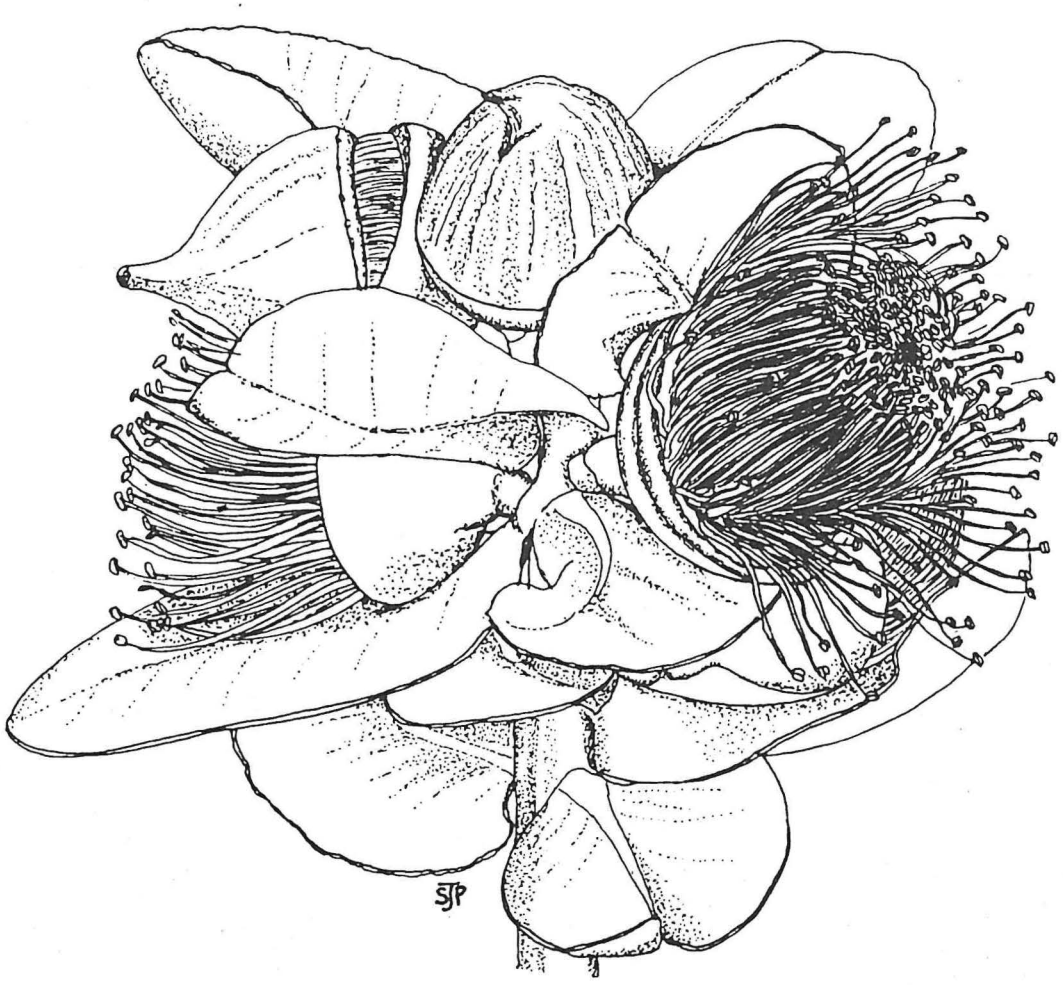
FIELD HERBARIA

GUIDE TO THEIR ESTABLISHMENT AND MAINTENANCE



Flora Information Section
Western Australian Herbarium

GUIDE TO THE ESTABLISHMENT AND MAINTENANCE OF FIELD HERBARIA.

Flora Information Section
Western Australian Herbarium
P. O. Box 104, Como, 6152.

Western Australian Department of
Conservation and Land Management.
1989

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1. INTRODUCTION

The Department of Conservation and Land Management now has over fifty field herbaria at Regional and District Offices, and at Ranger Stations. Most were established between 1983-88, but some have been in existence for considerably longer.

This manual attempts to draw together the information needed in order to run a field herbarium, particularly for those confronted with this task for the first time. Much of the information was originally presented by Ron Sokolowski when the herbaria were first established.

Specimens of most plants can be preserved indefinitely by careful drying and insect free storage, and can be used as permanent reference material. Thus the value of a field herbarium will increase over the years, as it becomes a more complete record of the flora for the area that it covers. It will become a reference source for a variety of functions, and will offer interpretation facilities for such activities as reserve management, proposed fire regimes, protection of rare flora, and education, while the network of Field Herbaria throughout the State will aid in the documentation of the Western Australian flora.

If you have not undertaken this type of work before and are unsure how to proceed, it is hoped that this booklet will provide a guide. However, don't forget that the Western Australian Herbarium is available to answer any questions that you may have and to discuss any problems. Contact Sue Patrick on 367 0496 or ask for other members of the Flora Information Section on 367 0500.

2. PROCEDURE FOR MAINTENANCE OF FIELD HERBARIA

a. Specimens

I. Collect adequate material for your own herbarium and for the Western Australian Herbarium. Although specimens for the field herbarium need to be only large enough for a 15 x 20 cm card, remember that herbarium sheets at the W.A. Herbarium are 42 x 26 cm, so that samples up to 30 cm long are needed, and may provide better information for research purposes.

II. Ensure where possible that each specimen is represented by both flowers, (buds for eucalypts) and fruits as well as a piece of stem bearing typical healthy leaves.

III. Attach a jewellers tag to each specimen, showing your own collecting number and date collected.

b. Data Sheets

I. Complete in duplicate for each specimen. The original copy accompanies the voucher specimen which you dispatch to the W.A. State Herbarium, the duplicate folds away and is inserted into your own herbarium wallet.

II. Ensure that you complete all documentation, map references and co-ordinates.

III. Number each separate data sheet in the top r/h corner e.g. 1/87, 2/87, 3/87 etc.

IV. Ensure that you record at the top of data sheet the N.P. or District from which you are dispatching the material.

V. Complete Det Name and Field Indent in pencil only, on receipt of name confirmation from the W.A. Herbarium alter all records where necessary.

c. Jewellers Tags/Tie-on Labels

I. Ensure all material is properly labelled including your own herbarium specimen.

d. Mounting Specimens

I. Use Selleys Aquadhere for large specimens on your own cards and/or strips of gummed labels for delicate specimens. Endeavour to avoid damage to flowers. Transparent Scotch Tape can be used if available. Affix plant to card at strategic points only. Seed pods and/or seeds should be mounted separately if available. Consult Section 4 for more details.

e. Despatch of Material

I. Despatch adequate material to W.A. State Herbarium correctly labelled together with a data sheet. I suggest that each specimen be inserted between separate newspaper folds and enclosed between two hard

cardboard surfaces (margarine box etc.). Avoid, where possible, sending material between your own cardboard separators as these will not be returned. Do not mount this material, this will be done by the Herbarium.

II. Send by C.D.O. mail where possible.

f. Fumigation (where necessary)

If insect damage is a problem specimens can be fumigated before mounting on cards, and if necessary the field herbarium itself can be treated once or twice a year to prevent further damage.

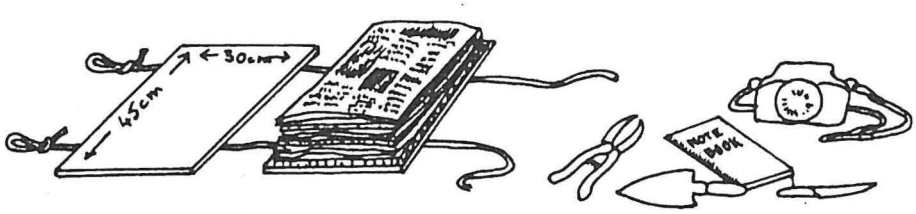
I. Place specimens into a deep freeze for 48 hours. Take out and allow to dry in warm place.

II. Alternatively, enclose within cardboard box containing a small quantity of moth balls, seal with tape and leave for 24-48 hours. Open this box in an outside area only due to the poison content of the Napthalene flakes. See Section 4. for more detail on insect control.

3. SHORT GUIDE TO PREPARING HERBARIUM SPECIMENS

a. Assemble equipment.

1) Prepare the press with folds of newspaper to receive the specimen.



2) Gather tools and supplies.

i) Field notebook and pencils.

ii) Secateurs, knife.

iii) Press, newspaper and corrugates, (corrugated cardboard with channels running the width of the 30 x 45 cm piece).

iv) 1 or 2 large plastic bags to hold unpressed specimens.

v) Tags.

vi) Trowel or other digging tool.

vii) Camera to record difficult to describe plant parts.

b. Collect the specimens and record the data.

i) Survey the plants to be collected and find the most representative specimens.

ii) Cut or dig the selected plant parts.

iii) Make detailed notes of observations that may be forgotten.

iv) Place jewellers tag on each specimen with your initials and collection number using the same number for this specimen in your collecting book.

v) Place the specimens in a container for transport or in the press. If notes are made and separate parts collected, give the same identifying number to portions so they can be associated later.

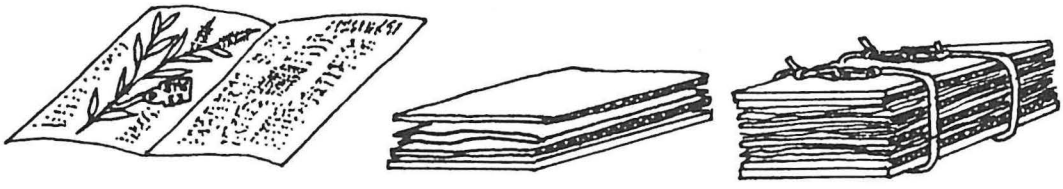
c. Prepare the specimen for pressing.

i) Place specimen in numbered newspaper fold.

ii) Cut away excess parts, arrange leaves and flowers.

iii) Write notes beside number in notebook, describe area, habit of plant, colours that may change, odours and any special details.

iv) Place fold between corrugates or heavy pads of newspaper.



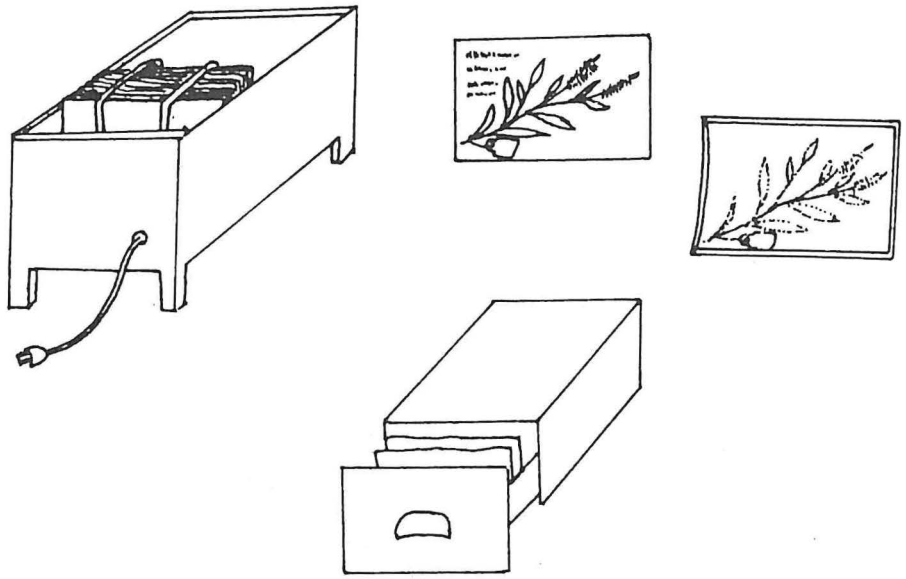
d. Press the specimen.

i) Press the specimen with its driers and corrugates tightly between press frames or weight heavily beneath board or books.

e. Dry the specimen.

i) Change driers or newspaper pads in 24 hours and thereafter as they become moist. Do not disturb the specimens in the newspaper folds.

ii) When dry to the touch test for incompletely dried specimens (incompletely dried specimens will feel cooler and ends will droop when lifted from the fold).



f.

i) Mount the specimen on card, retaining the original label, and recording on the card name (when correctly identified), date of collection, location and other details eg. flower colour, for easy reference if necessary. Fold the duplicate data sheet with all other information and store in the plastic wallet behind the card.

ii) Assemble the prepared cards in file boxes. Arrange in taxonomic order, eg. Green's Census or see Section 4. for other methods.

4. COLLECTION, PREPARATION AND PRESERVATION OF PLANT SPECIMENS

a. Introduction

Specimens of most plants can be preserved indefinitely by careful drying followed by storage under insect-free conditions. Such specimens can be used as permanent

reference material. Although lacking the freshness and colour of live material, a dry specimen which has been satisfactorily prepared, and which is accompanied by suitable notes, usually provides most of the features required for the identification and systematic study of the plant.

b. Collection

Specimens should be selected carefully, so as to show as many as possible of the typical features of the plants from which they are taken. The size should be governed by the size of the herbarium sheets on to which they are ultimately to be placed. In large herbaria, the herbarium sheets are usually about 42 cm x 26 cm, so that samples up to about 30 cm long make suitable specimens.

Specimens should include flowers or fruits, preferably both if available, as well as a piece of stem bearing typical healthy leaves. Fern specimens should include fertile (spore-bearing) fronds and sterile fronds, as well as part of the rhizome (if present) or base of the stem (stipe). For tree-ferns a portion of a fertile frond and the base of the frond stalk bearing scales or hairs should be collected. In the absence of open flowers, buds should be included if possible. If variation in leaf form is apparent, specimens should be taken from different parts of the same plant to represent this variation.

In the case of small herbs the whole plant should be collected. Herbs with underground storage organs should be dug up complete with these parts or, alternatively, a note on the characteristics of these parts should be made. The latter is preferable, for instance, in the case of rare species in which it is very desirable to leave the basal parts to shoot again in the following year. Grasses and other plants of grasslike habit should be collected whole so as to show the rootstock. Grass clumps may be broken up into small tufts of leaves and flowering stalks, and 2 or 3 of these tufts should make a satisfactory specimen. All dirt

adhering to the roots should be carefully knocked or washed away. Grasses are best collected after the flowers have opened, but before the fruits are ready to drop.

If the grass specimen is longer than the herbarium sheet, it should be bent once or twice when collected so as to form a V, or M (according to its length) and pressed in this position. Attempts to bend it after it is dry would probably cause it to break. In the case of exceptionally tall grasses, the flowering parts and a piece of the basal parts should be collected, and a note made of the height and habit of the plant.

Specimens of *Eucalyptus* should include flower-buds as well as fruits and, where available, juvenile leaves from suckers near the base of the trunk. Notes should describe habit, bark type and whether or not rough bark extends over the trunks, main branches, and fine twigs.

c. Notes and Field Observation

Observations should be noted down at the time of collection and should include the locality, collector's name, date, notes on the habitat (or conditions in which the plant was growing), the shape and size of the plant, and the colour(s) of the flowers and flower parts. If collecting more than a few specimens it is advisable to assign a number to each collection and record the corresponding field notes in a notebook. Small cardboard tags ("price tags") which may be numbered and tied to the specimens are available from many stationery shops.

Any additional associated material should also be numbered. The collection number may be written directly onto wood samples with a felt-tipped pen. Numbers for material preserved in liquid fixative may be written in pencil and placed in the container; an additional label on the lid or exterior of the container is advantageous. If specimens are treated with alcohol before drying, or afterwards

as a means of applying insecticidal compounds, numbers written with ball-point pens may become illegible; pencil is not affected by such treatment.

Notes should indicate whether the plants were cultivated or occurred in natural vegetation, disturbed sites, or pasture areas. Except for cultivated plants, it is desirable to note the altitude, rock or soil type if known and to describe briefly the habitat (e.g. in *Eucalyptus* woodland on dry sandstone ridge; moist grassy site near river bank, rooted in gravel, in water 30 cm deep, in fast-flowing stream). For large plants, where the specimen cannot include all features, notes should describe the height and form of the plant. Bark of trees should be described. Flower colours should be mentioned as these commonly change or fade on drying. Height or distance measurements should be in metric units. Photographs of the whole or part of the plant may be used to supplement the information included in the notes. If the locality is not a well-known one the distance and direction from a better-known land mark or town should be given as well as the latitude and longitude of the collection site.

d. Pressing and Drying and other Methods of Preservation.

As soon as possible after collection, and before shrivelling can take place, specimens should be pressed and dried between sheets of semi-absorbent paper. Material of some species may be kept in plastic bags for a few hours without deterioration if it is inconvenient to press it immediately. Other species show such rapid wilting, particularly of the flowers, that such delays must be avoided. Folded newspapers form suitable drying papers. Blotting paper tends to hold the moisture too long and is an unnecessary expense. Papers with any sort of glossy surface should be avoided. The plants should be carefully laid out between the sheets, as their form at this stage will largely determine their ultimate appearance. Wilted leaves should be straightened and unnecessary shoots of excessively twiggy shrubs can be cut away. Moderate pressure is then applied. This can be done for small

numbers of specimens by placing books or other weights on the pile of specimens, but it is preferable to have some arrangement which will permit as free a circulation of air as possible. This can be achieved by strapping the pile together in a press, i.e. between two frames made, for example, from sheets of heavy (non-bending) cardboard, masonite, plywood, pegboard or a lattice of wood strips. The press frames should be the same size or a little larger than the drying papers. The press of specimens and papers should be placed in a warm dry place for drying. For herbs and smaller plants immediate pressing in a telephone book is advisable.

Drying cabinets with forced circulation of warm air are used in large herbaria to shorten drying time and to avoid the need to change drying papers, but are not necessary for small quantities. When in the field, drying can be aided by placing the presses securely on to a roof rack of the vehicle during dry daytime conditions.

Where plants are uneven in thickness, as where flowers are borne on thick twigs or arise from a thick bulbous base, sheets of plastic foam (about 1 cm) placed between the newspaper folders help to distribute pressure. If foam sheets are not available, several thicknesses of folded newspaper placed over delicate structures will help prevent them shrivelling as they dry.

Sheets of cardboard, preferably smooth-sided corrugated cardboard, placed between the drying folders assist air circulation through the press. These are particularly necessary if using drying cabinets with forced circulation of warm air.

The drying papers should be changed every day for a few days, unless forced air circulation is used, the used papers being thoroughly dried again before re-use or discarded. As the number of changes required will vary with the original succulence of the plants and with the weather conditions, no exact guide can be given, but most plants should dry in less than a fortnight and the last one or two changes need only be given at intervals of three or four days.

Rapid drying should always be the aim, to preserve a good colour as far as possible. A few species regularly turn black on drying, but, in general, brownish or blackish colours in the completed specimens, or the growth of mould, indicate that drying was too slow.

Some species or conditions require the use of special treatments.

I. Some plants (e.g. many species of *Ficus*, "Fig" and *Amyema*, "Mistletoe") drop their leaves entirely upon drying or remain alive for an excessively long period in the press. This is overcome by killing the plant before pressing, either by freezing the specimen for a few hours or dipping it in boiling water for a few minutes.

II. Aquatic plants, if very soft or filamentous, may be best arranged on the mounting sheet while in a shallow dish of water. The mounting sheet is placed first into the dish and the specimen on the sheet then gently slid from the water. Commonly such specimens would adhere to the drying papers and are best pressed between a mounting sheet (to which it may remain permanently attached) and a sheet of cellophane or muslin which prevents it adhering to the drying paper.

III. Very bulky objects (e.g. *Banksia* spikes, thistle heads) may be split lengthwise before pressing.

IV. Dissections of flowers may sometimes be desirable to show the floral structures more clearly.

V. Very fleshy or delicate structures may be best preserved in liquid fixative rather than by drying. Suitable fixatives include:

(a) 70% ethyl alcohol (or 70% methylated spirit) with 30% water,

(b) formalin-acetic-alcohol or FAA (5% commercial formalin, 5% glacial acetic acid, 65% ethyl alcohol, 25% water), or

(c) 4% commercial formalin in water or salt water.

In some cases one or other of these fixatives is more appropriate for a particular class of material, for example 70% ethyl alcohol is very suitable for preserving orchid flowers. Such preserved material is particularly important for orchids as critical details of shape of floral structures are lost on pressing such flowers.

VI. Under humid tropical conditions special methods must be adopted to prevent rapid mould growth before the specimens can be placed in drying cabinets. Placing the entire bundle of drying papers and specimens in a plastic bag and adding a small quantity of ethyl alcohol is a method commonly adopted. Such methods alter specimen colours and should be avoided unless conditions make them essential. The same technique can be employed to save valuable specimens which have become mouldy.

VII. Alternative methods of drying succulents.

The drying of succulent plant specimens has always been difficult because they do not respond to normal drying methods and in some cases, even continue to grow in the presses.

Several methods have been applied over the years, such as scalding, slashing the fleshy parts and salting the cuts to withdraw the moisture. These techniques create unsatisfactory herbarium specimens. Modern technology provides us with two new and effective methods, namely the use of microwave ovens and freezing chambers.

When using the microwave oven method, fresh material is placed on paper towelling on the bottom plate and heated for a predetermined time until flaccid. The timing varies from specimen to specimen and has to be determined for the oven in use. As a guide, Carpobrotus edulis can require up to 120 seconds on full power. Note that the use of some newspapers can damage the oven due to the minerals used in the inks which can cause arcing.

The freezing method involves the placing of the specimen in a press which is frozen overnight. The press is then dried in the normal way over heaters or by regular changes of paper as described above. If the specimen is very succulent, more changes of paper are necessary for the first few days.

Of the two methods discussed the Western Australian Herbarium prefers freezing; although slower, it produces a better specimen without the risk of damage by overheating.

e. Forwarding for identification

If specimens cannot be identified by other means such as handbooks, floras, keys or field guides they may be forwarded to the W.A. Herbarium for determination. Each specimen should be accompanied by a completed data sheet, and each should be placed in a separate dry newspaper folder; the folders being packed as a flat parcel.

f. Mounting

Specimens may be attached to the cards by narrow strips of good quality adhesive paper or linen binding tape or by glue. Self-adhesive cellulose tapes are most unsuitable as the adhesive becomes sticky after a few years and the strips may become detached.

In the case of large specimens fusewire may be used. Small herbs can be placed in cellophane bags or folded envelopes which are attached to the card.

g. Preservation and storage

Dry plant specimens can be kept indefinitely as long as they are protected from insect attack and stored away from heat or moisture. For example specimens collected by Linnaeus in the eighteenth century or by Banks and Solander on the Endeavour voyage are still excellently preserved.

The two insects most likely to cause trouble are (1) Museum Beetle, small brown beetles about 3 mm long, (2) very small, more or less colourless book-lice.

The Museum Beetle in particular is a serious problem because it can go undetected for several years if a regular control program is not instigated.

There are basically three methods of insect control:

I. short term
II. interim
III. yearly or half-yearly

The short-term method of control involves the use of a knock-down fly spray or a microwave oven. Of these two methods the oven is far superior in its killing efficiency, destroying both eggs and adult insects. The spray destroys only the adults. These short-term methods are used for small numbers of specimens required for immediate examination.

Interim control is applied to all large specimen collections and to specimens that are not to be processed immediately. The method used here is to freeze the dried material in bundles in a deep freezer (-180C) for 48 hours. This time and temperature regime has proven to be sufficient to kill insects at all stages of their life cycle.

Both short-term and interim methods control insects that may enter the herbarium on incoming plant material. They will not prevent the insects from entering by other means.

For small personal collections mothballs or flakes of naphthalene can be placed amongst the specimens to discourage insect predation. For larger establishment collections and herbaria regular fumigation at half-yearly intervals is to be preferred. This requires elaborate safety precautions involving professional supervision.

Specimens should be filed in a systematic order if a relatively permanent collection is being made. The major groups, i.e. Ferns and allied groups, Gymnosperms, Monocotyledons and Dicotyledons are best kept separately. Within these, the families may be arranged alphabetically or according to some classification scheme, such as that given in a Flora or Handbook. e.g. Green's Census. Similarly the genera within each family and species within each genus may be filed alphabetically or following some such classification.

5. RARE FLORA

a. All native flora in Western Australia is protected, and licences must be obtained from the Department of Conservation and Land Management before any specimens are taken. Departmental staff do not require individual licences for the collection of specimens during the course of their duties. However, Ministerial Approval is required for the collection of Declared Rare Flora, and officers requiring a permit to take specimens must make application for this to the Senior Clerk Flora at State Operations Headquarters, Como.

b. Lists of the Declared Rare Flora, and Rare Flora Field Report Forms are issued to Regional and District Offices or can be obtained from Senior Clerk Flora.

c. The Reserve Flora List contains those species of flora which have or are being considered for declaration as Declared Rare Flora, but which have not fulfilled the additional criteria as outlined in Policy Statement No. 9.

This list is produced by Flora Conservation Research Program, Woodvale Research Centre.

6. FLORA SURVEY TECHNIQUES

a. Herbarium Field Notebook

Det. Name:

Field Ident.: **Family:**

Habit: Climbing/Prostrate/Caespitose/Rhizomatous/Other—

Form: Tree/Sm. Tree/Mallee/Shrub/Dw. Shrub/Woody Herb/Other—

Height:

Colour Notes:

Other Notes:

Abundance: Dominant/Abundant/Frequent/Occasional

Assoc. Veg.: Forest/Woodland/Scrub/Shrubland/Heath/Herbland/Grassland/Sedgeland/
Hummock Grassland/Other—

Characteristic species:

Topography:

Underlying Rocks: Granite/Laterite/Limestone/Sandstone/Other—

Soil Colour: White/Yellow/Grey/Red/Brown/Black/Other—

Soil Type: Laterite/Clay/Sandy Clay/Clayey Sand/Sand/Other—

Map: 1:100,000/1:250,000 **Sheet:** **Grid Ref.**

State: **Lat.** ° ' S **Long.** ° ' E

Locality:

Collector: **No.:** **Date:**

Photo: /Wood/Spirit/Seed/Pollen/Live/Duplicates

Voucher for:

INSTRUCTIONS FOR USE OF HERBARIUM FIELD NOTE BOOKS

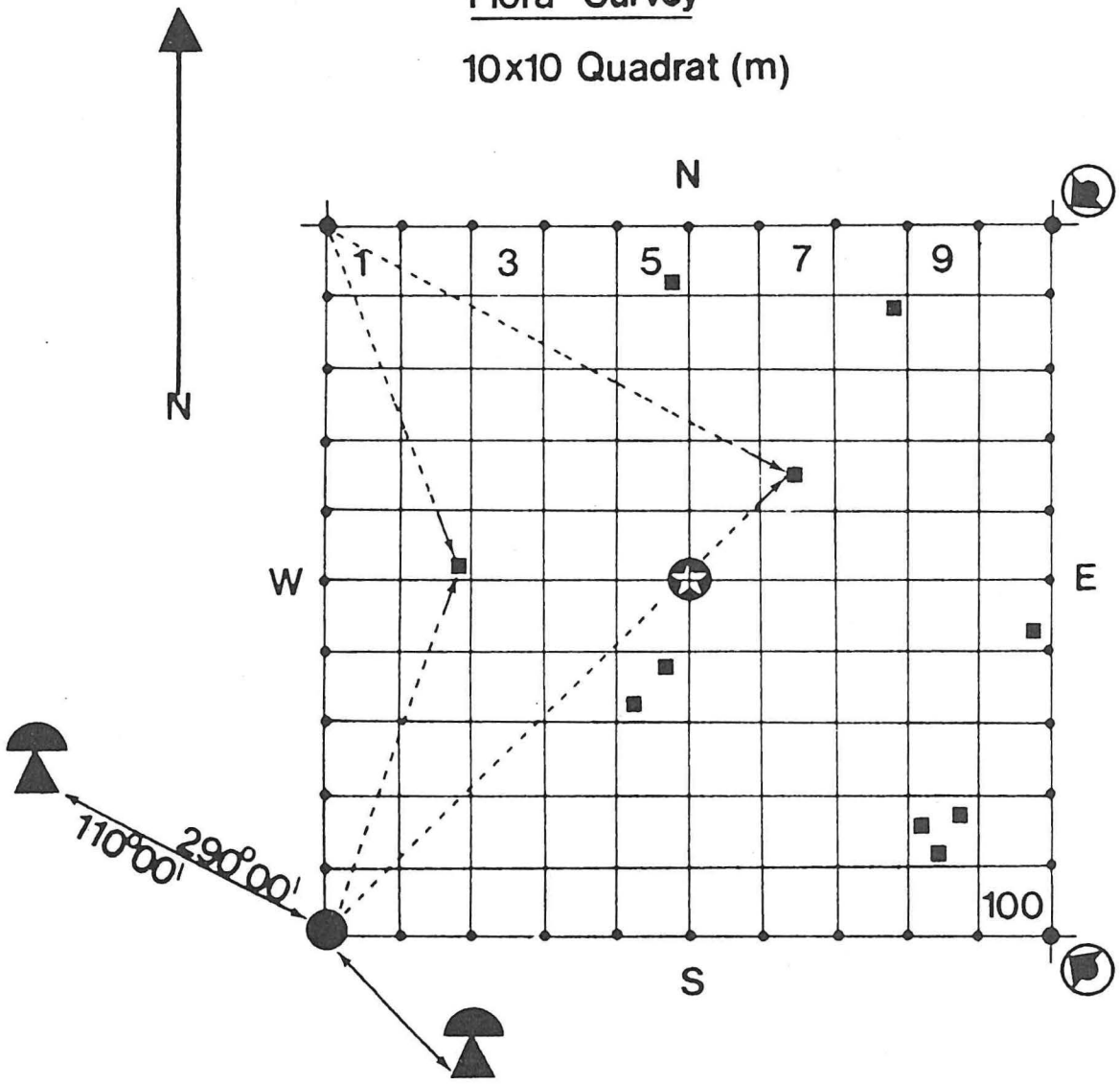
Field Ident:	Species name
Habit:	Self explanatory
Form:	Self explanatory
Colour Notes:	Flower, leaves, bark, buds, etc.
Other Notes:	Interesting features, i.e. bark peeling, stringy, pollinators - birds, native bees, etc. insect attack special features.
Abundance:	Self explanatory
Associated Vegetation:	Other species, see also vegetation classification table.
Characteristic Species:	What plants characterise the area, i.e. grasslands, shrubland.
Topography:	Land form - undulating, flat etc.
Underlying Rocks:	Type of rocks
Soil Colour:	Self explanatory
Soil Type:	It is important to determine this
Maps, etc.:	Self explanatory
Locality:	Please be precise, i.e. 6 kms N along Brown Rd from junction with Edge Rd. Ca. 14 kms NNW of (nearest town).
Collector:	Yourself
Photo:	Record with specimen. Include flower, leaf, buds, bark and general features.
Voucher for:	W.A. Herbarium, ( ) Tick appropriate box, Karratha Herbarium ( )

Additional:

i) Photography. Use good 35 mm colour slide material. "Kodacolor 64" or similar is recommended.
ii) A Herbarium Field sheet should accompany each specimen on despatch. The duplicate is to remain in the book.
iii) Number your Field Note Books and number each species page i.e. 1,2,3....
iv) Ensure your own Collection Number is recorded on the Herbarium species sheet.
v) If possible, please determine altitude where the plant is located.

Flora Survey

10x10 Quadrat (m)



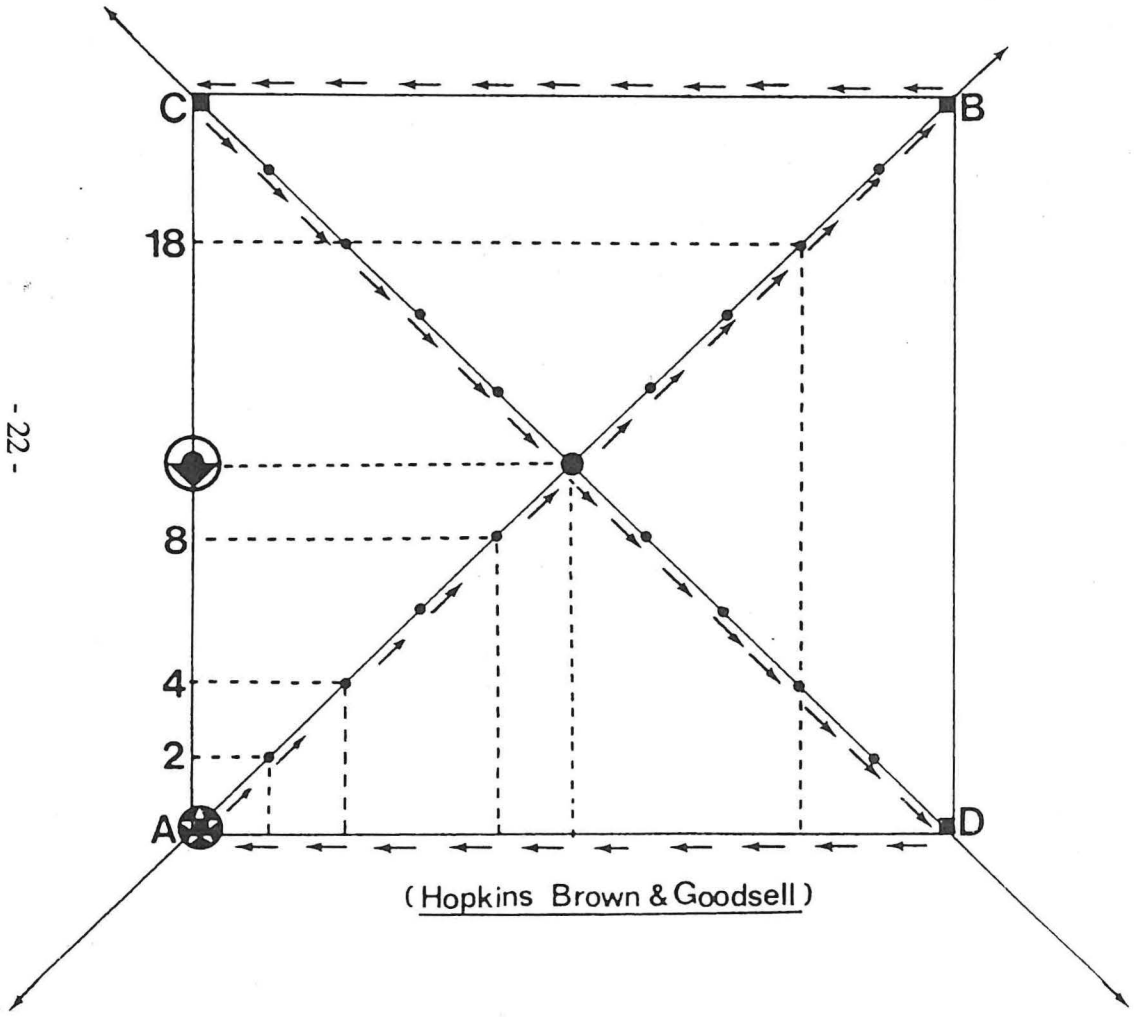
Key

- Fixed reference point
- DRF
- Tree
- Water gauge
- Steel picket
- Photographic points

R.E.S. Sokolowski.

Flora Survey and/or Monitoring

20 x 20 Transect (m) or Nested Quadrats.



(Hopkins Brown & Goodsell)

Key

- Fixed reference point.
- → Transect for recording canopy cover & fire fuel.
- Photographic point.

A → B → C → D → A = 96·6m.

Minimal Sample Area.

Forests (tree stratum)	$2-5 \times (100)^{m^2}$
" (undergrowth)	$50 - 200^{m^2}$
Shrub	$10 - 25^{m^2}$
Dwarf shrub/heath	" "
Moss communities	$1 - 4^{m^2}$
Lichen "	$0{\cdot}1 - 1^{m^2}$

RES Sokołowski

LIFE FORM/HEIGHT CLASS		CANOPY COVER			
		DENSE 70-100%	MID-DENSE 30-70%	SPARSE 10-30%	VERY SPARSE 2-10%
T	Trees > 30m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
M	Trees 15-30m	Dense Forest	Forest	Woodland	Open Woodland
LA	Trees 5-15m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
LB	Trees < 5m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
KT	Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
KS	Mallee shrub form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
S	Shrubs > 2m	Dense Thicket	Thicket	Scrub	Open Scrub
SA	Shrubs 1.5-2.0m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
SB	Shrubs 1.0-1.5m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
SC	Shrubs 0.5-1.0m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
SD	Shrubs 0.0-0.5m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
P	Mat plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
H	Hummock Grass	Dense Hummock Grass	Mid-Dense Hummock Grass	Hummock Grass	Open Hummock Grass
GT	Bunch grass > 0.5m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
GL	Bunch grass < 0.5m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
J	Herbaceous spp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
VT	Sedges > 0.5m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
VL	Sedges < 0.5m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
X	Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
	Mosses, liverwort	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

7. FIELD HERBARIA ESTABLISHED IN CALM OFFICES.

Albany
Bunbury
Broome (Nursery)
Busselton
Carnarvon
Collie
Como
Dwellingup
Esperance
Fitzroy Crossing
Geraldton
Harvey
Jarrahdale
Kalgoorlie
Karratha
Katanning
Kelmscott
Kununurra
Manjimup
Moora
Mundaring
Nannup
Narrogin
Pemberton
Pingelly
Scott River
Wanneroo
Wongan Hills
Wyndham

Avon Valley National Park
Cape Le Grande National Park
Cape Arid National Park
Cape Range National Park
D'Entrecasteaux National Park
Fitzgerald River National Park
Garden Island
Geikie Gorge National Park
Hamersley Range National Park
Hidden Valley National Park
John Forrest National Park
Kalbarri National Park
Leeuwin-Naturaliste National Park Augusta
Leeuwin-Naturaliste National Park Margaret River
Leeuwin-Naturaliste National Park Yallingup
Millstream National Park
Nambung National Park
Porongorup National Park
Purnululu (Bungle Bungle) National Park
Stirling Range National Park
Stokes National Park
Torndirrup National Park
Two Peoples Bay
Walpole-Nornalup National Park
Walyunga National Park
Watheroo National Park
William Bay National Park
Windjana Gorge National Park
Yalgorup National Park
Yanchep National Park

8. SUPPLIES

Wire presses (handmade)	Advanced Wire Products Unit 5 55 Berriman Drive Wangara
Glue or tape	Selleys Aquadhere 250 ml etc.
Index cards - white faint blue lined - 202 mm x 152 mm (8" x 6")	Dept. of Supply
Metal card index boxes 2 drawer cabinet 2A5	Metalux Industries Osborne Park, W.A.
Corrugated Cardboard 445 mm x 305 mm Cat. no. D9049-58	Visyboard, Peel St. O'Connor, W.A.
Felco Secateurs	Hardware stores
Seed envelopes no. 6	Wigg & Sons Stationers, Belmont
Tie-on Jewellers Tags No. 23H	Wigg & Sons, Stationers, Belmont
Field Notebook, Collins Series 3880	Stationers or through Dept of Supply
Brown paper bags - mixed	Dysons Paper Bags Pty Ltd. Balcatta. WA
Plastic bags 100 micron 600 mm x 300 mm	Dysons Paper Bags Pty Ltd. Balcatta. WA
Clear Plastic Wallets No. 8 gauge plastic 164 mm x 205 mm heat welded on 2 long edges & 1 short edge.	L.B.A. Stationers Barrington Street Spearwood
Mothballs (fumigation)	Hardware/Chemists

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A more complete list of references on the vegetation and flora of Western Australia may be obtained from the Western Australian Herbarium.