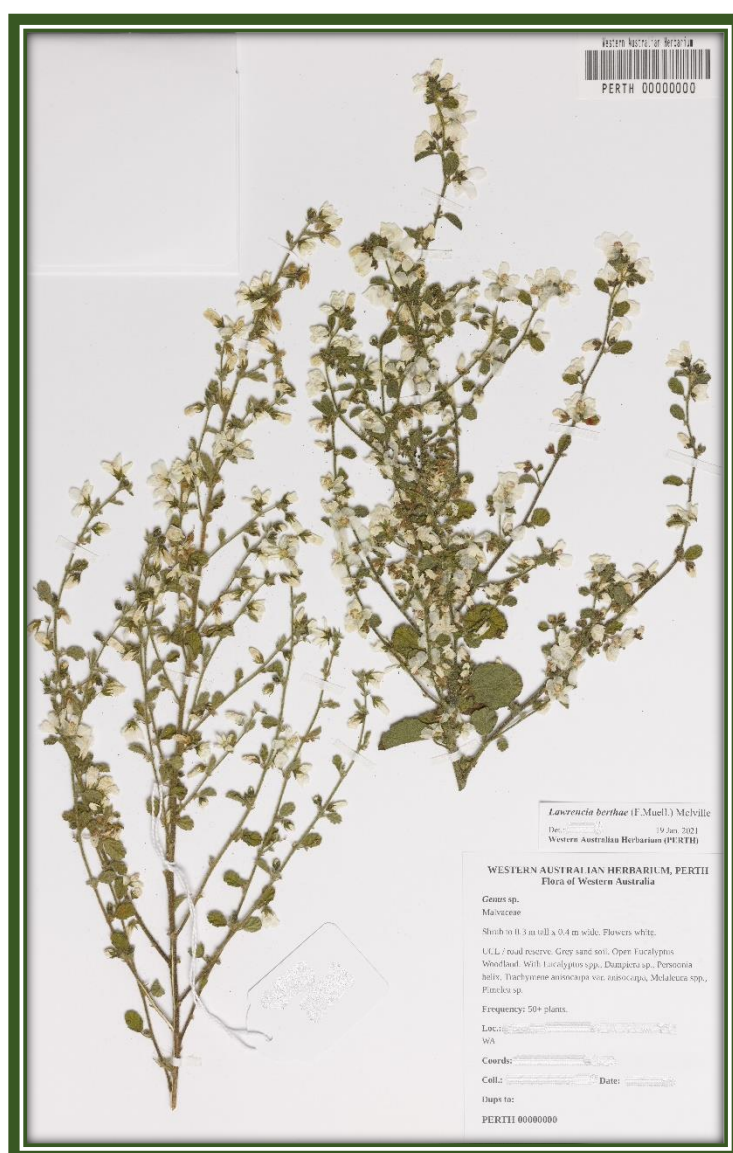




Department of Biodiversity,  
Conservation and Attractions  
Western Australian Herbarium

# Vascular Specimen Mounting Guidelines

## Western Australian Herbarium (PERTH)



*The Western Australian Herbarium acknowledges the Traditional Owners of the land and waters from where our collections have come, and pays respect to their Elders past, present and emerging.*

The Vascular Specimen Mounting Guidelines have been produced with help and contributions from the following Western Australian Herbarium current and former Herbarium Collections Staff: Louise Biggs, Skye Coffey, Shelley James, Karina Knight, Cheryl Parker, Julia Percy-Bower and Elisa Wood-Ward.

### Document Revision History

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1.0	January 2004	Skye Coffey	First created
2.0	2006	Karina Knight	Updated to reflect current practice
3.0	June 2019	Karina Knight & Elisa Wood-Ward	Updated to include stitching methodology
4.0	September 2021	Shelley James & Elisa Wood-Ward	Updated to include tape mounting and remove preparation instructions

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## Introduction

The Volunteer Mounting Program is an essential and invaluable program of the Western Australian Herbarium (PERTH). Our volunteers help to process specimens permanently incorporated into the Research Collection at the Herbarium.

A botanical specimen is mounted for two main reasons; to preserve and protect the specimen and to prevent it from becoming separated from the associated collecting information. Reducing the movement through a supporting sheet or packet helps to prevent fragmentation of the specimen.

A well-mounted botanical specimen ideally displays the scientific features of the taxon, not to show the most pleasing or artistic arrangement. It is arranged on the sheet paying attention to the following points:

- Orientation of the specimen on the sheet
- Mounting in a style appropriate to the specimen
- Arranging and attaching the specimen
- Positioning of collecting data label and accompanying annotation labels
- Retaining fragmented material and/or ancillary records

A well-mounted specimen, based on archival mounting methods and materials and stored in a stable and archival environment, is expected to last into perpetuity as a scientific voucher.

The following guidelines are the standard for mounting specimens at PERTH.

## Before beginning

While specimens will be pre-prepared for mounting, issues do sometimes arise. If you note any of the following, please do not hesitate to ask the Mounting Supervisor who will be in the mounting room with you:

1. The specimen is missing collecting notes or a collection label.
2. The collecting number on the specimen tag does not match the collecting number on the collecting notes.
3. Specimens to be mounted do not look the same or might be incorrectly labelled.

Please, never dispose of any specimens or specimen fragments without asking the Mounting Supervisor.

**If you are in doubt about any aspect of the mounting process, please **do not** take action and ask the Mounting Supervisor.**

## Specimens for mounting

Specimens ready for mounting are stored in boxes (red PERTH boxes and occasionally cardboard boxes) in the Short Term Specimen Storage 1 (STS1). Each box has an accession label that includes the accession number, the project, the date lodged at the Herbarium, and the processes required for each box. Boxes prioritized for mounting will be available on the racks in the Mounting Room.

Western Australian Herbarium Collections Staff pre-prepare specimens for mounting. Specimens are removed from the collecting papers (most commonly newspaper) and placed onto an archival mounting board within a flimsy (light paper folder). Any labels and fragment packets are clipped onto the mounting sheet using an archival paperclip.

Duplicate specimens will be placed behind the specimen to be mounted in newspaper or old flimsies. Please do not mount these specimens or separate them from the PERTH specimen.

## The mounting protocol

1. Choose a box from the box racks in the Mounting Room.
2. Transport the box on a trolley, if needed.
3. At the end of the day, count the number of specimens completed and fill in the Mounting Binder.
4. If not completed, return the box to the same location at the end of the day, separating completed work from unfinished work using a red plastic tray.
5. Completed boxes should be placed in the trolley located along the glass wall.

## Handling boxes and specimens

For your safety and that of specimens, please take care when handling boxes and specimens:

- Full boxes may be heavy and weigh as much as 7-10 kg.
- Boxes must remain horizontal at all times.
- Place on flat surface before opening the lid.
- Carry the box supporting the sides and bottom; hold the long side of the box against your body for further support. Avoid extended gripping using thumbs and fingers.
- Take care and avoid using thumbs to flip open the lids.
- Ensure hands are clean so dirt and/or greases are not transferred to the herbarium sheets.
- Wash hands with soap and water; please do not use hand moisturizers or sanitizers.
- Wherever possible sheets must not be turned over, tipped upside down, placed on end, or bent.
- Do not place heavy objects on, or lean on, specimens. Try to avoid crushing and damaging specimens as you mount them.

- Always use a support (cardboard or red plastic tray) when carrying individual specimens.
- Please, do not consume food or beverages in the Mounting Room. We advise that you get up, have a stretch, take a drink and snack away from specimens.

## Mounting materials

A complete list of mounting materials along with a summary explanation is available in Appendix 1. Each volunteer is provided with their own set of mounting tools (Figure 1).



**Figure 1. Tools used to mount herbarium specimens.**

## Morphology of a mounted specimen

### Sheet orientation

The orientation of the mounting sheet is always in portrait position (Figure 2). Either side of the sheet may be used.

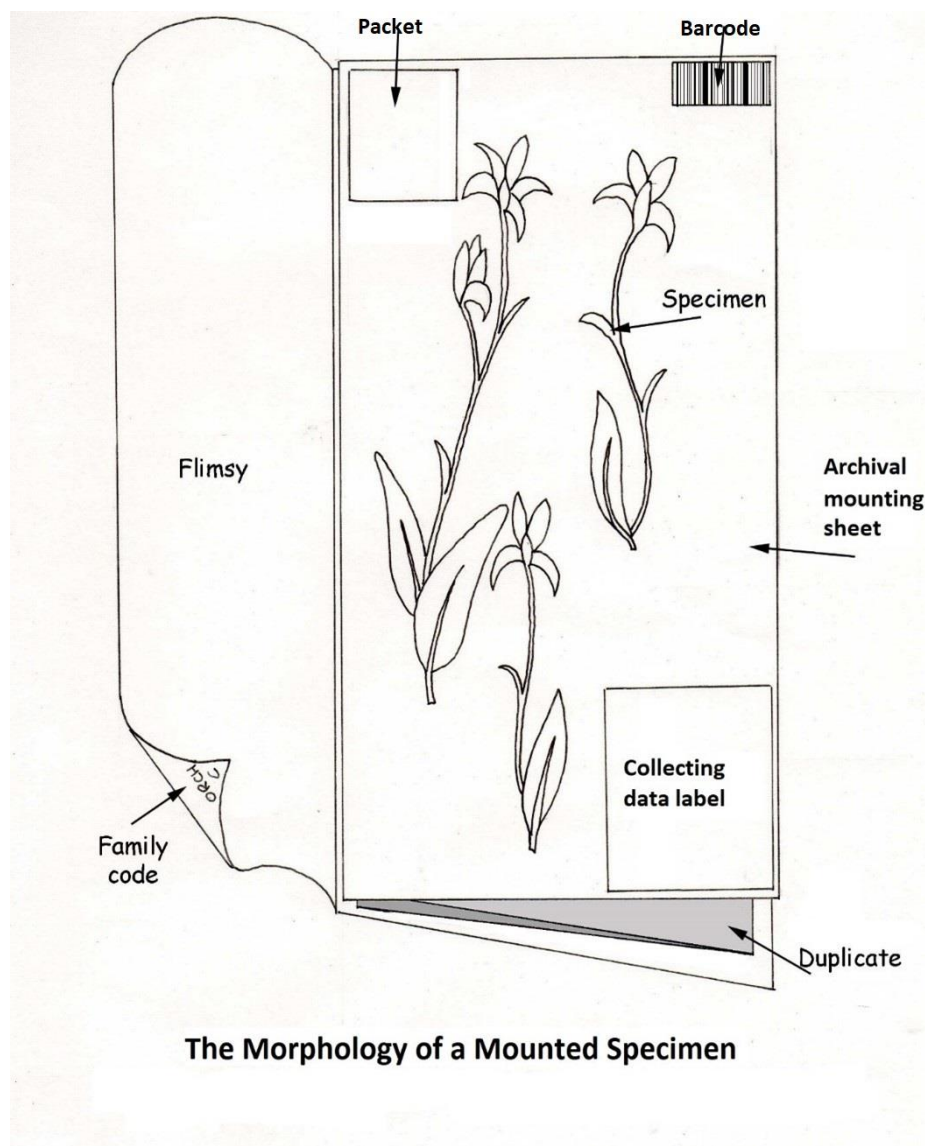


Figure 2. The morphology of a mounted specimen.

### PERTH barcode

A barcode is placed in the top right-hand corner of the sheet by Herbarium Database Staff after the specimen is mounted. Please ensure there is enough space remaining for this to be applied. Refer to Figure 3 for an example of the barcode size.





Figure 3. Western Australian Herbarium barcode (actual size).

#### Labels and annotation slips

A collecting information label (Figure 4) is typically attached to the bottom right-hand corner of the sheet after databasing. Please ensure enough space remains available for its attachment along the right-hand side (refer to Figure 2). However, a label can cover part of the specimen if needed; it is not completely glued down by Herbarium Collections Staff.

### **WESTERN AUSTRALIAN HERBARIUM, PERTH Flora of Western Australia**

***Triodia epactia*** S.W.L.Jacobs

Poaceae

Alluvial plain or distal sheet flood fan; silty sand. Zero slope.  
Very few coarse fragments to maximum size of 6 mm. No  
bedrock exposed. Red brown sandy loam, average depth 11.8  
cm. Shrubland of *Acacia ancistrocarpa* (mostly dead) over  
Hummock Grassland of *Triodia pungens* & *Triodia* sp.

**Loc.:** Site: WYW07, W side of highway, 9.0 km along track to  
Dampier – Bunbury gas pipeline 11.13 km S of Onslow turnoff  
on North West Coastal Highway, 46 km W of Mt Amy, 32.8 km  
NNW of Nanutarra Roadhouse, Cane River Conservation Park,  
Pilbara IBRA WA

**Coords:** 22° 15' 20.200" S 115° 26' 12.300" E (GDA94)

**Coll.:** S. van Leeuwen et al. PBS 1948 **Date:** 8 May 2004

**Voucher:** Pilbara Biological Survey

**Dups to:**

**PERTH 08905843**

Figure 4. Western Australian Herbarium label.



Determinavit, confirmavit, and other identification slips (Figure 5) are used to indicate a name change or confirmation of a specimen's taxonomic identity. Annotations slips are attached on the right-hand side of the sheet above the label. To accommodate future annotation slips please leave an area above the label free when mounting, if possible.

Other annotation slips (Figure 6) document the research use of specimens. Whenever possible leave space in the bottom left-hand corner of the sheet for other slips.

As part of pre-preparation, any labels will be attached with a plastic paperclip to the mounting sheet. **Please, do not glue down any labels, annotation slips, or collecting notes.**

<p><b><i>Banksia attenuata</i> R.Br.</b></p> <p><b>Det.:</b> K. Thiele                      14/07/1993  <b>Western Australian Herbarium (PERTH)</b></p>	<p><b><i>Acacia acutifolia</i> Maiden &amp; Blakely</b></p> <p>See: B.R. Maslin in <i>Nuytsia</i> 10:97(1995)</p> <p><b>Nom. Rev.:</b> C. Parker                      29/03/1990  <b>Western Australian Herbarium (PERTH)</b></p>
<p><b>Conf.:</b> A.P. Brown                      1/03/1988  <b>Western Australian Herbarium (PERTH)</b></p>	

**Figure 5. Examples of determinavit, confirmavit and name change (Nom. Rev.) slips.**

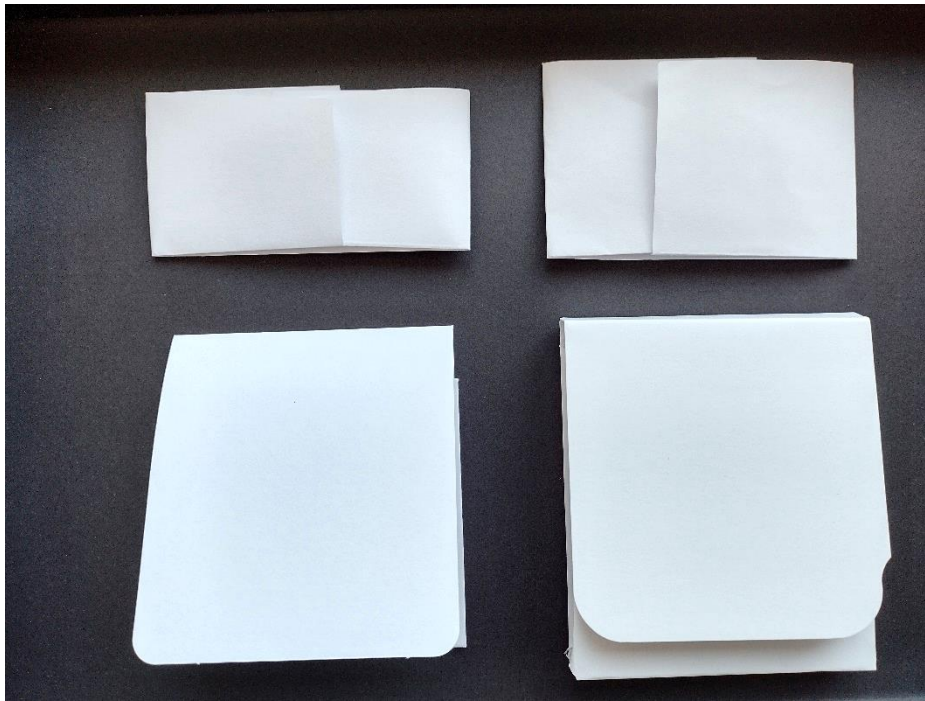
<p>Genomic biogeography &amp; taxonomy of northern Australian eucalypts in the monsoon tropics &amp; arid zone. S.C. Coffey (DBCA) for R.Fowler (MELU) 22nd Dec. 2020</p>	<p>Portion removed. Phylogenetics of parasitic red algae and hosts. M. Preuss (WELTU), 2021</p>	<p>Leaf &amp; seed material removed for molecular diagnostic &amp; imaging. K. Smith (Dept Agriculture, Water &amp; the Envir.) 26th February 2021. Mantis: 7518</p>
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**Figure 6. Examples of annotation slips.**

### Fragment packets

Fragment packets hold fragments of the specimen that have been removed (accidentally or purposely for study). These packets are typically attached to the top left of the mounting sheet (Figure 2). If there is insufficient space in the top left corner, select another location but avoid attaching to the right-hand side of the sheet where space has been allocated for the barcode, collecting information label, and identification slips.

The Western Australian Herbarium currently has four different types of fragment packets (Figure 7). The use of each is dependent on the type and volume of fragment material. The packet should be of a size that will contain materials that are likely to break loose from the sheet.



**Figure 7. Fragment packets.**

### Specimen

Botanical specimens are mounted in the central space available on the sheet (Figure 2). In preparing specimens for mounting, the Herbarium Collections Staff have provided an indication of how the specimen might be best arranged to show the critical taxonomic features. In all cases, the Collections Staff have made an informed judgement about what can fit on a single sheet. If you have concerns, please consult with the Mounting Supervisor.

## Preparation of a specimen for mounting

- Many specimens have a jeweller's tag attached around a stem which usually contains the collector's name and the collecting number assigned by the collector (Figure 8). This must not be removed and should remain visible upon mounting. Please note: some collectors do not use tags.



Figure 8. Example of a collector's tag.

- Mount the material roughly as placed on the sheet during pre-preparation, leaving space for the barcode, attachment of the label, annotation slips and fragment packets. If you feel there is too much material for the sheet, please consult with the Mounting Supervisor. If there is too much material for one sheet, a second sheet will have been prepared for mounting. Additional material is set aside for exchange with partner herbaria (refer to page 29: Retaining duplicate specimens).
- The side of the specimen to face upward on the sheet will have been indicated during pre-preparation. This will display as many of the diagnostic plant parts as possible, e.g. both sides of the flowers, buds, fruits, and leaves.

## Positioning the specimen on the mounting sheet

### Single sheet

The general practice is to place a specimen, specimen pieces, or specimens (if a gathering) centrally in an orientation to fit the sheet (Figure 9). A slightly diagonal arrangement, from bottom left to top right, (Figure 10) may enable longer specimens to fit a sheet than if placed in a vertical arrangement. It may also help to prevent parts of the specimen lying behind the label or fragment packet.

Mount a specimen to represent the natural habit of the plant (i.e., the right way up with roots to the bottom of the sheet and leaves to the top). Some specimens are very long and may have been folded back on themselves when being pressed (Figures 11 and 12. Examples of a folded specimen indicating habit.) but should still be oriented in the same way (direction of growth). This may, however, not always be possible due to the arrangement during pressing of the specimen by the collector.

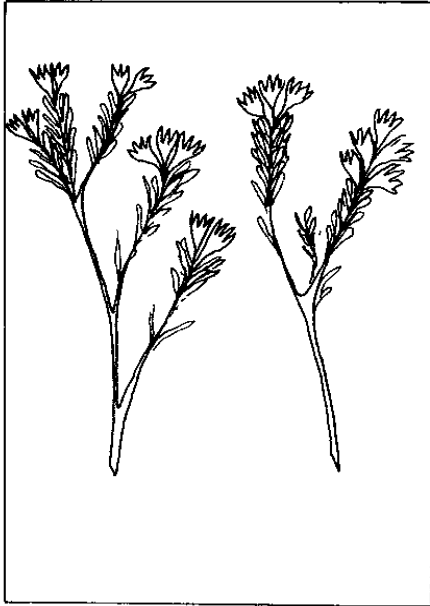
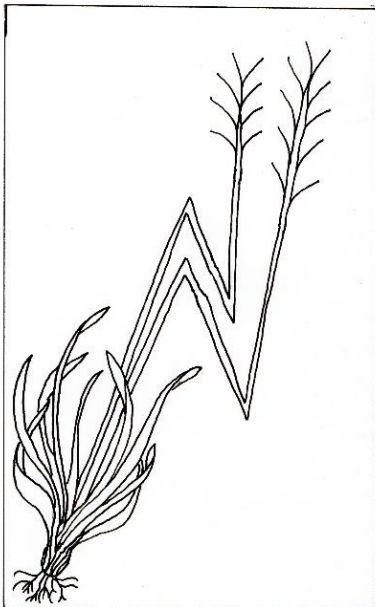


Figure 9. Example of vertical mounting.



Figure 10. Example of diagonal mounting.



Figures 11 and 12. Examples of a folded specimen indicating habit.

Although specimens will be pre-prepared for mounting, the following guidelines should be taken into consideration:

- Where there are multiple pieces on a sheet, consider placing larger pieces towards the base of the sheet to avoid the top flexing upon handling.
- Avoid placing fragile portions towards the left side of the sheet. They are more likely to be crushed in that position due to the folder and flimsy folding on that side.
- If specimen clumps can be separated without causing significant damage, they should be to better show the diagnostic characters.
- If a leaf or other part of the specimen is covering a diagnostic characteristic, such as a flower, it should be carefully removed and placed in the fragment packet. Leaving evidence that a piece was removed from the location is good practice (e.g., remove the leaf blade but keep the petiole attached to the specimen).

#### Multi-sheet – more than one sheet for a collecting event

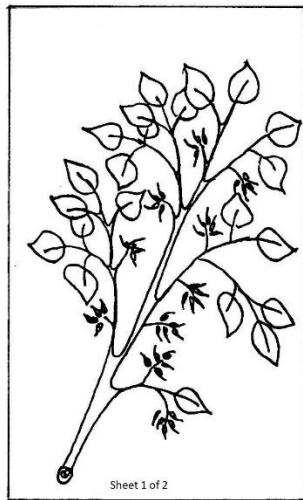
One sheet is normally sufficient to mount a collection. However, more than one sheet may be required when it is not possible to mount all the necessary and informative material on a single sheet. All of the material forms part of a single collecting event, and typically comes from a single individual.

Below are some examples when multi-sheet collections could occur:

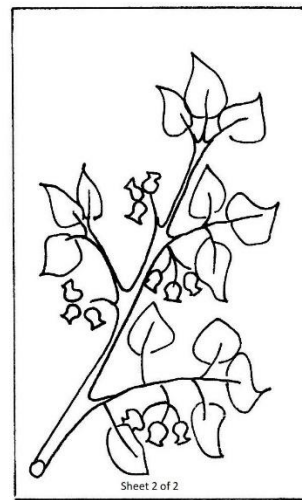
- A single collecting event comprising flowering and fruiting material. For example, most eucalypt specimens require buds, flowers and fruit for identification. The different parts require separate samples from the single plant (Figure 13).
- A single collecting event of both juvenile and mature leaves (Figure 14).
- A single collecting event with male and female flowers on separate samples but from the same individual (Figure 15).
- Fertile and infertile fronds of ferns, collected during the same collecting event.
- When a specimen does not fit the mounting sheet, such as a large palm frond.

In all these cases if the representative specimen items fit onto a single sheet they can be mounted together on one sheet. However, if space is an issue they will be prepared and mounted on separate sheets. Along the bottom right of the mounting sheet “Sheet 1 of X” on the first sheet and “Sheet 2 of X” and so on for the total number of sheets (e.g., Sheet 1 of 3, Sheet 2 of 3, Sheet 3 of 3) is indicated. For storage, each sheet is placed in a flimsy and placed under the first sheet within the first flimsy.

Please check with the Mounting Supervisor if you are uncertain about multiple sheets or mounting duplicates.

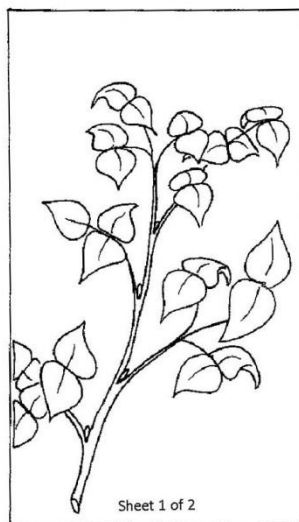


Buds



Fruits

**Figure 13. Multi-sheet showing different diagnostic characteristics of buds and fruits. This is a single collecting event.**



Juvenile



Adult

**Figure 14. Multi-sheet showing different leaf forms collected from one individual during a single collecting event.**



**Figure 15. Monoecious flowering (male and female flowers on same individual).**

#### Specimens that do not fit within the edges of the mounting sheet

Parts of a specimen must not hang over the edge of the mounting sheet because in time these parts will fragment and break away from the specimen, thus risk damaging this and other specimens. Plant specimens often have some flexibility and can be gently manipulated and mounted to fit on the sheet. If not, please see the Mounting Supervisor for advice.

As specimens are prepared for mounting, the specimen should have been already assessed, trimmed and determined to fit the sheet.

Trimmed materials are placed within the fragment packet.



## Mounting the specimen

Many techniques have historically been used to mount specimens within the Western Australian Herbarium. Glue-backed archival tape, gluing of specimens using PVA glue, hot-gluing, non-archival sticky tape, and the use of 3M archival polyester transparent tape have all been used at some stage. The thread used to stitch specimens has also changed through time, with white (unflavoured) waxed dental floss being used in the past.

Stitching and taping (using archival glue/gum-backed linen tape) are the current methods for mounting most vascular specimens. The method chosen depends on the type of specimen. Most specimens can be attached to the mounting sheet using only the gum-backed linen tape. Bulky specimens may need to be stitched at critical anchor points as the weight of the specimen requires this for security. If the specimen is big and bulky or heavy, a heavier-grade mounting sheet can also be used. Taping is then used to attach outer points of the specimen. Thin/fragile specimens, such as herbs, are taped as this is a more effective way to secure them. Stitching takes more time and requires the frequent turning of the specimen and tipping of the sheet. Hence, it is not recommended unless necessary.

Strips of archival tape can be cut to lengths and widths appropriate to the specimen being mounted. Tape should extend at most 10 mm beyond the part of the specimen that is to be taped down. Heavier stems may need a slightly thicker piece of tape with longer tails for secure adhesion to the sheet whereas more delicate parts are adequately secured with thinner pieces and shorter tails.

Numerous small and fragile specimens are usually stored in large packets rather than being attached to the mounting sheet directly (see page 23).

**Specimens *usually* require a minimum of three (3) anchor points per stem.** This can be a combination of tape and stitching. The strongest parts of the specimen, such as stems and branches are anchored with tape or thread; stitching or taping across foliage only occurs when absolutely necessary or appropriate. Some flexibility is required; if the backing sheet should bend for any reason, fully attaching the specimen and not allowing some flexibility may lead to damage.

Avoid excess tape and taping. Try not to obscure too much of the plant with tape. The mounting test is to carefully take the sheet and gently bend the corners downward. If portions of the specimen pop up off the sheet, they need to be supported with small pieces of tape.

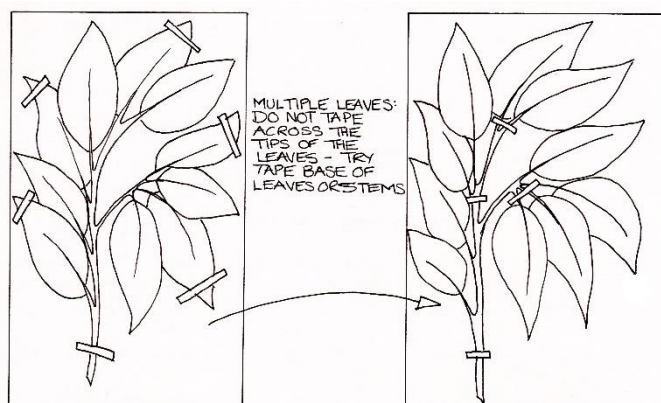
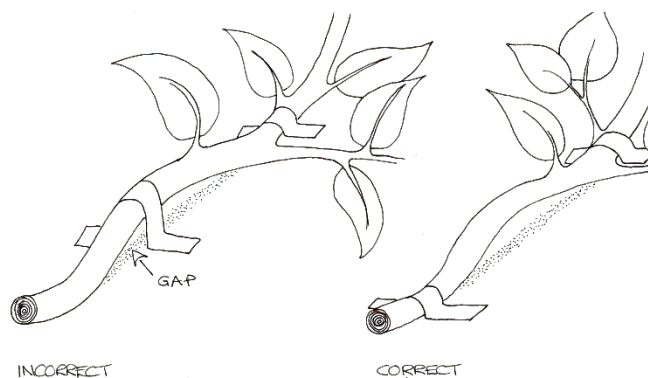


Figure 16. Examples of incorrectly (left) and correctly mounted specimens.

### General mounting tips

- Avoid anchoring the tips of foliage (Figure 16).
- Avoid stitching or taping anchor points which sit above the mounting sheet, attach where the anchor points are flat on the sheet (Figure 17).
- Avoid anchoring roots as they are brittle. Place the first anchor point above the root attachment to the stem.
- It is best not to tape or stitch fruit, flowers or leaves that have dislodged from the main specimen. Place in a fragment packet which is then attached to the sheet. If there are lots of bulky fragments, a carpological collection may need to be created. (Refer to page 26: Retaining fragments and loose material).
- Do not use long pieces of tape or stitch from one side of the sheet to the other to mount for example, dense shrubs, or several specimens at once (Figure 18).
- If necessary, use forceps to tuck tape firmly around and under stems.
- Do not remove native fauna such as insects and spiders that were collected by accident on the specimen, and do not remove diseased parts of the specimen.



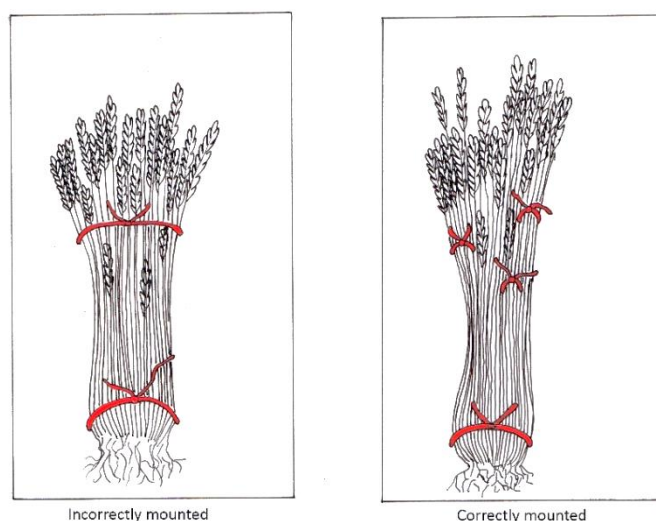
**Figure 17. Anchoring to the mounting sheet.**



**Figure 18. How to mount dense shrubs.**

### Tips on mounting specific groups

*Grasses and sedges* usually do not have obvious anchor points because they mainly consist of clumps of leaves or flowering parts which are fragile. Often an anchor point will need to be created by either sewing or taping small bundles together (see Figure 19). Generally, grass-like specimens are primarily anchored where the plant is heaviest, which is near the base where the stems/culms are close together. However, care must be taken to ensure the specimen is spread sufficiently to be able to assess diagnostic characteristics, and the natural look of the plant is maintained. If provided with numerous separate plants, mount them as separate entities on the sheet. If several plants are bunched together, they should be separated, but only if it does not damage the specimen.



**Figure 19. An example of mounting grass.**

Culms/stems can be used to support and secure other culms or stems. Use tape to restrain small portions of wayward material which will not stay within the confines of the sheet.

*Monocots.* The underground parts of most monocots such as roots, stolons, bulbs and corms are an important diagnostic feature. These parts should not be trimmed unnecessarily.

*Callitris (Cupressaceae) and other fragile specimens.* Specimens which are brittle and fragment easily must only be sewn or taped using the stems as anchor points. Leaves can only be tethered in bunches. Due to their weight, extra support is usually required when mounting *Callitris* and typically two mounting sheets or a thick mounting board are used.

*Host/parasite (Loranthaceae/Santalaceae).* Where the specimen is documenting a parasitic plant, a piece of host is usually provided for reference. Both should be mounted on the same sheet. However, where full specimens of both the host and parasite have been submitted, they will be mounted on separate sheets, and will be cross-referenced.

### Tips on mounting unusual or difficult specimens

*Large leaves.* Some specimens, such as water lilies and cacti, have very large leaves. The specimen is sewn in small sections and may require the creation of small holes through the leaf to attach the leaf to the mounting sheet. Stitching may be required and securing across a vein is recommended. Seek help from the Mounting Supervisor prior to commencing.

*Soil and sand.* While collecting best practice indicates that soil and sand be removed prior to pressing, often material can remain attached to specimens. Soil attached to the roots and other parts of a specimen will fall off over time potentially damaging the specimen. Excess dirt can be gently removed from a specimen before mounting by laying the specimen on a flat surface and gently tapping and brushing the soil from the specimen with a soft brush. Most will be removed during pre-preparation. Seek assistance from the Mounting Supervisor as needed. Please place all soil and sand into the yellow quarantine bin.

*Bark* is an important diagnostic feature for some groups of plants such as wattles and eucalypts (Figure 20). The type of mounting used for bark is based on the size of the sample and the bark may be mounted in one of the following ways:

- Small samples: place in a fragment packet and attach to the mounting sheet (refer to page 26: *Retaining fragments and loose material*).
- Larger samples: tape or stitch to the sheet, mount bark so the outer side shows (or both sides if adequate material is provided).
- Large bulky samples: are placed in a snap-lock bag within a box (to be stored in the Carpological Collection, refer to page 25: *Bulky specimens*).

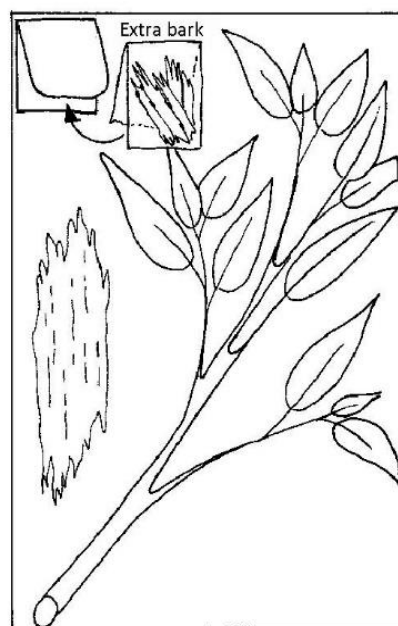
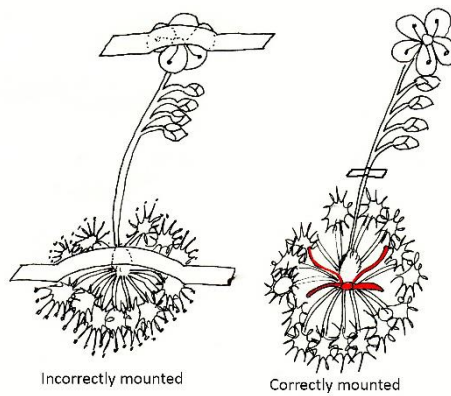


Figure 20. Mounting bark.

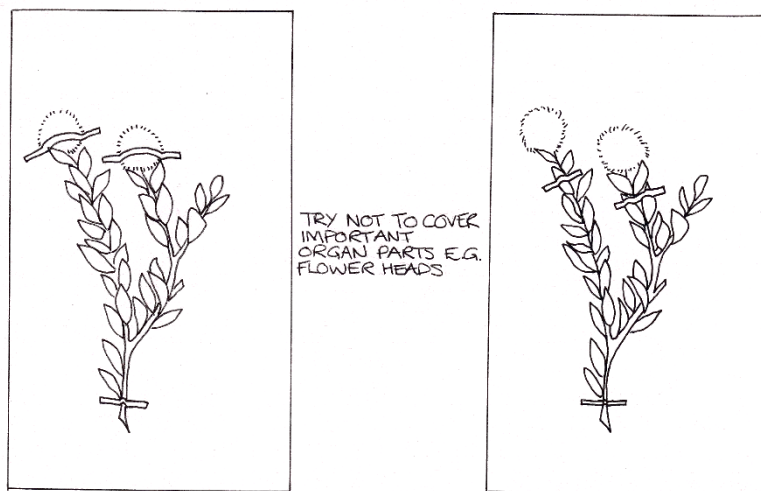
## Taping specimens

Due to the efficiency of taping and reduced handling of specimens, it is the preferred method for mounting. Taping is used to secure specimens or parts of specimens that are thinner and lighter, reducing pinch-point damage that might result from stitching. Use just enough tape to anchor points to stop specimen movement; do not smother the specimen with tape. Usually three anchor points per stem are required.

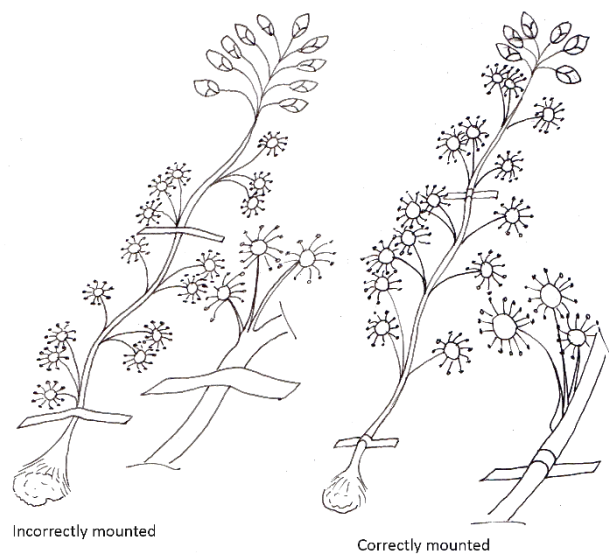
1. Prepare your work area. Collect a moistened piece of sponge in a petri dish from the sink area in the Curation Laboratory adjacent to the Mounting Room. The sponge should not be saturated; the ideal is a small amount of free water when you press the sponge. The sponge can be moistened throughout the session using available water bottles. Pre-cut strips of gum-backed archival linen tape are available as needed.
2. Position the specimen and choose the anchor points.
3. Ensure the tape will not cover important details such as flower heads, buds, or fruit (Figure 21 & Figure 22).
4. Use an appropriate amount of tape per anchor point, just enough to support the specimen and keep it fixed to the sheet; a maximum of 10 mm on either side of the anchor point is adequate. The width and thickness of the tape is dependent on the part of the specimen being attached (i.e., thicker woodier stem, use a broader and slightly longer piece of tape; for thin and delicate parts a narrower and shorter piece of tape can be used). Pre-cut tape can be modified as required using scissors.
5. Moisten the glue-backed linen tape just sufficient to activate the adhesive. Fingers or forceps can be used.
6. Centre the tape over the anchor point with equal lengths on either side.
7. Place tape perpendicular to the anchor point.
8. Always place the tape right up to the edges of the anchor point to ensure the specimen is tightly anchored (Figure 23).
9. Hold the tape in place gently for about 10 seconds to ensure the tape adheres to the mounting sheet. Ensure you do not use your thumbs; keep a neutral hand and wrist positioning.
10. Repeat at several points until the specimen is securely attached to the mounting sheet.



**Figure 21. Stitching and taping delicate specimens.**



**Figure 22. Avoiding diagnostic characteristics.**

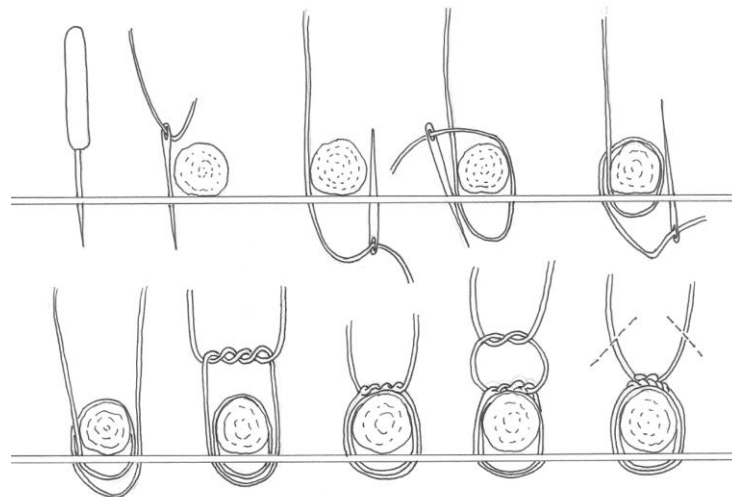


**Figure 23. Taping specimens correctly.**

## Stitching specimens

Stitching uses lengths of cotton thread to attach anchor points of a specimen to the mounting sheet. Stitching should be used only where the specimen is bulky or woody for the initial anchor points.

1. Place a mounting mat (cardboard) underneath the mounting sheet.
2. Position the specimen and choose the first anchor point.
3. Use an awl to punch a small (needle-width) hole in the mounting sheet, one hole immediately either side of the stem.
4. Thread a needle and using a single piece of cotton thread push the needle through one hole from the top of the sheet, then into the second hole from the underside, over the stem, repeat once to finish with two threads to be tied off on the specimen (Figure 24).
5. Tie off the thread with a knot, looping around twice on the first knot and finishing with a second knot, being careful not to over tighten which will result in a tear or buckling of the mounting sheet or damage to the specimen.
6. Cut the thread so the ends are at most 0.5 cm long.
7. Repeat until the major anchor points are secured.



**Figure 24. Stitching a stem to the mounting sheet.**



## Packeting small specimens

The Western Australian Herbarium has several different packets for smaller or delicate specimens. A specimen that consists of a gathering, particularly of smaller herbs, are neither taped nor stitched. They are placed free in a packet which is glued onto the mounting sheet (Figure 25). Different sized opening packets, also used for fragments and mounting cryptogram specimens, are available. Small specimens are packeted for the following reasons: 1) small specimens are more easily damaged by stitching or taping than larger specimens, 2) taping unavoidably covers important diagnostic features, and 3) taping many individual small specimens is fiddly and time consuming.

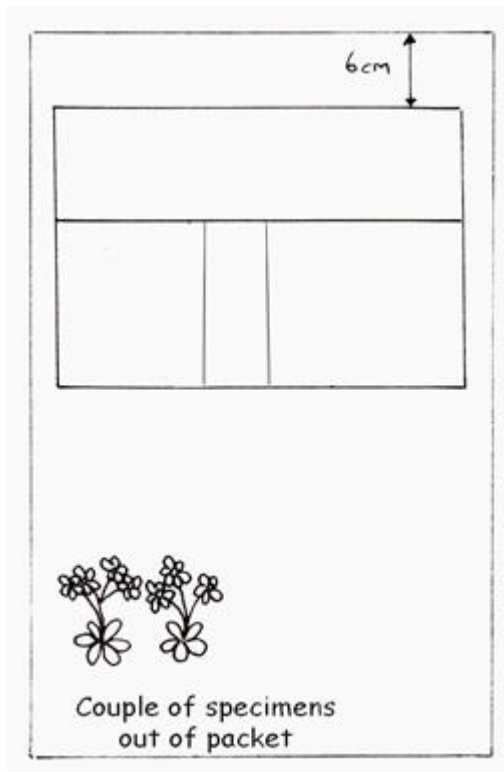
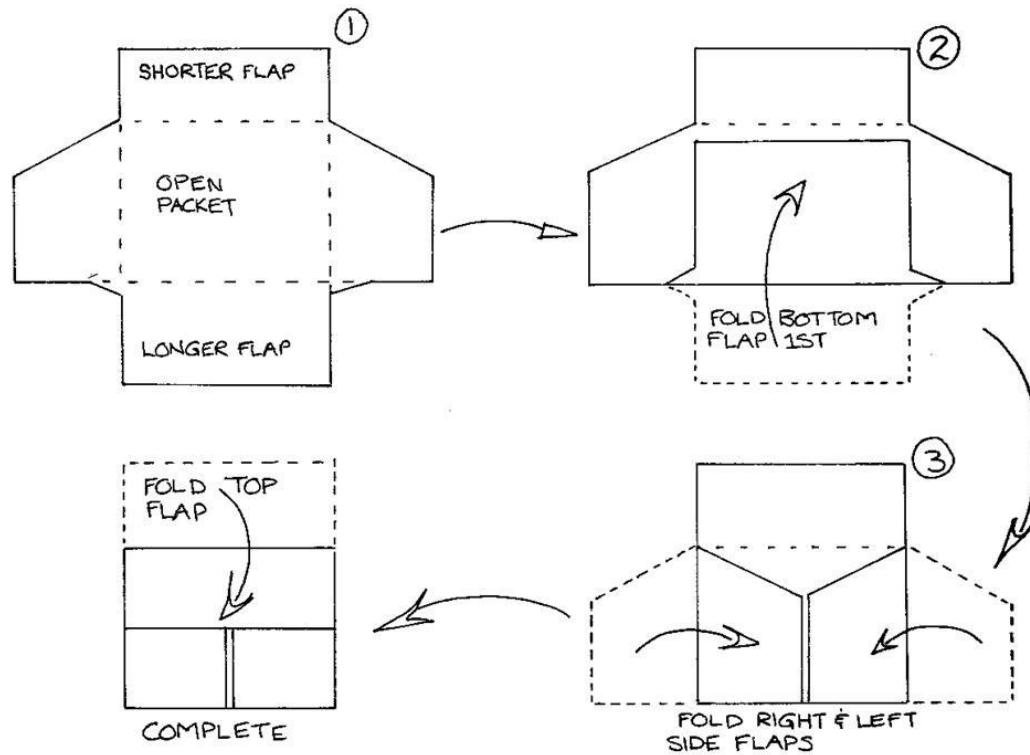


Figure 25. Layout using a large packet.

- Mount with tape the one or two representative specimens selected by the Herbarium Collections Staff onto the mounting sheet. Position the specimens below the packet and next to the label. This gives an example of the specimens inside the packet and helps to minimise unnecessary handling of the collection.
- Small fragments which have fallen from the main specimen/s are also retained as they contain important diagnostic material such as nuts, fruits, seeds, flowers and leaves which can be used later for examination or when material is required for destructive sampling.

Folding and positioning large packets (Figure 26)

1. Fold the large lower, longer flap to cover the specimens.
2. Fold the side flaps in to hold the large flap down.
3. Fold down the smaller top flap to hold the side flaps down.
4. The original jewellers tag if present is also placed in the packet.



**Figure 26. Folding a large packet correctly.**

## Bulky specimens (Carpological Collection)

Specimens too bulky to mount or too bulky for fragment packets are separated from the main sheet and retained in the Carpological Collection (Figure 27). These are prepared by Herbarium Collections Staff. Most often the material will be fruits, nuts, corms, bulbs, bark, large inflorescences (such as *Banksia*), or improperly pressed collections which are too bulky to mount. Bulky specimens are bagged, boxed and stored as carpological for the following reasons: 1) they take up too much space in the collection, 2) may damage flat-sheet specimens, and 3) cannot be easily or effectively secured to a mounting sheet.

- Mount the representative voucher onto the pre-prepared sheet.
- The remainder of the material is placed in a polypropylene (snap-lock) bag. The smallest sized snap-lock bag appropriate for the size of the collection is used, ensuring the bag is easy to seal.
- A pop out tag with the collector's name and number written in pencil is inserted into the bag.
- The bag is then placed in an appropriately sized box with the collector's name and number written in pencil on the box. This box is retained in the same PERTH box as the representative voucher until databasing where the box will be databased and have a Western Australian Herbarium label affixed to the box.
- In the collection it will be stored separately to the voucher specimen (in a box at the end of the genus or family).

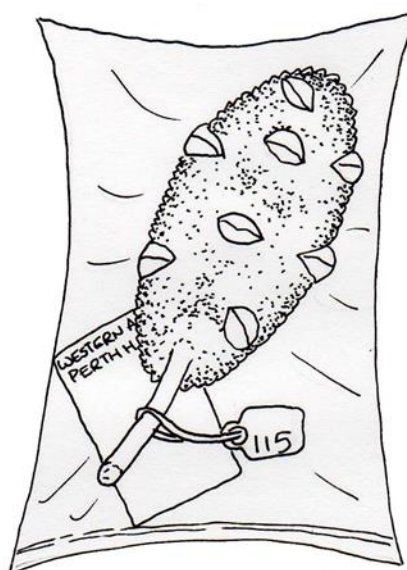
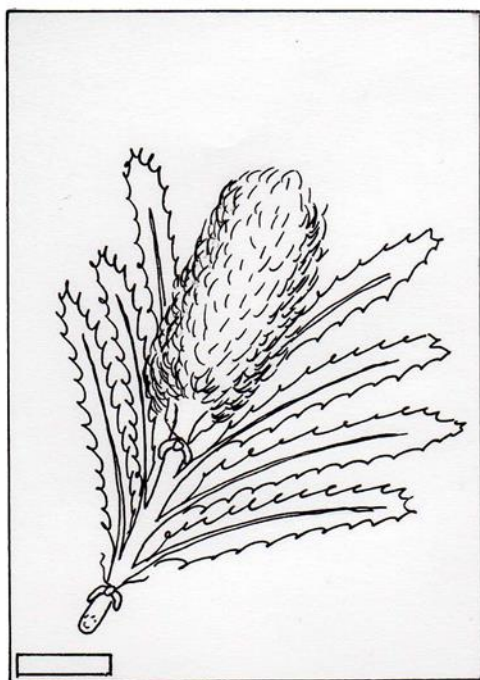


Figure 27. Creating a carpological collection.

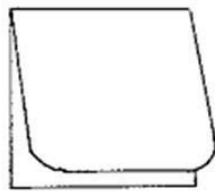
## Retaining fragments and loose material

Once the specimen is mounted, most often small fragments which have fallen from the specimen remain in the collecting/pressing enclosing sheet (newspaper, paper bag, old flimsy). Fragments must be retained as they often contain important diagnostic material such as nuts, fruits, seeds, flowers and leaves which can be used at a later time for examination or when material is required for destructive sampling. Care must be taken, however, in not just automatically transferring all frass into the fragment packet as it may contain soil or other contaminants.

### Fragment packet types

Choose the packet that best fits the size and bulkiness of the fragment. PERTH currently has four different fragment packets.

- *Flat pockets (non-expanding)*. Pre-glued; fold down the top flap of the pocket. Requires a plastic fragment bag.
- *Expanding pockets* (Figure 28). Pre-glued; push in both sides and then the bottom part of the packet and crease down each of the lines to form an expanding pocket. Finally fold down the top flap over the pocket. Requires a plastic fragment bag.
- *Small and large enclosing packets* (Figure 29). These archival packets need to be pre-folded. Large/long flap up, small flap down and sides interlock either way. Does not require a plastic insert and should be used for fragile fragments such as flowers or small specimens. Smaller than the flat and expanding packets. Does not require the addition of a jeweller's tag.



Non-expanding

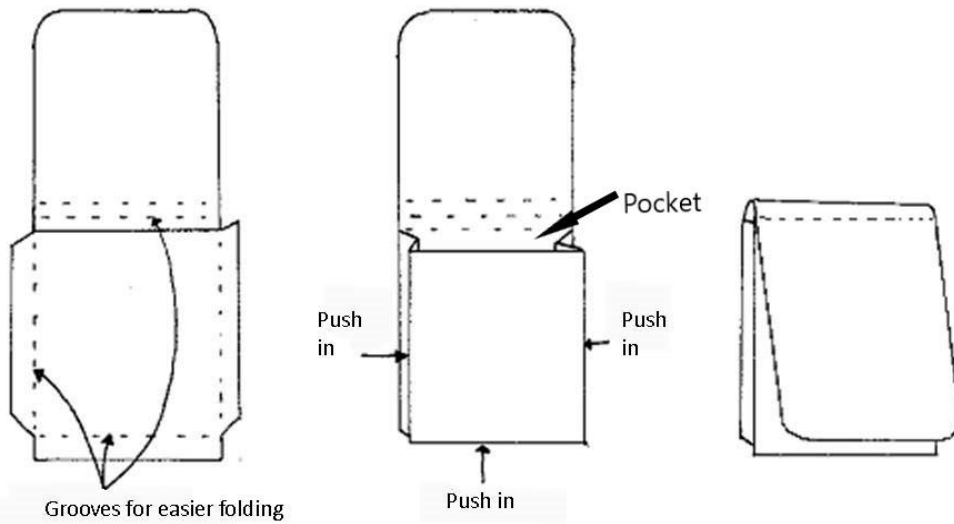


Figure 28. Flat pockets and expanding pockets.

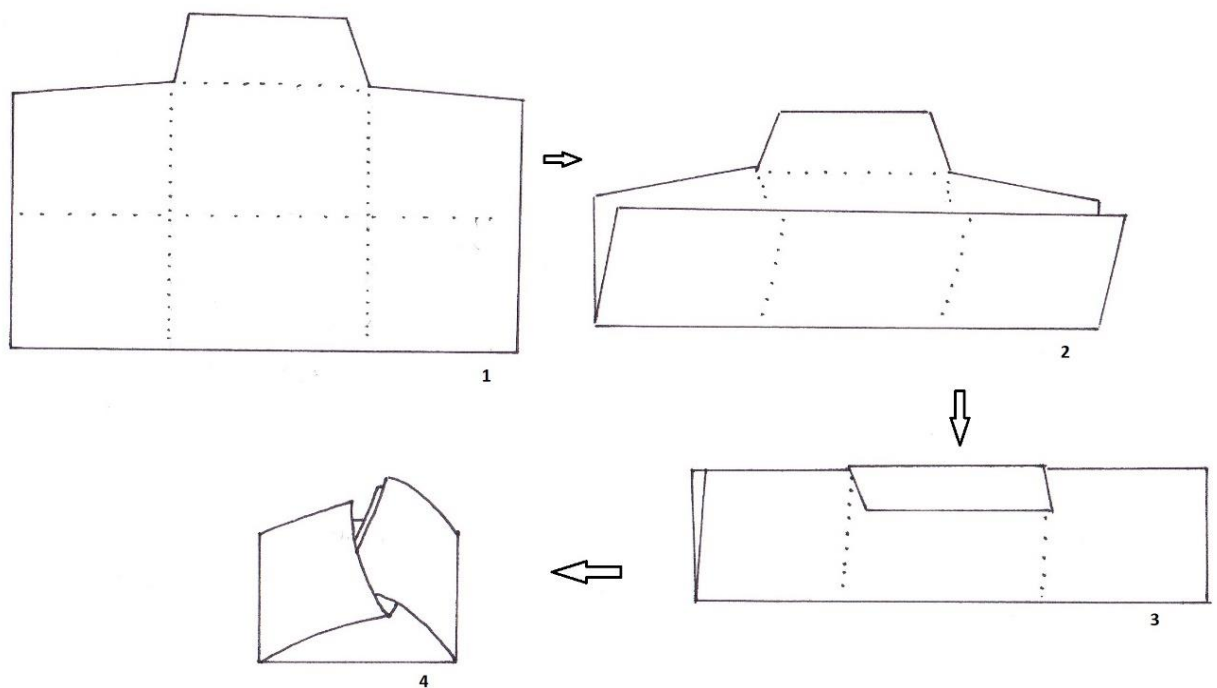


Figure 29. Preparing enclosing packets.

### Positioning and gluing fragment packets

1. Choose a packet that best fits the available space and that can accommodate the fragments.
2. For the flat and expanding pockets, remove the fragment bag, place a small strip of archival PVA glue down the left-hand side on the back of the fragment pocket if attaching to the corner or down the left side of the sheet, glue across the top of the back if attaching along the top or bottom edge of the sheet.
3. For the enclosing fragment packets, place a dot of glue on the back in each of the four corners and place on the sheet. If the packet will cover the specimen, follow the gluing for the pockets.
4. Wherever possible, secure the packet to the top left-hand corner of the mounting sheet.
5. Secure by pressing firmly for a few seconds.
6. In the case where there is insufficient space, the packet may lie over a portion of the specimen, or may be placed on a suitable place on the sheet avoiding the right-hand side of the sheet.

### Packeting fragments

1. **For flat and expanding pockets**, place the specimen fragments into a fragment bag. Write the collector's name and number in pencil onto a pop out tag. This is found on the collecting information provided with the specimen.
2. Place the tag into the fragment bag.
3. Fold the fragment bag neatly so that it fits into the packet without crumpling.
4. Place the fragment bag into the packet (Figure 30).
5. **For the enclosing packets**, carefully place fragments directly into the open packet. No fragment bag or tag is required.

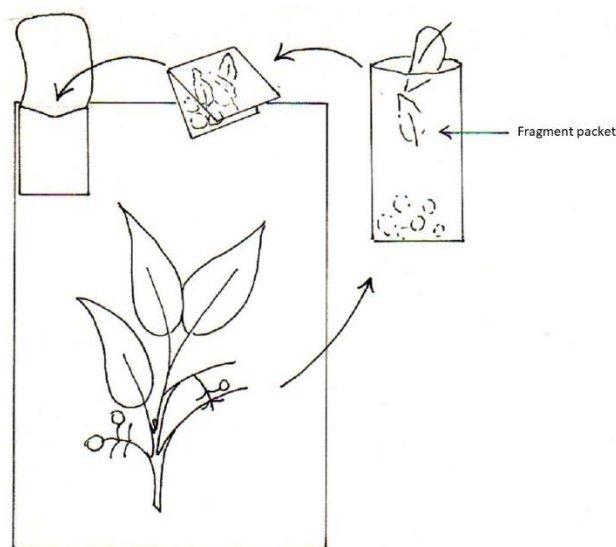


Figure 30. Preparing flat and expanding packets.

### Documents retained with the specimen

Paper based documents provided with the specimen, such as photographs, illustrations and maps, are placed below the mounted specimen within the flimsy.

**Collecting information provided with the specimen must not be glued to the sheet.**

## Finishing the mounting process

### 1. Enclose the specimen in a flimsy

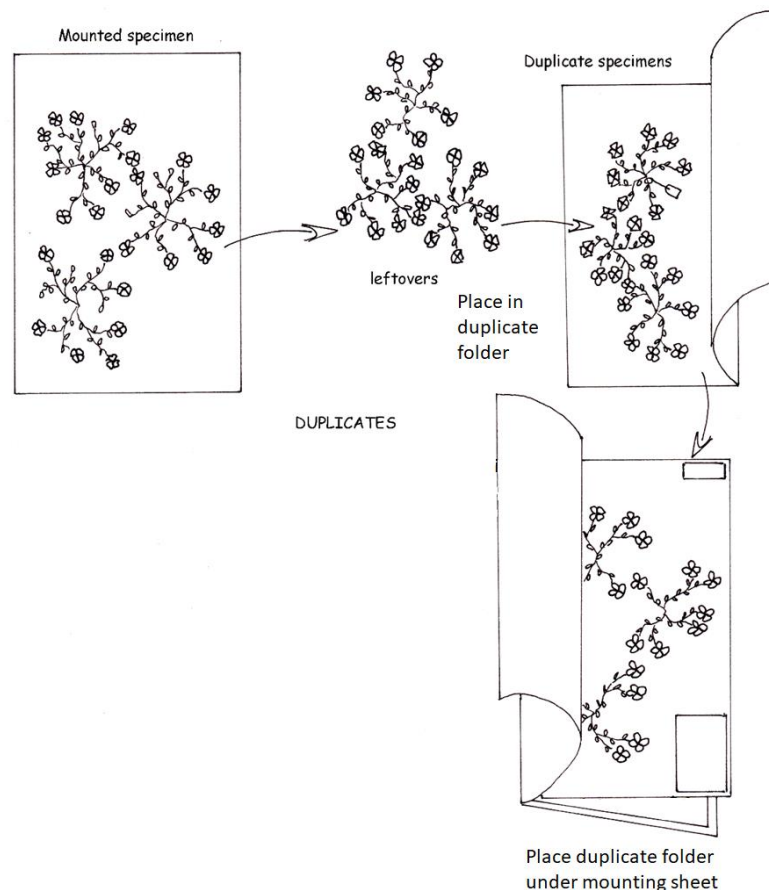
The mounted specimen is enclosed in a flimsy (an archival folder which protects the specimen). In the case of multiple sheets of the same collection (refer to page 13: Multi-sheet), place each specimen in a separate flimsy. To ensure the sheets remain together, file each specimen and their flimsy in order of Sheet 1 of 2, Sheet 2 of 2 etc. under the first sheet.

### 2. Retaining duplicate specimens

A duplicate specimen is material left over once enough material has been mounted for PERTH. The mounted specimen and duplicate/s are temporarily stored together within the same flimsy (Figure 31) until they are distributed to partner herbaria. Previously, cut-down newspaper was used for storing duplicate specimens. Newspaper is extremely acidic and the newsprint can be transferred to the specimens over time. Old flimsies, removed from the collection, while still slightly acidic, are better than newspaper, and are now used to store duplicate material.

- If there is enough material for two or more duplicates, each duplicate is placed in its own flimsy.
- File the duplicate material in the same flimsy as the mounted specimen. Place it under the mounted specimen with the open side into the crease of the flimsy to ensure the loose specimens do not fall out in transit.
- These duplicates are distributed to other herbaria which are known by Herbarium acronyms. Some duplicates may already be assigned to herbaria and this is noted on the flimsy. The most encountered acronyms are Australian herbaria: AD, BRI, CANB, DNA, HO, MEL, and NSW. Common international herbaria include Kew (K), Smithsonian (US), Paris (P), and Naturalis (L).





**Figure 31. Creating and housing duplicate specimens.**

### 3. Annotation slips

If an annotation slip is present, reattach it to the mounting sheet with the collecting information with a plastic paper clip. Annotation slips will be attached at labelling after the specimen has been databased.

### 4. Annotate the flimsy

The last process in mounting a specimen is to annotate the outside of the flimsy with information which aids in the sorting of specimens prior to incorporation into the vaults. The flimsy is annotated with the following information (Figure 32):

- the family code
- first letter of the genus
- specialist name (when applicable)

The family code usually consists of the first four letters of a family (e.g., PROT for Proteaceae), but occasionally it may be five letters. Some taxa are directed to an in-house specialist and the specialists name is annotated onto the flimsy to ensure the specimens are directed to them prior to their incorporation into a vault.

To locate the family and specialist details for a specimen, search for the genus (this is the first Latin name of the specimen) in the *Family Index* available on each desk of the Mounting Room. Write the appropriate information *in pencil only* to the bottom right-hand corner on the front of the flimsy. Please print the information in capital letters, neatly and in normal sized handwriting.

For a multi-sheet collection, only the outer flimsy requires this annotation.

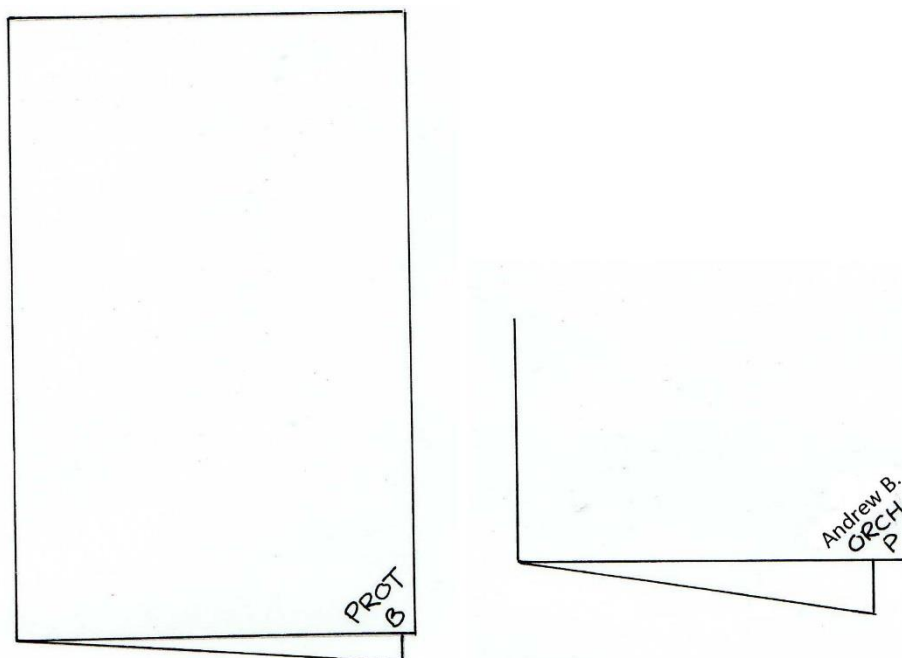


Figure 32. Annotating the flimsy.

## 5. Completed specimens and boxes

At the end of your volunteer session, if the box is not yet completed, place the finished specimens back into the box with a red plastic tray as a separator, and return the box to the shelving in the Mounting Room. Fully completed boxes can be placed in the trolley by the internal windows, ready to go to databasing (see below).

Count the number of mounted specimens and fill out the relevant columns in the Mounting Journal (on the trolley). For multi-sheets count as multiple specimens.

Once a box of specimens has been mounted, the specimens frequently no longer fit comfortably into the original box. Arrange an overflow box with the assistance of the Mounting Supervisor (Figure 33 and Figure 34). **Specimens should not be compressed or forced into a box as this can result in damage to multiple specimens.**

- Divide the specimens into two boxes, the original box and a new box (PERTH red box).
- Annotate the original box label indicating another box has been added to the original box.
- Copy the information on the original label to an *Overflow Box Label*.

- Slide the new label onto the front of the red box.

ACCESSION NUMBER	DATE	CATEGORY	Project: Aster Smith- Calocephalus	
<b>6589</b>	<b>23 September 2019</b>	<b>Lodge</b>		
AFIX STICKER HERE	ELECTRONIC DATA	ITEM No. (e.g. 1/2)	1. OVERFLOW: <input checked="" type="checkbox"/>	4. Mount: Daisy Smith 23/09/2021 <input checked="" type="checkbox"/>
	EXCEL	<b>1/3</b>	2. Forward to: ... <input type="checkbox"/>	5. Database: <input type="checkbox"/>
			3. ID: ... <input type="checkbox"/>	6. Accession d/b: <input type="checkbox"/>
			<input type="checkbox"/>	7. Label: <input type="checkbox"/>
			<input type="checkbox"/>	8. Incorporate: <input type="checkbox"/>

Figure 33. Original Box Label

OVERFLOW BOX			
<ul style="list-style-type: none"> <li>• Complete the red fields on this label with the same information as on the original box.</li> <li>• Write "+ overflow" or tick the overflow check box on the original box label.</li> </ul>	ACCESSION NO.	ITEM NO.	Mount: D. Smith 23/09/2021
	<b>6589</b>	1/3	Database:
	PROJECT: Aster Smith- Calocephalus		Accession d/b:
			Label:
			Incorporate:

Figure 34. Overflow Box Label

## 6. Tidy up

- Sweep the bench area and place all mounting rubbish into the yellow quarantine bin
- Wipe down your work area with 70% ethanol solution using the provided paper towels (spray bottle and towels are available on each bench).
- Place the used paper towels into the yellow quarantine bin.
- Rinse the sponge and petri dish and leave to dry next to the sink in the Curation Laboratory adjacent to the Mounting Room.

## Appendix 1: Mounting Materials

### Mounting supplies

Mounting sheet – archival quality. Three thicknesses of board, regular and thick, for securely attaching the specimen. 300 gsm, 250 gsm and thick board in use.

Flimsies – thin archival folders for covering the mounted specimen. It protects the specimen from damage and collects material that falls from the specimen.

Paper packets - 5 types: non-expanding pocket, expanding pocket, large packet, two sizes of enclosing packets. Packets used for cryptogam specimens can also be used.

Plastic fragment bags for storing small fragments of material (for flat and expanding pockets).

Archival PVA water-based glue for securing packets to sheet.

Cotton thread for mounting specimens.

Polypropylene snap lock bags (assorted sizes) for placing bulky specimens in carpological collection.

Cardboard boxes (assorted sizes) for carpological bags.

Pop out paper tags to be placed in fragment bags.

Transparent archival paper for covering and protecting delicate features.

Archival gum-backed linen tape, stripped to 5 mm width, trim to required length and width.

Old flimsies, cleaned, for temporary duplicate storage.

### Mounting tools

Tweezers/forceps for handling tape.

Small flat sponge and tray (petri dish), moistened with water.

Water squeeze bottle, for moistening the sponge.

Sharp scissors for cutting tape to length or trimming thread.

Brush for cleaning dirty specimens, i.e., removing dried soil from the specimen.

Awl for punching a hole in mounting sheets for stitching.

Needle with adequate eye for sewing specimens.

Needle threader.

Paper clips, plastic or plastic coated for attaching labels.

Sharp pencil (2B) for writing information on tags, flimsies, or mounting sheet.

Tissues for cleaning up.

Latex gloves, dust masks, laboratory coats - available if required.

Mounting mat or corrugated cardboard sheet - an aid in stitching specimens.

70% Ethanol (or isopropyl alcohol) solution to sterilise the work bench.

Paper towels to wipe down the work bench.

### Other tools

Secateurs and sharp scissors for careful trimming of specimens.

**Former supplies**

Cut down newspaper to enclose duplicate material.

3M adhesive tape, 5 mm - long lasting tape consisting of clear polyester film and an acrylic adhesive. Used to secure specimen to the sheet.

Dental floss (white, waxed, non-flavoured).