How to Collect Herbarium Specimens

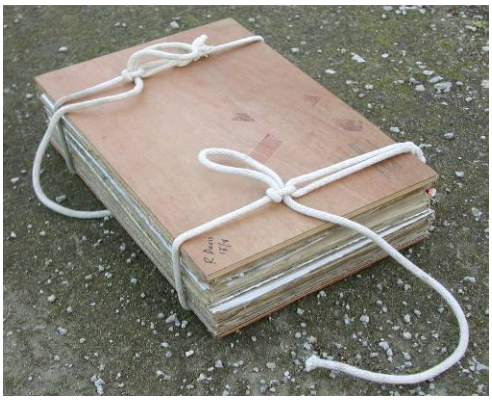
A guide prepared by the Western Australian Herbarium

February 2008

This guide describes how to collect good plant specimens. A good specimen is one that can be accurately identified and has high value as a herbarium voucher for future study and reference.

In general, a good specimen will:

- be of an adequate size (small scraps or twigs make poor specimens)
- have a good range of parts to allow identification and study
- be well-collected, carefully pressed and well dried
- be accompanied by adequate and accurate notes and other information



A typical plant press

Specimens are best prepared using a standard plant press. A press can be easily made from 2 pieces of plywood 45cm x 30cm (ie the size of a single page of The West Australian newspaper) and 8-10 mm thick, a number of pieces of cardboard of the same size, a quantity of newspaper and 2 lengths of sash or nylon cord or quick release straps.

Except in exceptional circumstances, do not press specimens in books or telephone directories, except for scraps destined for your field herbarium. The specimens will be too small and too poorly pressed to be of much value for research.

To collect a good specimen, please follow as closely as possible the following steps.

Choosing a specimen to collect

The best specimen is one that includes flowers and/or fruits, and a range of leaves. It will fit within, and +/- fill, a folded sheet of a tabloid newspaper (a single folded sheet of The West Australian newspaper is the right size). This will make a good-sized specimen in the press and when mounted on a herbarium sheet.

Sterile specimens (i.e. ones without flowers or fruits) and small scraps are usually of little use as herbarium specimens and often cannot be confidently identified to species. The Western Australian Herbarium will often not retain such specimens. The only exception to this is cases where the plant is known to be rare, is distinctive when sterile, and the specimen is a voucher for a previously unknown population.

A flowering specimen of good size, from a shrubby plant

Of course many species of plants do not carry flowers and fruits at the same time, and a specimen will usually bear leaves and flowers or leaves and fruits. When fruits are available at flowering time (e.g. Hakeas) you may need to collect a flowering branch plus a small branch bearing fruits. When collecting flowering specimens of *Acacia* it is worth looking for last season's pods, either still on the plant or on the ground immediately beneath it.

Specimens with fruit only can make very valuable collections, as fruits of many species are poorly represented in herbaria.

Multiple specimens of a herb, together making a good-sized gathering

In all cases, try to make sure that the specimen(s) provide at least several flowers or fruits, to allow sufficient material for some to be dissected for identification without destroying the gathering.

For woody plants (trees and shrubs) an adequate specimen can usually be made from a single branch or stem. For small shrubs and subshrubs you may need to cut 2 or 3 branchlets which together will comprise the specimen. For small annuals or perennials such as herbs and small subshrubs, aim to gather a number of individual plants. This will help give an indication of variation in the local population.

If the specimens are taken from different plants, it is good practice to record this fact in the collecting notes unless it is obvious (e.g. in the case of small annuals when it will be clear that the specimen comprises several individuals).

Some shrubs and other plants are dioecious – that is, they bear male and female flowers on separate individuals. In these cases, male and female plants should be collected as separate specimens and given unique collecting numbers (see below).

Collecting and trimming the specimen

If possible, use secateurs when making your collections. As in the garden, a clean cut from a secateur will cause less damage to plants and will heal more quickly, reducing the chance of fungal infections. Secateurs also make it easier to collect a good sized specimen when stems are thick and woody or when the plant is prickly.

Plants that are densely branched, particularly ones that are prickly and tough, will make untidy, bulky specimens when pressed. To address this, use

The specimen on the left is too dense to make a good specimen when pressed. The same specimen has been trimmed (right) using secateurs

secateurs to carefully prune branchlets and/or leaves from the specimen, especially from the 'back' and perhaps the 'front' of the specimen, to make it flatter and easier to press. Leave enough leaves and branchlets to show their arrangement; when pruning side-branchlets, leave a short stub to show that a branchlet was present.

When collecting tufted or rhizomatous plant, always make sure to include some rootstock, rhizome or bulbs in the specimen

When collecting grasses, sedges, restiads, lilies and similar tufted plants, do not use secateurs; instead, carefully pull or otherwise detach a tuft from the base so as to include the leaf bases, part of the rootstock and a flowering or fruiting stem. The basal parts of these plants contain crucial taxonomic information and identification can be difficult in their absence.

For all small plants, try to include some roots on the specimen. If you suspect that the plant has underground bulbs, tubers, fleshy roots, rhizomes or a , use a knife or small trowel to carefully dig up a complete or partial plant including the underground parts. For some bulbous plants (e.g. sundews in the genus *Drosera*) the bulb may be a considerable distance below ground. A specimen with the bulb is much more valuable than one without it, and it is worth going to the trouble to carefully excavate it.

In some plants, the basal leaves are very different from leaves on the upper stems. In such cases (and when the whole plant is too large to make a single specimen) try to collect a fertile stem plus one or more detached basal leaves. Press all the parts together in a single newspaper sheet if possible, or in several newspaper sheets if necessary.

Collecting duplicate specimens

Multiple specimens of a given gathering are more valuable than single (unicate) specimens. If the Herbarium receives multiple specimens, one will be kept while the remainder will be distributed to other Herbaria as part of a national and international exchange program, or used in the Reference Herbarium. Multiple specimens are particularly important if the plant turns out to be a new taxon – in this case, the duplicate specimens may be distributed as important Type specimens.

If you are collecting for an interstate or overseas Herbarium under a scientific permit, it is required that you collect duplicate specimens; one specimen must be lodged with the Western Australian Herbarium while others may be kept for your home institution.

It is common practice also to retain one specimen for your personal field herbarium or for your local Regional Herbarium and to forward the remainder to the Western Australian Herbarium for vouchering.

Affix a tag to a branch of the specimen. The tag should have the collectors initials and collecting number, in pencil

Tagging the specimen

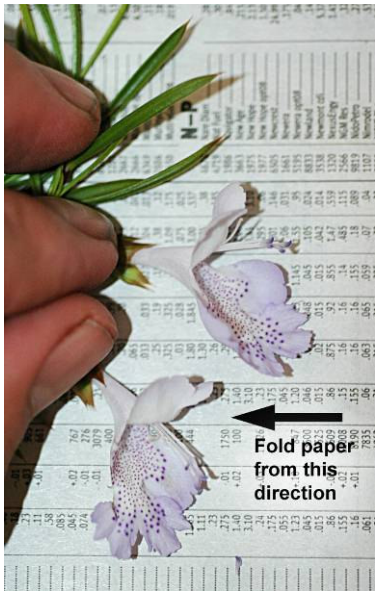
Always tag each specimen as it goes into the press with your initials and a collecting number and/or any other

information needed to cross-match it with the entry in your field collecting book (see below). While you may intend to collect only a few specimens and think you will be able to remember them, chances are you will get specimens mixed up. Jeweller's tags, available from the Western Australian Herbarium or some stationery suppliers, are ideal. A strip of paper with two slits cut at one end can be used if necessary, but these are more likely to be accidentally dislodged than a jeweller's tag. Writing the collecting number or other information on the pressing paper is not good practice, as you may need to change the papers when drying.

Laying out the specimen in the press

Starting with a cardboard spacer on the bottom board of the press, place the specimens into the press between 2 interfolding sheets of newspaper, with a cardboard placed between each specimen.

The specimens at left will press poorly. Spread them out as shown at right before closing the pressing paper



Carefully holding the flowers as the paper is folded will greatly improve the quality of a specimen

When placing a specimen in the press, you will improve its final quality by carefully laying it out before pressing. Place the specimen in the press in such a way that any flowers or fruits are obvious and will press well. If possible, spread the branchlets and leaves out to mimic the way they displayed in the field. If the specimen has large leaves, try to carefully spread them as the paper is folded across to ensure they don't become folded or scrunched during pressing.

Some flowers, especially ones with large petals, are very liable to be so scrunched and damaged after pressing as to be almost unrecognizable. In such cases, carefully place the flowers so that the petals will be spread out when the paper is folded across and the cardboard pressed down.

In some cases, particularly when pressing grasses, sedges and lilies, the flowering stems may be too long to fit in the press. In these cases, carefully fold the stems in

a zigzag fashion to fit. You will probably need to hold them down while folding down the paper and placing the cardboard.

Bending a long flowering stem to fit the sheet

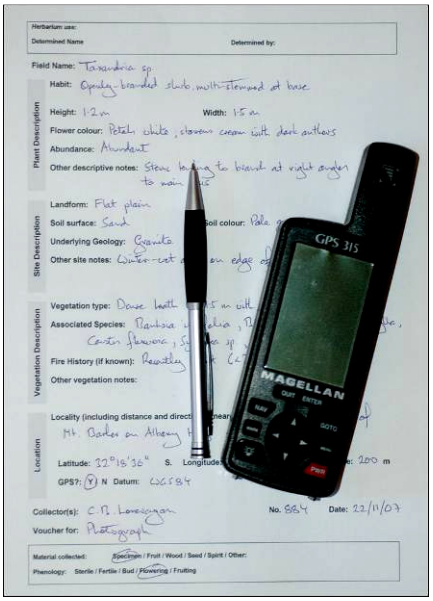
It is good practice to check all specimens a couple of hours after they have gone into the press, straightening and unfolding any scrunched leaves and flowers before they have dried and gone brittle. A little attention at this stage can improve a specimen greatly.

Pressing the specimens

When all collections are in the press, place the top board then apply pressure and tie the cords or lock the straps. Kneeling on the press while tightening the cords is usually sufficient. Place the press in a warm dry place, preferably with some airflow. When traveling in dry weather putting the press on a roof-rack will dry the specimens very well. At home, a drying cabinet or warm laundry will usually suffice. During sunny weather putting the press outdoors in direct sunlight during the day will help. The ideal is to have all specimens well-dried in the press within 2-3 days.

If drying conditions are not perfect or the weather is humid, specimens (particularly flowers) will discolour and may moulder if left too long in the press between damp sheets of paper. In such circumstances, try to remove and replace the papers in which the specimens are collected every second day until the specimens are well dried. This is particularly important for succulents.

Recording information



Always record accurate notes for each specimen, either in a field notebook or using a Herbarium proforma.
A GPS will make recording locality information easier

The information that accompanies a specimen is as important as the specimen itself – one without the other is virtually useless. At a minimum, record the collecting locality, a brief description of the habitat, the date and collector's name, and a brief description of the plant.

If collecting along a road, make a note of the odometer reading from the closest intersecting road. If you are in a large bush block, describe as best you can where you are in the block relative to roads, topographical features, boundaries etc. Include in the locality statement the approximate distance and direction from the nearest town or other named landmark.

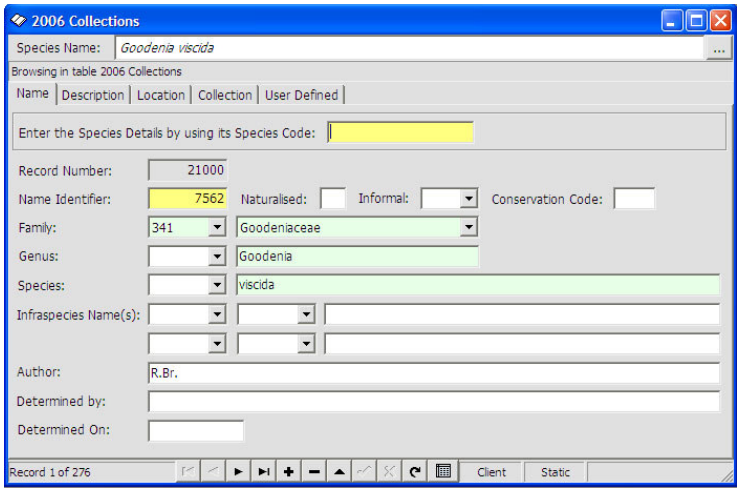
In describing the plant, pay attention to features that will not be obvious on the final dried specimen. Height, habit and details of the flowers such as colour and scent should always be recorded. Don't describe features that are obvious from the specimen, such as leaf shape, indumentum (hair) details etc.

If you have a GPS (Global Positioning System) unit, record the exact position of the collection site (either as latitude and longitude or UTM eastings and northings). Always record the map datum (e.g. WGS84, AGD66)

used by your GPS unit. Recording a geocode without recording the datum is almost useless, as the geocode may be very precise but refer to exactly the wrong spot.

It is good practice to number your specimens with a collecting number. A simple consecutive numbering series is simpler and more effective than a complex system (e.g. using the date or collecting site as a numbering prefix).

A useful collecting sheet is available from the Herbarium as a download from http://www.dec.wa.gov.au/science-and-research/information-systems-research/max.html.



MAX is an electronic collecting book that integrates with the Herbarium's databases

If possible, it is a good idea to use the MAX software for recording collecting details, either in the field or shortly afterwards when processing specimens at home. MAX has the advantage that the Herbarium databases can read MAX files directly, saving considerable work when the specimens reach the Herbarium.

Visit the MAX website (see above) for more details.

Voucher specimens for photographs

If you are a photographer, we strongly recommended that you collect a specimen of every species that you photograph. A photograph without a voucher specimen cannot always be identified accurately, particularly if the species photographed is subsequently split into a number of new taxa. A voucher allows the photograph to retain its value over time compared with an unvouchered photograph. Conversely, a specimen that is accompanied by a photograph of the live plant is very valuable also, as the photograph will record details that are unavailable on the dried specimen.

Forwarding the specimen to the Herbarium

Make sure that all specimens are fully dried before forwarding them to the specimen, paying particular attention to succulents and plants with fleshy leaves or flowers. Packing and forwarding moist material will almost certainly result in mouldy and useless specimens.

Please include the collecting details for all specimens with the batch, either as printed or handwritten labels inserted into each specimen's news-sheets or as a MAX file on CD (with the specimens tagged using numbers that match the specimen records).

Forward batches of specimens by post or by hand to the Western Australian Herbarium (see http://www.dec.wa.gov.au/science-and-research/wa-herbarium/index.html for the postal address). If a batch contains a number of specimens they should be protected in a cardboard box of suitable size. A small number of specimens can be tied into a bundle between cardboards and posted safely.

Notes for special families

Some families and other groups of plants require special consideration when collecting specimens.

Rare plants. If you are collecting rare plants it sometimes seems extravagant or damaging to collect a good-sized specimen, and there is a temptation to collect a small scrap to avoid damage to the plant. Such specimens, however, are usually of little value and are better not collected at all. Unless the population is very small, collecting a specimen of reasonable size will not have significant impact.

Whether the plant is known to be rare or not, if only one or two plants of a particular species can be found at a locality (especially in the case of small shrubs or herbs) these should not be collected. Sometimes, a plant that appears rare at a given locality will turn out to be reasonably frequent after scouting around the general area. Satisfy yourself that this is the case before collecting a plant that at first sight appears rare.

When collecting grasses, sedges, restiads,and lilies, always make sure to include some rhizome or rootstock in the specimen

Grasses and Sedges. Identifying grasses and sedges is often difficult unless mature (fruiting) inflorescences are collected. Try to collect material that is advanced enough that there are at least immature seeds, but not overmature so the seeds have all been shed. When collecting the specimen, ensure that the base (rootstock) of a tuft, or a length of rhizome for creeping species, is included

Restiads. These rush-like plants are almost always dioecious (with male and female flowers produced on separate plants). Unfortunately, it is sometimes necessary to see both sexes before a reliable identification can be made. You should therefore aim to collect both male and female specimens at the collection site (collected under different numbers but related to each other in your field book).

To help you decide which males belong with which females, first use a hand lens to check for anthers (male plants) and styles or fruits (female plants). While males and females may look very different, particularly in their inflorescences, close examination of the stem nodes and culm sheaths will help match the sexes together, as these characters will usually be similar in all plants of one species.

It is important with restiads to collect a good sample of the rootstock, as this provides vital characters for identification. A hand trowel will help. Don't be too worried about long-term damage to the plant, as all restiads reproduce below ground by a proliferating network of rhizomes as well as by seed.

Stylidium and *Drosera*. These beautiful plants pose particular problems when it comes to the interpretation of dried specimens. Additional observations made at the time of collection are especially valuable, as flowers of these genera do not reconstitute well after drying.

For *Stylidium*, record if possible the flower colour (including any markings), the orientation of the corolla lobes (e.g. whether they are paired vertically or laterally in relation to the labellum) and whether there are any appendages in the throat of the flower. For *Drosera*, record if possible the

number of styles, the shape of the stigma and the colour of the anthers and/or pollen. With both *Drosera* and *Stylidium*, it is very important to include basal rosettes in your collection. Rough diagrams of the floral parts made in the field are also very useful.

Orchids. Orchid flowers generally do not press well, especially when pressed carelessly. Pay particular attention to spreading the flower out when pressing, and make good notes on flower shape, colour, scent etc. For terrestrial orchids try to collect the bulb as well. Note that many orchids are listed as Declared Rare or Priority Flora, and cannot be collected without a special permit.

Flowers of *Stylidium* species are complex. Take careful notes of flower colour patterns and the disposition of petals

Eucalypts. Buds and fruits provide critical characters for identifying eucalypts, and it is important that you find a good sample of both. If it is not possible to collect both buds and fruits on the one stem, then collect both separately from the same tree, using the same collection number for each. If flowers are available, ensure your specimen contains unopened buds as well. Mature buds are more valuable than immature buds, so try to collect buds that are as large as possible at collecting time

When collecting eucalypts, please include in your description notes on habit (tree, mallee, mallet etc), height, and nature of bark (rough or smooth; the distribution of any rough bark; the colour of both rough and smooth bark).

Mistletoes. All mistletoes are, to some extent, host-specific and many aspects of their ecology (e.g. fire ecology) are tied to that of their hosts. Thus, the host is the mistletoe's habitat, equivalent in some ways to soil, topography etc. for other plants. The host should always be recorded. However, hosts are not always identifiable in the field and may be subject to taxonomic change over time. So the safest approach is to collect a sample of the host with each mistletoe collection. There are two ways of doing this. Sometimes it is possible to collect the mistletoe specimen attached to its host branch, and have enough material on the host for identification. However, this is often not possible, in which case you may collect the host in its own right, then cross-reference in your collection notes between the host specimen and the mistletoe specimen.

The swollen haustorium at the point where a mistletoe joins its host

It is also useful with mistletoe specimens to collect the *haustorium* (the structure produced at the point where the mistletoe attaches to the host). The shape of this differs between species and is ecologically interesting. Collect a haustorium by sawing off the length of branch that it sits on, then tag this with a collecting tag with the same number as is given to the normal specimen. Of course, haustorium specimens are bulky and difficult to connect, so only do so if practical.