The Use and Methods of Making a Herbarium/Plant Specimens

An Herb Society of America Guide

Revised Edition 2005

The Herb Society of America
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"Grateful acknowledgement is made to the many friends who have shared their information and experiences." – Frances R. Williams

Special thanks to the Claude E. Phillips Herbarium (DOV) at Delaware State University for the technical standards, methodology and illustrative photos included in this guide. Photos by Lou Calabrese and Susan E. Yost, Ph.D.

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INTRODUCTION

A HERBARIUM is a collection of dried plants systematically named and arranged for ready reference and study. To make a herbarium specimen, the plant is collected, and notes are made about it. The plant is then pressed until dry between blotters that absorb moisture and mounted onto a herbarium sheet with a suitable label. A garden club should find it of interest and value to make a specialized herbarium of special kinds of plants, such as plantain-lilies, ground covers or herbaceous plants with variegated foliage. These collections could be made in triplicate, so that sets could be lent to other clubs. Interesting items might even be found that would be of value to large herbaria, such as Harvard's Gray Herbarium which has over 5,000,000 specimens and the New York Botanical Garden with over 7,000,000 specimens. The procedures outlined in this publication for the preparation of herbarium specimens are intended for the beginner and the amateur who are just starting the pressing and mounting of plants for a herbarium.

"There is special need of [herbarium] material of cultivated plants" (1). "There are few collections of pressed specimens of plants embracing the wide range of horticulture and there should be more of them… [A herbarium] is like a reference library and it enables a nurseryman to keep his stock true to name" (2). Collectors should learn to make excellent specimens, and there are reasons why excellent specimens are needed. A herbarium is a "Hortus siccus" or "dry garden" and is used for study by botanists and students; they want as good material as possible to study. Plants are often collected in far-off places and sent thousands of miles away from where collected to be studied and correctly named. Such a study may be carried on many years later than when the collection was made so that the best kind of dried plants are necessary. The collector in the field should make note of many details that will be unknown to the botanist who studies the plant, especially describing characteristics that vanish during drying. It will be of great help if the collector can give a word picture of the habits of the plant and its habitat; "as a graceful, colorful herb in a meadow, or as a high climbing vine decorating the jungle margin, or as a huge smooth-trunked giant of the tropical forest" (3). "It is not often possible to obtain fresh specimens of related kinds at the same time for comparison; they do not last long; memory soon becomes dim and faulty…Crumbled, twisted, broken, bunched and scrappy material is not worthy of the name of botanical specimens" (1). "Most species of plants were first described from dried specimens and if we were obliged to make diagnoses from living subjects alone, the plants of the world would yet be mostly unknown" (1).

"New species should be described only from good collections. Many a collector has not had his name associated with a species which he was the first to collect because his specimens were poorly prepared" (3). If a person has a plant that he/she wants named by a competent botanist, it is only fair to the botanist to send him/her good dried material, and not just one or two leaves, as are sometimes sent to many herbaria, to be identified. A collector should gather at least two specimens of each plant if it is unknown, one to be sent to a botanist for identification, so that the person who identifies them can keep one specimen in return for the service of naming them. Complete copies of all field notes should go with the specimens. Such specimens are sent unmounted. The set, retained by the botanist who names it, is called the "determination set." Number the plants collected, and refer to each plant by its collection number. A collection is one gathering at one time, from the same plant or a group of absolutely the same kind of plants. Different hours of the day will affect some flowers, and make them appear different to the collector.

A botanist may report his/her work in some publication and give his/her collection number for that plant. Then each institution that has a duplicate of that number knows just what specimen is described and can check it in their herbaria. The specimen of the plant that first and originally receives the name becomes the "type specimen" to which all others are compared. For instance, whether a *Melissa officinalis* is the true plant may only be determined by comparing with the type specimen in the Linnaean collection. "In the last analysis and wherever critical judgment is required, files of dried herbarium specimens are the only solution" (4).

PROCEDURES

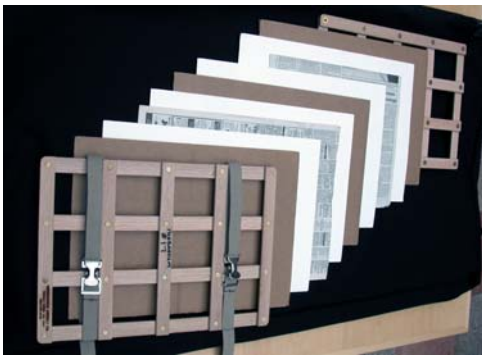
During the collection process, notes should be kept in a notebook under the collection number of that plant specimen. The notebook or field labels, that could later be attached to the mounting sheet, should be used to document the scientific name of the plant, habitat, place, date, height, color, sap, sun or shade, smell, maybe taste, annual or perennial, owner of the garden if a private place, the collector's name, the specimen collection number and any other information that is important. The plants can be brought back in a plastic bag, a canvas bag, a large cloth, or in pails with a few inches of water in them. Moistened newspapers in the plastic bag will help to keep the specimens fresh for some hours.

Tools needed for collecting are a trowel, clippers, a sharp knife and a small pick. In noting the heights of plants, it is convenient for the collector to use himself/herself as a gauge and know how high is his/her knee or shoulder and what is the stretch of his/her fingers. At times, collecting is done in a hurry; in such cases, going through a garden when specimens and their names are being given rapidly to the collector, it is convenient to have at hand, tags that fasten with wires. On these tags can be scribbled the name and a hasty note about the plant. An old thick ledger with specimen-papers between its pages can be carried under the arm when visiting gardens, and cherished plants put into a press before they wilt in the hand. The ledger and specimen-papers will tie up tight with heavy string and serve as a temporary press.

Plant specimens collected should fit the standard herbarium mounting paper, 11½ x 16½ inches. If the plant is small, the entire plant is collected; large plants should include plant parts that show the habit of growth. Extra blossoms, fruits, and some of the root to show the way the plant grows are desirable. A second collection later in the year, to be mounted on a separate sheet, may be necessary to get fruit.

Plants prepared for a herbarium should be pressed flat and dried as quickly as possible. The faster they dry, the better the color; and rapid drying under pressure produces specimens that often keep their color for many years. Just before placing in specimen-paper (blank newsprint is excellent for specimen-papers, or folded newspapers can be and often are used), the plant may be shaken gently to shake the leaves back somewhat into their normal position. Arrange the plant within the specimen-paper, keeping in mind the herbarium sheet dimensions (in general, a specimen that will fit within a folded newspaper will also fit a standard herbarium sheet). On one side of the specimen-paper, the plant is spread out carefully. A pleasing arrangement must be made at this time, as only minor changes can normally be made after the plant is dry. If the specimen is too tall for the sheet, make sharp bends in the stem so that the plant fits the sheet and shows some of the underside of the leaves. The other side of the specimen-paper is folded over the specimen; there is then paper above and below the plant. On the outside of the specimen-paper, along the edge, write the specimen collection number and scientific name of the plant (see photo on page 15, under “basic tools”).

The specimen-paper and the enclosed specimen are never separated until the dried plant is finally fastened to the herbarium mounting sheet and the information from what was originally written about the plant is copied onto the label. The specimen-paper and the plant, enclosed, are treated as one unit and dried together. The blotters should be some kind of paper that absorbs moisture. Several changes of the blotters may be necessary before the plant is dry. If necessary, make any plant re-positioning arrangements at the first change of blotters. Corrugated cardboard helps very much when used between blotters and acts as ventilators. A stack of plants are placed in the wooden press as follows (see photo right): a piece of corrugated cardboard, a blotter, the specimen-paper with the plant inside, another blotter, another piece of corrugated cardboard,



a blotter, another specimen-paper and so on.

The press wooden slats, crossing both ways, are placed at the top and bottom of the press. A press is built up to about 18 inches in height and strapped tightly with two straps. When drying, the press is positioned so that the corrugated cardboards allow the air to be drawn through the press; normally this is accomplished with the corrugated channels being vertical when the press is placed on its longer side edge. The straps should be tightened again as the plants dry. Plant specimens may also be pressed using blotters and weights (heavy books or rocks); three or four corrugated sheets should be put at the bottom of the pile to protect the floor or table. Also, plants could be pressed and dried quickly in a closed car on a hot summer day. In addition, a simple drier can be constructed with light bulbs or with a small portable space heater as a source of heat with the plant press suspended above. Some specimens will take a short time to dry and some will take weeks. If no artificial heat is used, the blotters may be changed every day at first, then not so often. If arrangements with artificial heat are used, some specimens get dry in one day. If not careful, specimens can become too dry and brittle when too high artificial heat is used, causing some species to get "cooked." After the plant specimen has been dried and pressed, the specimen label should be prepared by the collector and placed inside the specimen-paper along with the plant specimen (see photo above).

After pressing and complete drying, plant specimens should be frozen to kill insects in the specimens; freeze at –20°F (–29°C) for 2-5 days. The specimens are now ready to be gathered together and held for mounting.

Herbarium mounting paper of 100% acid-free, rag paper (archival) should be used for mounting herbarium specimens. Only one specimen collection number should be put on one sheet. The label with full information is glued at the lower right-hand corner (see photo right). A thin Sharpie® pen is useful for writing out the labels; however, computer-generated labels are even better. The label should also be made of 100% acid-free, rag paper, about 3" x 4" in size and may have a printed heading. It is glued to the herbarium mounting sheet with an acid-free (archival) glue (the same glue used to mount the plant specimen) before the specimen is mounted. The glue for the label should be put in a fine line along the edges and in the middle of the label; if too much glue is applied, it will cause the label and herbarium sheet to warp. The archival glue may be diluted with water; the thickness of the glue must be learned by experience, but when it makes a thin thread, it is about the right consistency. Note: The DOV Herbarium stamp is shown in the upper left corner.

Two methods of mounting plant specimens, provided by Dr. Arthur O. Tucker, Co-Director of the Claude E. Phillips Herbarium (DOV) at Delaware State University, in Dover, Delaware, are described in attachments #1 and #2 of this procedure. The first one is the Spatula & Needle Method and the second is the Dip-Method. Also, photos depicting the more important mounting steps are shown in attachments #3 and #4. In addition to using glue, gummed linen tape may be used to attach thick plant parts to the herbarium paper. The tape is cut in appropriate lengths and widths sufficient to hold the thick plant parts securely to the mounting paper; they should be made tight by tucking against the left side of the stem, carried over the stem and against the right side before the final tucking/sticking on the right of the stem (i.e., the final shape of the tape around the stem should be a “C,” not a “U”). Small envelopes/packets, for keeping extra/broken pieces of the specimen, are useful and should be glued to the herbarium mounting

paper in one of the remaining corners with the opening of the packet flap towards the plant; these should be folded from 100% rag paper**.** Little lumps of glue that drop onto the herbarium paper should be removed quickly by blotting with a paper towel and/or scraping off gently with a spatula.

Note: Plant mounting techniques vary somewhat in both procedure and level of detail between herbaria and collectors.

Genus folders of heavy manila paper are needed to hold and file the specimens and keep the specimens from breaking. The genus folders, with the completed specimens enclosed, are placed on shelves within a herbarium cabinet (preferably a sealed, metal cabinet; see photo right), and it is better if the stacks are not over 6 inches high.

In conclusion, when plant specimens are pressed, "The skill, discrimination and good taste with which these operations are accomplished will be clearly manifest in the dried specimen. The collecting and preparation of botanical specimens can be an art. Accomplishment in it should be the wish and pride of every collector/preparer. Excellent specimens are not the product of laborious effort. They are the result of thought and care during simple operation, and they are the result of practice" (3).

LITERATURE CITATIONS

1. Bailey, L. H. 1924. *Manual of cultivated plants*. New York: Macmillan.
2. Bailey, L. H. 1935. *Standard cyclopedia of horticulture*. New York: Macmillan.
3. Johnston, I. M. 1939. *The preparation of botanical specimens for the herbarium*. Jamaica Plain, MA: Arnold Arboretum of Harvard University.
4. Svenson, H. K. 1935. *The preparation of herbarium specimens*. Brooklyn Botanic Garden Leaflets, series XXIII, no. 4. New York: Brooklyn Botanic Garden.

BIBLIOGRAPHY ON HERBARIA AND PLANT COLLECTING

Brayshaw, T. C. *Plant Collecting for the Amateur*. Victoria, British Columbia: Royal British Columbia Museum, 1996.

Bridson, D. and L. Forman. *The Herbarium Handbook*. Rev. ed. Kew: Royal Botanic Gardens, 1992.

DeWolf, G. P. “Notes on Making an Herbarium.” *Arnoldia.* 28 (1968): 69-111.

Johnston, I. M. *The Preparation of Botanical Specimens for the Herbarium*. Jamaica Plain, MA: The Arnold Arboretum of Harvard University, 1939.

Macfarlane, R. B. *Collecting and Preserving Plants.* New York: Dover Publications, 1985.

Massey, A. B. *Plant Collecting: An Enjoyable Hobby*. Washington, DC: National Wildlife Federation, 1940.

Metsger, D. A. and S. C. Byers, eds. *Managing the Modern Herbarium: An Interdisciplinary Approach*. Washington, DC: Society for the Preservation of Natural History Collections, 1999.

Savile, D. B. O. *Collection and Care of Botanical Specimens.* Ottawa: Research Branch, Canada Department of Agriculture, 1962.

Smith, C. E. *Preparing Herbarium Specimens of Vascular Plants*. Agriculture Information Bulletin 348. [Washington]: Agricultural Research Service, USDA, 1971.

Stuessy, T. F. and S. H. Sohmer, eds. *Sampling the Green World: Innovative Concepts of Collection, Preservation, and Storage of Plant Diversity*. New York: Columbia University Press, 1996.

Taylor, G., ed. *Plants*. 6th ed. Instructions for Collectors, no. 10. London: British Museum (Natural History), 1965.

Tehon, L. R. *Pleasure with Plants*. Illinois Natural History Survey Division Circular 32. Urbana, IL: Illinois Natural History Survey Division, 1952.

ATTACHMENT #1

THE SPATULA & NEEDLE METHOD (S&N) STANDARDS FOR MOUNTING PLANT SPECIMENS

A. INITIAL STEPS IN MOUNTING SPECIMENS

- Conduct all work in appropriate work area using archival herbarium mounting paper/sheet.
- Always place cardboard backing under herbarium mounting paper/sheet.
- Obtain plant specimens, still in original newspaper/plain paper, from top of manila folder.
- Carefully open newspaper/plain paper containing plant specimen and label; watch for loose segments (seeds, leaves, etc.), and carefully remove specimen from newspaper.
- If specimen is too voluminous for one mounting, consider/ask if excess plant material should be kept for a duplicate mounting. If a duplicate is decided, make a copy of the label using archival paper; however, make only one mounting, and preserve the extra plant material in the original newspaper (write the word "duplicate" on the outside edge) along with the copy of the label; hold as a duplicate.
- Packet containing plant parts may already be in newspaper.
- Place label in lower right corner.
- Make sure you keep sufficient space for packet; one way to do this is to initially place the packet in its preferred position in the upper left, the next being in the lower left corner, then in the upper right corner, finally wherever it fits.
- Arrange/orient the specimen on mounting paper, displaying flowers and wide leaves in prominent positions (this step is very important); preferably with roots down and flowers up; try to keep thick plant parts, like flowers, in the center to left side of the paper.
- Make sure sufficient space is maintained above label for possible future annotation label(s).
- Arrange specimen diagonally, if possible, thus allowing more space above label for annotations and clear space near packet opening.
- Packet fold must be toward the plant thus allowing any contents, if spilled, to fall towards the plant specimen; place packet sufficiently away from plant, so unfolding it will not damage specimen; leave a narrow, even space between edge of mounting paper and edge of packet.
- Do not remove old leaves; they should be less prominently displayed, possibly tucked under rest of plant; small broken-off plant parts should be placed in packet.
- Remove excess soil/foreign material from plant by tapping/poking soil area lightly with needle.
- Use weights (metal washers, size ½-inch, or other suitable objects) to hold/position specific parts of plant in place, if necessary.
- Entire plant must fit within edges of mounting paper; do not place plant parts too close to the edge of the paper.
- Avoid clumping of plant parts; spread plant out for better display (an important step!), being careful not to break plant.
- Try not to cover herbarium stamp in upper left corner; if you must cover, do not glue directly over stamp.

B. GLUING THE SPECIMEN

- Glue the label (virtually even with edges of the mounting paper but not overlapping the edges) using a very thin bead of glue near the edges and in the middle of the label (too much glue will cause the label and specimen paper to bow upward while drying); glue the packet, also using a small amount of glue, not too close to the edges; apply weights to label and packet to secure.
- Using the least amount of glue is best; avoid the “plastered down”/“over-glued” look.
- Best to apply glue (polyvinyl alcohol) to underside of plant with spatula instead of directly from glue container (better control); however, stiff plants may allow direct gluing.
- The primary tools used are the spatula and needle (angled point), but keep forceps and towels handy; use needle tool to position/lift plant; don’t put too much glue on spatula at one time to avoid glue splatter on specimen/herbarium paper.
- Consider gluing base of plant or reproductive parts first, then work systematically towards the opposite end of the plant.
- The entire plant surface does not have to be glued; most plant parts can be secured by spot gluing under plant parts and some by placing under other glued parts; also, have at least one leaf of the plant with the underside showing.
- Don’t glue plant over herbarium stamp, packet or label; thin plant parts need very little glue; by maneuvering/tilting the spatula, less glue can be applied to the plant; avoid using excess glue; apply weights on top of plant parts to make sure glue contacts paper securely.
- Do not allow weights to touch glue to avoid having the weights stick to the plant/paper; use as many weights as necessary to hold the plant parts down, i.e. double/triple/etc.
- Don’t try to glue every loose plant part during the first gluing; time can be saved, and any loose parts can be glued during the touch-up phase.
- Check newspaper to see if any plant parts remain; if so, place in packet (do not dispose of any plant parts).

C. GLUE-DRYING PROCESS

- Handle mounted specimens by cardboard sheet only.
- Place mounted specimens in designated drying area(s).
- Place set of wooden blocks at each corner, mid-point, and center of mounting paper/cardboard; be careful not to damage specimen.
- Stack next completed specimen on top of blocks, and place wooden blocks on completed specimen.
- Do not stack completed specimens too high (12 maximum).
- Place cardboard sheet on top of completed stack.
- Drying process is normally completed by 24 hours.
- After drying period, break down the stack, removing blocks and weights very carefully.
- If weights stick, lift gently sideward while holding down plant to prevent plant damage.

D. "FLIP-OVER" TEST

- Accomplish test after drying period/break down.
- After removing blocks/weights, gently turn herbarium specimen paper and cardboard sheet over, holding the sides, without bending the specimen paper.
- Observe any plant parts which may flop downward.
- Apply minimum glue to those parts which flop (touch-up), and place specimen in drying area, if necessary.
- If no flopping occurs, specimen is good; carefully remove cardboard sheet; the specimen is now ready for filing.

E. SOME IMPORTANT THINGS TO BE CONSIDERED

- A specimen to be mounted is not just any plant; it is special. Much prior effort has already been invested in collecting, pressing, identifying, labeling, and drying the plant; mounting will be the final step prior to filing into the herbarium. It represents the final product and is what people will see and judge as your work.
- Take pride in your work. It reflects on you and the herbarium. Be interested in and enthusiastic about your work. Quality is most important and is measured by conformance to the above standards. Neatness counts; minimize smudges. If unsure of anything, ask questions.
- Keep your work area neat and clean; always clean up your work area when finished. Put away all tools after cleaning them. Make sure glue containers are closed. Always put remaining unfinished specimens away in cabinets. Keep tools clean, and share as necessary.
- If asked to demonstrate mounting procedures to visitor(s), do so in a confident, enthusiastic, and courteous manner. Be proud of your work.

Prepared by Lou Calabrese
Claude E. Phillips Herbarium (DOV)
Dover, Delaware
as of 7 April 2005

ATTACHMENT #2

THE DIP-METHOD (D-M) STANDARDS FOR MOUNTING PLANT SPECIMENS

PREFACE:

The primary purpose of implementing the D-M was to **increase the rate of mounting specimens**. The D-M described herein is primarily used on those plant specimens with broad plant parts, dried to a rigid/ stiff structure, and not too large. However, plant preparers/mounters who have become more proficient with this method may be able to use it to mount all types of plant specimens.

PREPARATION:

The following items are necessary and should be assembled prior to mounting plant specimens: a large quantity of plant specimens to be mounted, a wooden plant press, **Missouri type herbarium glue** (archival), a large metal/plastic tray, heavy-duty aluminum foil, a small paint brush, a water container/ container mat (paper towel), large forceps and sufficient amounts of herbarium mounting paper, cardboard spacers, wax paper sheets, and packets.

MOUNTING PROCEDURES:

- Conduct all work in appropriate **work areas** allowing enough space to handle/process all necessary materials and equipment.
- Wrap the heavy-duty aluminum foil completely over the metal/plastic **tray**; the tray should be large enough to accommodate entire plant specimen without having to reposition the plant in order to obtain sufficient glue coverage.
- Use only plant specimens that meet the “broad plant and rigid/stiff, and not too big” **criteria**; more proficient plant preparers/mounters may use other types of specimens.
- Always place herbarium mounting paper onto a **cardboard sheet** prior to mounting. If specimen is too large for one mounting, consider/ask if two **separate mountings** should be made or one held as a **duplicate**; if duplicate, photocopy the label prior to gluing, using archival paper, and retain excess plant material and label copy in original newspaper, marking along the outside edge of the newspaper the word “duplicate.”
- Place **label** in lower right corner of herbarium paper. Place a **packet** in its preferred position just below the herbarium stamp (upper left corner); if specimen prevents locating the packet there, place it in the lower left corner or top right corner. If still no room, place packet wherever it may fit.
- Prior to gluing, establish how the specimen is to be **oriented** on the herbarium paper. This is a critical step and will greatly influence how well the mounting is accomplished. Place flowers/ fruits/seeds in a prominent position, preferably in the center to upper left portion of the herbarium paper. Make sure sufficient space is maintained above the label for possible future annotation label(s) and also adjacent to the flap opening of the packet. Consider arranging the specimen diagonally (lower left to upper right) thus allowing more space above the label and away from the packet.
- When positioning the packet, always place packet opening fold toward the plant specimen (thus allowing any contents, if spilled, to fall towards the plant specimen), never facing outward and as far away from any plant parts as possible. Maintain a narrow, uniform space between the edge of the herbarium paper and the edge of the packet.

- Remove excessive soil, **foreign material/debris**, etc. from specimen by tapping/poking away the soil/debris gently using a needle, without damaging the plant specimen.
- Entire plant **specimen must fit** within the edges of the herbarium paper; stay away from the edges as much as possible. If necessary, carefully bend/reposition plant parts to fit well within the edges. Ensure both sides (top and underneath) of the plant are visible. If you must cover the herbarium stamp/label, do not apply glue directly over the stamp/label. If the packet must be placed over a plant part, do not apply glue directly over the plant.
- Place a small amount of Missouri type **glue** on the foil, and spread over the tray area using the paint brush. Dilute with plenty of water to obtain a very thin, even, glue film surface. Missouri type glue is extremely strong so use only a small amount, and add plenty of water. This will result not only in better surface-to-surface contact but also conserve glue. Keep in mind the quantity of specimens to be mounted when adding additional glue, so that the last specimen to be glued is completed with the very least amount of glue remaining in the tray, thus preventing waste.
- Remove the plant specimen from the newspaper with large forceps. Carefully "drop" the **specimen into the glue** on the tray. Gently pat down with your finger or forceps any plant parts sticking up, especially the outer plant part tips, to ensure good glue contact. Do not drag the specimen through the glue (it will cause glue to accumulate on the top and edges of the specimen). Use the large forceps to pick up the plant specimen gently out of the glue, normally positioning the forceps near the center of the specimen, being extremely careful not to break the specimen since there is a tendency for the specimen to stick in the glue. If it does stick, very gently pull the specimen out in a straight up, horizontal position, and use a spatula to help keep the specimen from drooping. Do not concern yourself at this time if overlapping plant parts do not make contact with the glue; those parts will be glued, if necessary, during the test/touch-up phase. Position the specimen as close as possible above the herbarium paper, and then gently "drop" it onto the herbarium paper. Do not try to rearrange the specimen after it has been placed on the herbarium paper; doing so would cause glue to smear about the paper; however, if plant parts are too close to herbarium paper edges, reposition and blot up any glue residue. Place any broken, small, loose plant parts in the packet.
- Apply a small amount of **glue** to the **packet** using the brush, making sure glue does not come too close to the edges; attach packet in the preferred position if possible. Apply glue to the **label** using a squeeze bottle; use a very, very small amount of glue. It's best to apply glue to the label in very thin, almost invisible beads, and not too close to the edges. Attach the label in the lower right corner of the herbarium paper, virtually even with the herbarium paper edges, but not overlapping them. Check newspaper, which plant came in, to see if any small, loose plant parts remain; if so, place in packet.
- Place the cardboard/mounted specimen onto the bottom half of the **wooden press**, and place a sheet of **wax paper** over the plant specimen. Repeat this step until all specimens have been mounted, lastly placing a cardboard sheet over the last completed specimen followed by the top half of the wooden press. Attach and tighten (not too tight, just snug) the two press straps, and allow specimens to **dry** overnight in an undisturbed drying area.
- After the specimens have dried, **break down** the specimens carefully by removing the top press half, removing the wax paper and conducting the **"Flip-Over" test** by gently turning the specimen over while still on the cardboard sheet. If any plant parts "flop down," apply glue to those parts with a spatula/needle from a squeeze bottle, and weigh down with metal washers (test/touch-up phase). If no "flopping" occurs, the specimen is sufficiently glued. Remove the cardboard sheet; the specimen is now ready for filing.
- Immediately following completion, the **work area** should be **cleaned** as follows: remove and dis-

card the aluminum foil; wash the brush thoroughly with water and dry with paper towel(s); empty and clean/dry the water container; clean the forceps and other tools used; return all materials/ equipment to their proper locations; and clean up any spills and/or debris.

SOME IMPORTANT THINGS TO REMEMBER:

- **Use very little glue**! It makes for better specimen mountings, and it saves money.
- Try not to get glue on your hands; the glue will eventually find its way onto the herbarium paper as unsightly smudges. Use the large forceps to handle specimens.
- More **physical movement** is involved with this method as compared to the Spatula & Needle Method; this additional movement results in person(s) having to remain in a standing, more tiring, position. Working in two-person teams while using the D-M may facilitate and speed up the mounting operation.
- The most critical and most difficult step is the **positioning/orienting** of the glued specimen onto the herbarium paper. The key to best accomplish this is to plan ahead **prior** to dipping the specimen into the glue. Then carefully hold the glued specimen momentarily as close as possible to the herbarium paper just before "dropping" it onto the herbarium paper (using a spatula may help control/position the plant specimen).
- Take **pride** in your work; it reflects on you and the herbarium; people will judge your performance by the quality of your specimens! Always look for better ways to improve your results.
- **Quality** remains the main objective in mounting your specimens. The D-M procedures provide an effective method for increasing the production of mounted specimens without significantly sacrificing quality. It also eliminates the use of stacking blocks and metal washers.

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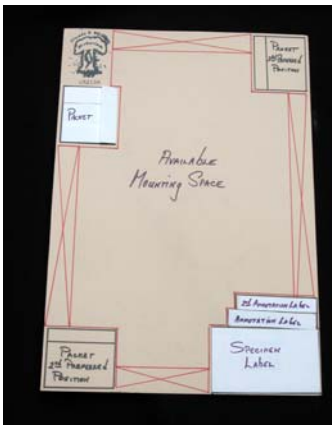
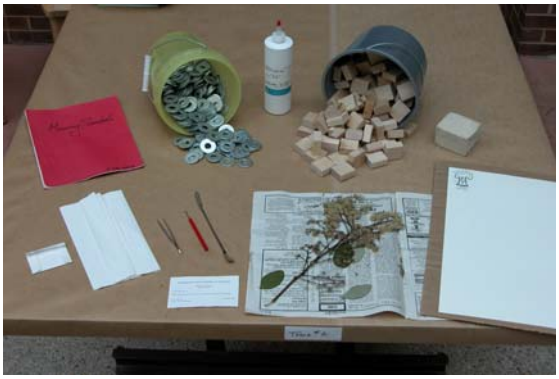
ATTACHMENT #3

PHOTO SEQUENCE OF SPATULA & NEEDLE METHOD



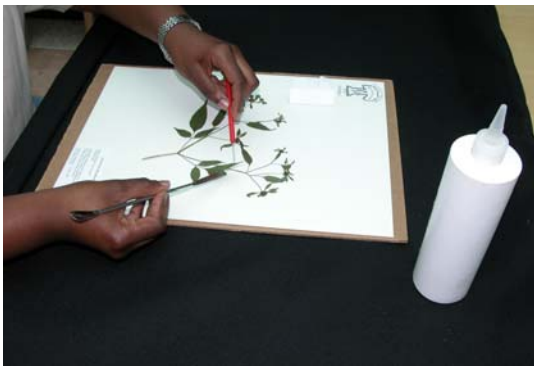
Herbarium sheet training aid showing specimen label location, possible packet locations, annotation label(s) location, desired edge space and resulting available mounting space.

Basic tools: scissor (used only for cutting gummed label tape; never to be used on plant specimen!), spatula, needle (angled), forceps, creasing tool (bone), Sharpie® (fine point), sponge type eraser, and gummed linen tape. Stamped herbarium paper and specimen-paper (newspaper) with plant's scientific name and collection number (lower edge).

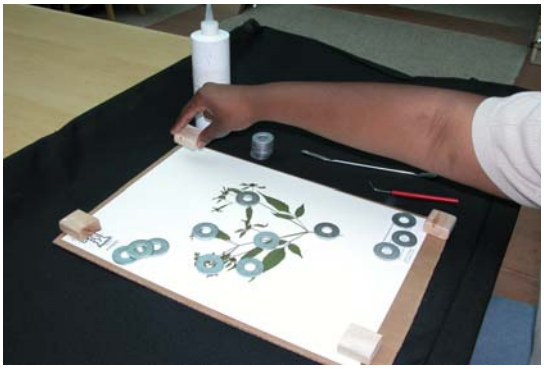


Some additional basic equipment: written mounting standards, metal washers (weights), archival glue (polyvinyl alcohol), wooden blocks, sponge type eraser, packet, towels, forceps, needle (angled), spatula, specimen label, plant specimen in newspaper, and herbarium sheet on cardboard backing sheet.

Orienting a plant specimen by arranging the plant to display its prominent features and making it fit within the available mounting space.



Gluing the plant specimen using the spatula and angled needle; the needle is used to lift the plant part while the spatula applies a small amount of glue under the plant part.



Having completed the gluing of the plant specimen and applying metal washers as weights during the gluing process to ensure sufficient contact with the herbarium sheet, wooden blocks are then placed on each corner (more if needed), to allow stacking while drying and saving space.

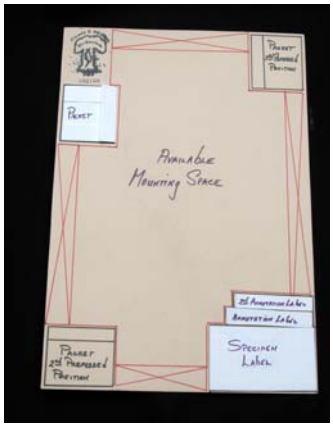
Stack of plant specimens drying, with wooden blocks used to separate each plant specimen/cardboard sheet, preventing herbarium sheets from sticking to each other and also saving space.

The "FLIP-OVER" test being conducted by simply holding the plant specimen along with the cardboard backing sheet and turning both completely over (spread fingers) and observing if any plant parts hang down; touch up with glue and spatula/needle as necessary.

The completed herbarium plant specimen.

ATTACHMENT #4

PHOTO SEQUENCE OF THE DIP-METHOD



Herbarium sheet training aid showing specimen label location, possible packet locations, annotation label(s) location, desired edge space and resulting available mounting space.

Basic tools and equipment: written mounting standards, metal tray covered with heavy-duty aluminum foil, wooden plant press, Missouri type (archival) glue, wax paper roll, aluminum foil roll, water container with brush, spatula, forceps, specimen label, packet, newspaper with plant specimen, and herbarium paper on cardboard backing sheet.

After first determining how the plant specimen will best fit onto the herbarium sheet, carefully dip the specimen into the glue using large forceps to hold specimen, and gently pat the specimen into the glue with the forceps or finger.

After dipping, carefully lift the plant specimen out of the glue; lower it close to the herbarium sheet/ predetermined position; and carefully "drop" the specimen onto the herbarium sheet. Minimize any further movement of the specimen to prevent glue smears.

After the plant specimen has been "dropped" onto the herbarium sheet, place a wax paper sheet over the specimen, and place the herbarium paper with the cardboard backing sheet onto the bottom half of the wooden press. Continue to stack completed herbarium sheets/wax paper with cardboard backing sheets on top of each other (without using washers or wooden blocks) until finished; then cover with final cardboard sheet and the top half of the wooden press. Apply both press straps and tighten (not too tight); allow to dry overnight.

The "FLIP-OVER" test being conducted by simply holding (spread fingers) the plant specimen along with the cardboard backing sheet and turning both completely over and observing if any plant parts hang down; touch up with glue and spatula/ needle as necessary.

The completed herbarium plant specimen.