

What to Do with an Unknown Specimen: Preparation & Storage of Vouchers

Workshop on Invasive Species

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INTRODUCTION

Properly prepared voucher specimens are fundamentally essential in documenting occurrences and distributions of plant species. The specimen itself is permanent, verifiable, and tangible evidence, and its label provides geographical, ecological and other kinds of data. Voucher specimens should be deposited in an officially recognized public herbarium, where they will provide a permanent record and will be available to other researchers. An herbarium is a collection of dried plant specimens, a permanent repository of specimens and data, and most state universities support an herbarium. Each specimen is a “voucher” providing a permanent record of the occurrence of a species at a particular geographical location. Specimens without geographical data are of limited use. Herbarium specimens will last indefinitely if properly cared for and protected from water, humidity, and a variety of pests, mostly insects and fungi.

PREPARING VOUCHER SPECIMENS

The following steps are normally involved in preparing a voucher specimen from start to finish: (1) locate the plant, (2) prepare the plant for pressing, (3) record geographical and other data in the field notebook, (4) press the specimen, (5) dry the specimen, (6) identify the specimen, (7) prepare the label, (8) mount the specimen, (9) apply a serial accession number to the herbarium sheet, (10) sort the specimens, and (11) file the specimen systematically into the herbarium. Most herbarium curators will accept well-prepared, unmounted voucher specimens so long as they include adequate data, and many will take unidentified vouchers in exchange for determinations. Therefore, it is

possible to complete only steps one through five or six and still send the voucher to an herbarium where it will be further processed and properly stored.

RECORDING SPECIMEN DATA. Ideally the following kinds of data would be recorded: geographical data, including country, state, county, and specific locality; ecological data, particularly type of habitat and size and extent of the population; miscellaneous data denoting features of the plant that will not carry over in the finished specimen, such as flower color or plant height; collector's name; collection number, if used; and date of collection. The arrows in Figure 1 indicate data elements that are absolutely essential.

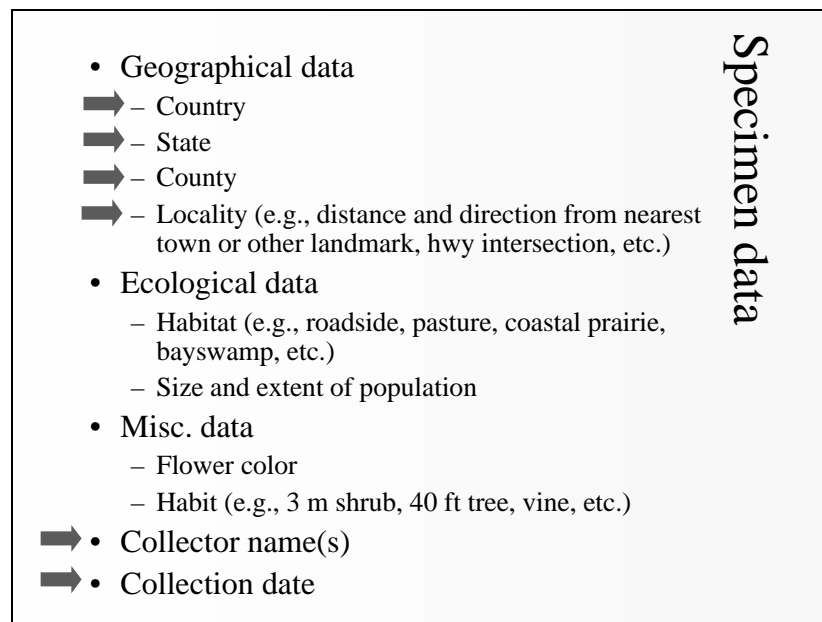


Figure 1. Data elements normally recorded in the field notebook when preparing voucher specimens; arrows indicate essential data elements.

Collection data are normally recorded in a field notebook. The field notebook should be small enough to be conveniently slipped into a daypack and should have a permanent binding and high quality paper. Field notebooks are available from most engineering, forestry, or scientific supply houses. Figure 2 shows how the basic data elements may be organized in the field notebook. Also, after the voucher specimen is identified, its determination is normally recorded in the notebook correlated with a unique collection number. Although a variety of systems are used for designating collection numbers, I recommend each collector begin with “0001” and increase serially with each new voucher collection. Normally, duplicate collections made from the same population at one site are given the same serial collection number. A data sheet for voucher specimens is included in this handout, which should accompany specimens sent to an herbarium without labels.

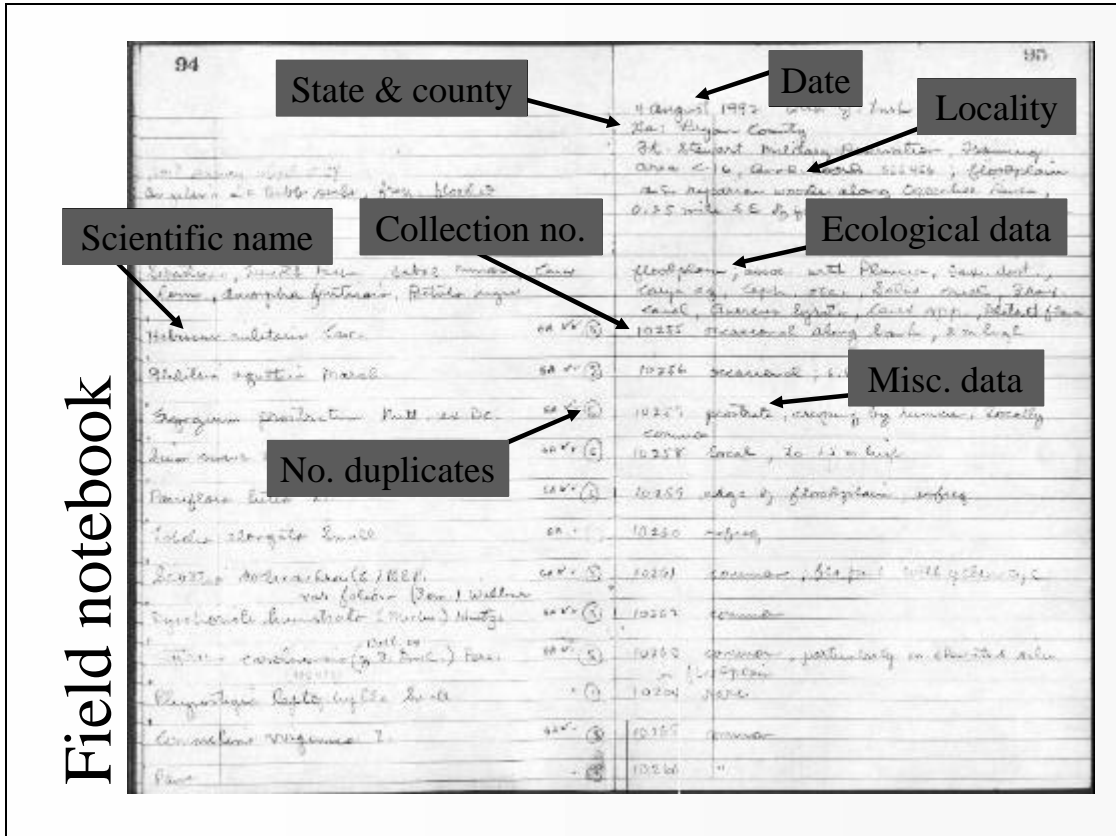


Figure 2. Field notebook showing organization of the basic data elements: date, state, county, locality, ecological and miscellaneous data, collection number, number of duplicate specimens, and determination (scientific name) of voucher.

PRESSING SPECIMENS. Voucher specimens are normally pressed enfolded in single newspaper pages. The entire newspaper section (e.g., the sports section) is easily reduced to individual pages by tearing lengthwise in half along the vertical center crease. The collection number is then written along the margin of the folded newspaper page, and the newspaper page with enfolded specimen is then placed between two ventilator-blotter sets in the plant press.

Plant press components may be purchased from scientific or herbarium supply companies. The standard press consists of two straps or ropes, two plywood header boards (½ X 12 X 18 in.), blotters (12 X 18 in.) to absorb moisture from the specimen, and pasteboard ventilators (12 X 18 in.) with channels oriented parallel to their 12 in. edges. The ventilators allow warm air to flow through the press as the specimens are dried. Heavy-duty press straps with parachute buckles are recommended. Figures 3 and 4 show how to construct the plant press and place the voucher specimen for efficient drying.

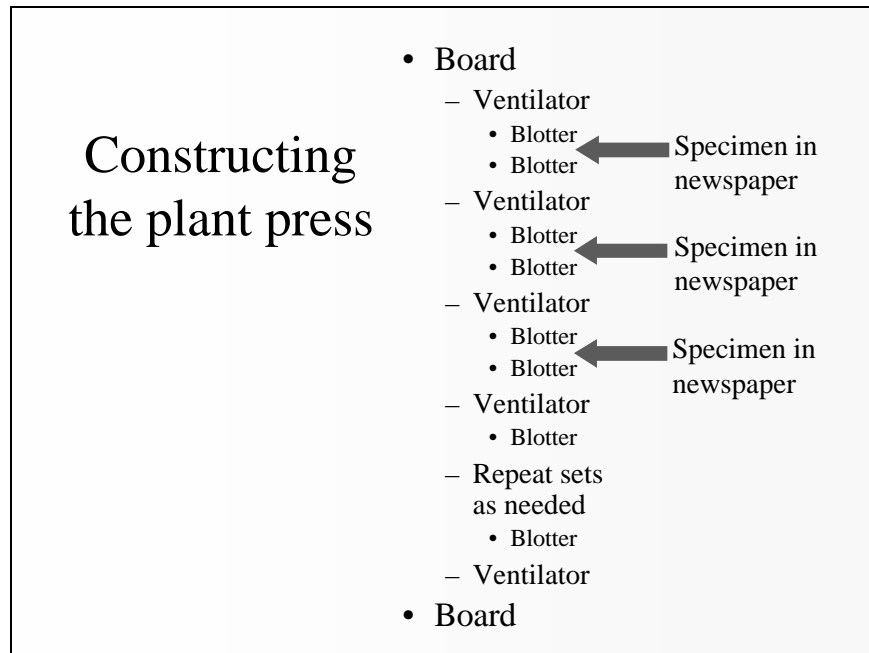


Figure 3. This schematic shows how the press is constructed with each specimen enfolded in a newspaper page inserted between press sets.

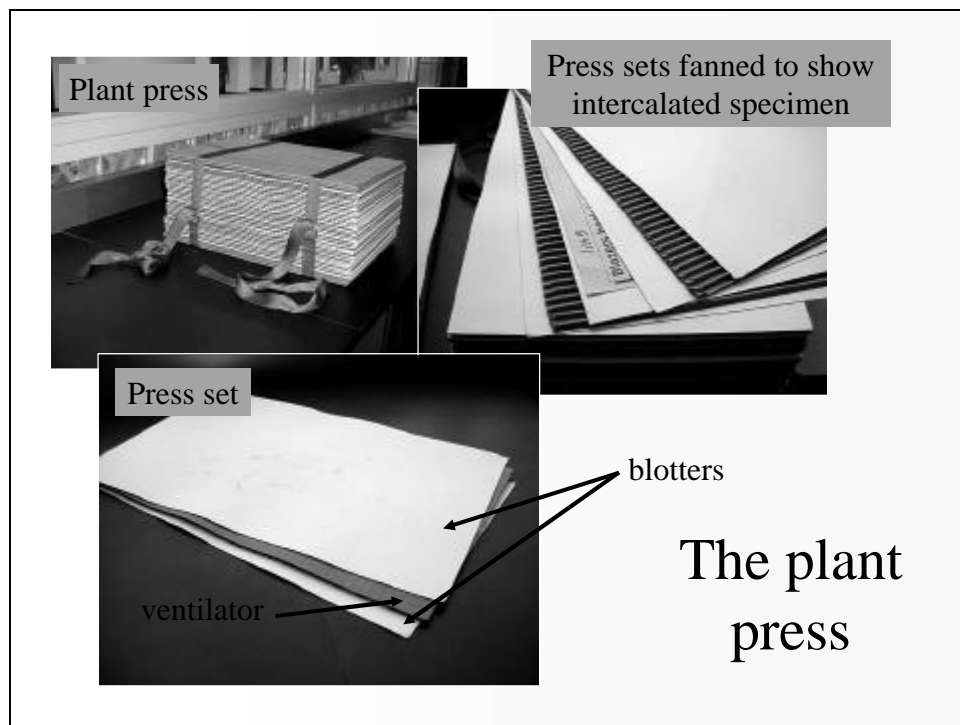


Figure 4. Each press set consists of a ventilator placed between two blotters, and each voucher specimen, enfolded in a newspaper page, is intercalated between two press sets.

ADDITIONAL CONSIDERATIONS IN PREPARING SPECIMENS. The plant base should always be rinsed free of soil before the specimen is placed in the newspaper fold. Ideally, to the extent possible, the appearance of the finished specimen should conform to the living plant. If specimens are too large to fit the newspaper page, their stems and leaves should be carefully broken and folded or cut to fit. Cutting or breaking and folding are preferable to bending the stems, because with cutting or breaking there is normally no doubt about how the specimen was altered during preparation. In contrast, artificial bending of the stem is to be avoided since with bending one cannot so easily discern whether the condition is natural or artificial.

With **small herbs** less than one meter tall, the entire plant is generally preserved. If they are small enough, several plants should be pressed within the newspaper fold. Include as much of the plant base as practical or at least a representative portion of the root system, rhizome, or other subterranean organ. With **larger herbs** the stem may be broken and folded one or more times to fit the newspaper page. If it is impractical to preserve the entire plant, then cut it in pieces and include representative portions: the plant base, a portion of the mid-stem with attached leaves, and the upper stem with leaves, flowers and fruits. If the entire plant is not preserved, then its height should be estimated and recorded in the field notebook. Only representative portions of **trees, shrubs and vines** are preserved. Be sure to include enough of the stem to show the pattern of leaf arrangement. Also, position the leaves to show both upper and lower surfaces, and include flowers or fruits. Break and fold the stems, and estimate the plant height and record it in the field notebook.

Large fleshy fruits can be especially difficult to dry, and they are normally sliced lengthwise into two or more sections before placement into the newspaper fold and press for drying. Large dry fruits and seed cones are not normally pressed. Instead, they are tagged separately with the same collection number as the pressed voucher specimen.

Well preserved voucher specimens with intact flowers and fruits are essential for positive identification, especially of poorly known species, newly introduced non-indigenous species, or other species not represented in the herbarium. Mature fruits are essential for positive identification of grasses, sedges, rushes and similar kinds of plants. Also, characteristics of the plant base are quite useful in identifying such plants. These factors should be taken into consideration in making voucher specimens.

SPECIAL CONSIDERATIONS FOR NOXIOUS WEEDS. During and after collection, every precaution should be taken to prevent dispersal of seeds or other reproductive parts of plants, especially of noxious weeds. This would normally include cleaning of footwear, trowels, mattocks, buckets, or other collecting gear in the field; proper disposal of plastic bags used to hold specimens; and proper housekeeping indoors in areas where specimens are dried and handled.

REFRIGERATING SPECIMENS. Refrigeration is a convenient means of keeping fresh specimens for short periods (several days) when immediate processing is not possible. The fresh specimen should be tied up or zipped into a plastic bag before refrigerating, and precautions should be taken to prevent freezing.

DRYING SPECIMENS. Once the press is assembled with a header board and ventilator on each end, the straps are positioned and tightened. The plant press is then placed on a dryer so that warm air rises up through the ventilators taking moisture away from the specimens as it passes between them. The dryer shown in Figure 5 is essentially

a plywood box open at the top and bottom. Heat, generated by 150-watt incandescent bulbs, rises by convection and passes through the presses above. For increased efficiency and safety, the dryer should be used in a well-ventilated room.

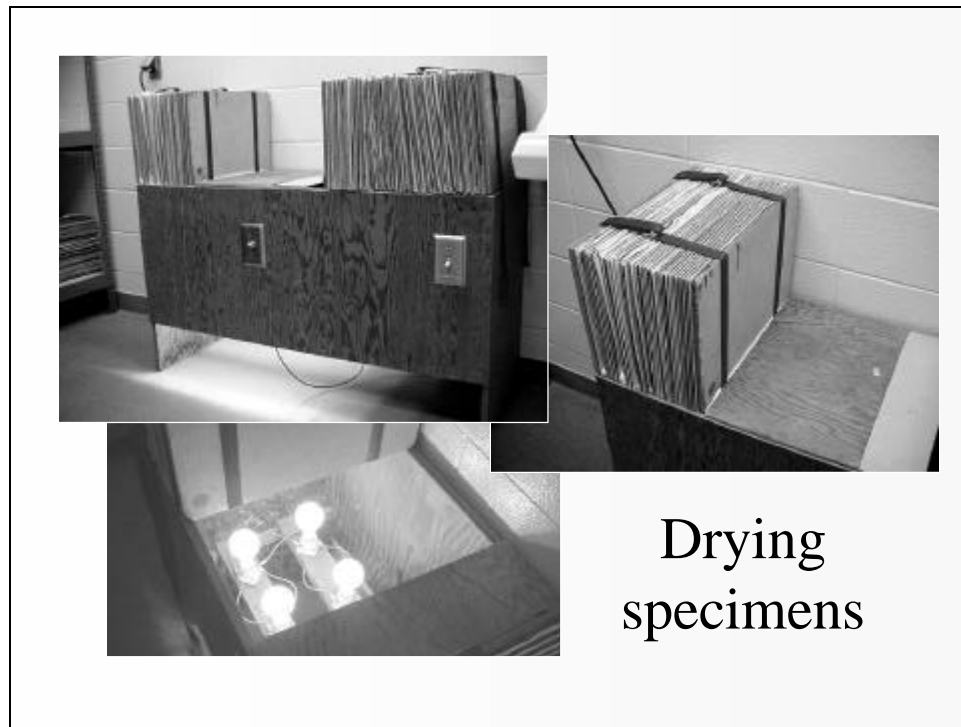


Figure 5. Drying voucher specimens with a simple plant dryer.

IDENTIFYING SPECIMENS. A stereo-dissecting microscope is useful in identifying vouchers. Regional floristic manuals are useful in routine determinations. However, newly introduced, non-indigenous plants present much greater difficulty, and their reliable identification usually requires access to a wide variety of primary literature (e.g., scientific journals, monographs), exotic floras, or the assistance of a taxonomic specialist. Reference specimens in the herbarium are indispensable and greatly facilitate the determination of problematical specimens.

PREPARING LABELS. As shown in Figure 6, data taken from the field notebook are used to prepare a label for the voucher specimen. Labels are printed on archival quality paper. Word processors and databases are widely available, easy to use, and can greatly expedite label preparation. As indicated previously, many herbarium curators accept well-prepared specimens without labels, so long as they are accompanied by adequate data. Included in this handout is a form for recording collection data that should be submitted with voucher specimens in the absence of finished labels.

MOUNTING SPECIMENS. This discussion is not intended to provide complete instructions on mounting herbarium specimens. Instead, its aim is only to give some background about how the dried voucher specimen is processed into a finished herbarium specimen. To insure longevity, only archival quality materials (buffered, neutral pH) are used in preparing herbarium specimens. Archival quality herbarium materials are available from a variety of herbarium, museum, and library supply companies. The dried voucher specimen is mounted on an 11½ X 16 ½ in. sheet of archival quality herbarium

before transfer into the herbarium collection. As an additional precaution, an insect repellent such as naphthalene should be kept in the herbarium cases. If facilities are not available for proper storage, voucher specimens should be sent to an herbarium as soon as possible.

FREEZING SPECIMENS TO CONTROL PESTS. Freezing is a safe and effective means of controlling insect pests in herbarium specimens. Rapid freezing is essential to prevent acclimation of the pest. To insure rapid freezing specimens are frozen in packets no more than 6 in thick, and to reduce condensation problems the specimen packet is placed in a plastic bag prior to freezing. In a conventional domestic freezer, the specimens should be held at a temperature of -18°C or lower for at least 48 hrs. For control of resistant dermestids, refreezing is recommended after rapidly bringing the packet to $15-20^{\circ}\text{C}$. If available, an ultracold (-80°C) freezer is most effective.

SHIPPING VOUCHER SPECIMENS. Unmounted, dried voucher specimens are easily mailed. The dried specimens in newspaper folds are sandwiched between reinforcing pasteboards and secured with tape before posting. Additional pasteboards should be used as necessary for reinforcement. If drying facilities are not available, it is possible to ship a “fresh” specimen. The specimen is first placed within a folded newspaper section (e.g., the sports section, arts section) and then flattened by placing books or other heavy objects on the newspaper section overnight. The specimen still in the newspaper section is sandwiched between reinforcing pasteboards, secured with tape, and mailed. This method should be used only as a last resort, when a plant dryer is not available, and the recipient should always be given a “heads up” before shipment. Following are some additional precautions that should be observed in preparing voucher specimens.

- Don't tape or staple specimens to paper.
- Don't mail fresh specimens in zip-lock or other plastic bags.
- Don't leave specimens in zip-lock or other plastic bags at room temperature for prolonged periods.

SELECTED REFERENCES

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VOUCHER SPECIMEN DATA
Required Elements Shown in Bold at Top of Form

Date of collection:

Collector name(s):

Collection number:

Country:

State:

County (Parish):

Locality (e.g., 3.5 miles west of intersection of Interstate 75 and Hwy. US 84 in Valdosta):

GPS coordinates:

Habitat type (e.g., bayswamp, marsh, pasture, roadside):

Size and extent of population:

Misc. data (e.g., flower color, plant height):

Continue on back as needed.