously and ensure that landowners, leaseholders or managers either know of the intention to access the area, or have previously agreed to an entry procedure.

Where volunteers require access to other lands, CALM will arrange for that access, and the protocol for any future access requirements. Where practicable, the land occupier should still be contacted before enterring as a matter of courtecy. In some situations this may not be possible, e.g. absentee landowners, or where the population is remote from the house.

When operating on other lands, normal protocol should be observed, i.e. gates should be left as found, stock should not be scared, rubbish should not be left, produce (e.g. mallee roots or mushrooms) should not be removed.

Definitions

Flora - any plant which is native to the State (or which is declared by the Minister to be flora under the Wildlife Conservation Act), including any part of the plant and all seeds and spores.

Protected Flora - flora declared under the act to be protected flora for the purposes of the Act, and currently includes all flowering plants, conifers and cycads (Spermatophyta), ferns and fern allies (Pteridophyta), mosses and liverworts (Bryophyta), and fungi, algae and lichens (Thallophyta).

Taxa (singular taxon) - a level of classification. In the current context it refers to the lower level of specificity for which a plant species has been subdivided to, either species, subspecies or variety.

Vascular Plants - plants with a developed fluid conducting system (higher plants), i.e. flowering plants, cone bearing plants and ferns.

Non-vascular Plants - plants without a specialised fluid conducting system (lower plants), i.e. mosses, fungi and algae.

Presumed extinct - not collected or otherwise verified in the wild over the past 50 years despite thorough searching, or whose only known populations have been destroyed more recently.

Endangered - in serious risk of disappearing from the wild within one or two decades if present landuse and other causal factors continue to operate.

Vulnerable - not presently endangered but at risk over a longer period through continued depletion, or which largely occur on sites likely to experience changes in landuse which would threaten the survival of the species in the wild.

Threatened - presumed extinct, endangered or vulnerable.

Rare - used where the species is rare but not considered threatened. May be represented by a relatively large population in a very restricted area, or by smaller populations spread over a wider range. 2000 plants may be used as a guide to rarity, but this is dependant on the biology of the species.

CALM ENDANGERED FLORA VOLUNTEERS

TASK DESCRIPTIONS

1. Monitor populations of DRF/Priority List species and submit Rare Flora Report Forms (RFRF) as required (including 'mud maps').

2. Advise CALM where populations of DRF/Priority List species are under imminent threat, or where populations are declining rapidly.

3. Advise CALM of new, or suspected new, populations of rare flora.

4. Maintain a log book and record date, departure time, trip details and return time. Forward copy of log book sheet to CALM on a regular basis.

5. Act in accordance with the Wildlife Conservation Act and Regulations and any Departmental policies, instructions or requests.

6. Not disclose location/population details to any unauthorised person without the consent of CALM.

7. Have no right of access to private property, leasehold land, or any other managed land (including Crown land reserves) unless authorised in writing by CALM. CALM will obtain entry approvals where necessary. Once approval is gained, volunteers will contact the land managers prior to entry on each occassion, unless otherwise arranged by the land manager, and confirmed by CALM.

8. Not enter into any agreements, represent CALM, nor discuss CALM rare flora management policy with land owners, managers, or other Government instrumentalities. All formal communications to be made through CALM.

ADVANCED TASK DESCRIPTIONS

(By appointment)

9. Search for new populations of DRF and Priority List species. Collect voucher specimens (with Ministerial permit for DRF) and submit them to the WA Herbarium and to the local CALM District Office. Complete RFRF for these populations.

10. Collect seed and/or other propagating material as required by CALM (with Ministerial permit for DRF).