

The Herbarium and Creating Herbarium Specimens

John Tobe. John.tobe@dep.state.fl.us 850-245-8493

A herbarium is a collection of dried, pressed plants mounted on herbarium sheets bearing detailed data label and stored in a herbarium cabinet in a climate controlled room, preferable one that can be fumigated and one without windows that open. A herbarium can be thought of as a dried plant library, the pages of the books are the sheets of plants. Like a library, the “books” or dried plant specimens are arranged in systematic order by plant FAMILY, e.g. Aceraceae, the MAPLES. The study of the order of plants is called PLANT SYSTEMATICS. To navigate the botanical nomenclature or plant names you must know something about the evolutionary relationships among plant species. Usually the plant families are arranged either alphabetically or phylogenetically (by their evolutionary relationships). Obviously for the beginner an alphabetic order by family would be the best choice. Most if not all University herbaria are arranged phylogenetically.

The herbarium cabinet. The least expensive models are metal with rubberized seals around the doors to keep the humidity constant and help prevent insect infestation. Insects and mold can devastate a herbarium. The cabinet has deep shelves to hold the herbarium sheets. Each shelf “slot” is not very large such that you cannot overstuff the slots. You do not want to force too many sheets into the herbarium cabinet slots as this tends to crush your specimens. When not in use, keep the herbarium cabinet doors closed. Often there is a space for holding mothballs or insecticide on the inside of the door. You can build your own cabinets out of plywood. Make sure you seal the wood with polyurethane or a product that will coat and seal the wood grain. Doors must have rubberized or foam seals. I have seen some really nice homemade herbaria.

One-reason herbaria smell like mothballs is because in the past, most cabinets held a small amount of naphthalene. This was allowed to permeate the specimens and prevent insect damage. The newer, less health adverse insect prevention is to use a method of systematically freezing specimens. A large, deep freezer can accommodate stacks of herbarium sheets. These are placed in tight plastic bags, the bags are important since specimens removed from the cold will not become soggy from condensation.

See herbarium supply company for information about pricing cabinets and supplies.

http://www.herbariumsupply.com/nu_dynamicIndex.asp

Pressing herbarium specimens from fresh plant material. Always bring a field notebook to record important morphologic characters especially those that might be lost when the plant is dried, such as flower color. Each specimen should get its own unique collection number. Record the date, location, directions to site, etc. Fresh plant material can be collected in plastic bags, large containers (these are especially good for aquatic plants) or pressed right on the spot. For most specimens, keep plants moist (and cool if possible) but not soaking. You can label the bags with a sharpie. The idea is to get the plant back to the press without massive wilting which will make it more difficult to position plants for drying in the plant press. Wilting makes it nearly impossible to position large, delicate flowers. Cut, trim or bend specimen to fit on a standard herbarium sheet, you can cut a template to place beneath the specimen or cut the newsprint to the size of a herbarium sheet. Arrange the fresh plant material in the plant press, do this so that the top and underside of leaves will be available for examination. Be careful to arrange floral parts and fruit for easy inspection. Try to be neat and if possible aesthetically sensitive to the plant arrangement. With time you will intuitively know when to bend stems, remove extra leaves, include bark fragments, make cross sections of stems, large fruits and succulent leaves, etc. Cacti and succulents may take a very long time to dry. Typical plant specimens will be dry in a few days in a standard drying cabinet. See below.

Each specimen is placed in a folded sheet of newsprint or any paper large enough to cover most of the specimen. Each newsprint wrapped specimen is then sandwiched between special water absorbent paper

also called a blotter. Sheets of foam are also used to flatten large, bulky material such as fruits, cones, nuts, rhizomes, thickened stems and leaves, etc. The foam can be placed up against the newsprint wrapped specimen. The idea is to create a sandwich of cardboard, blotter, newspaper, specimen, newspaper blotter, cardboard, etc. This is all placed in a plant press and compressed with the plant press straps (not too much). With just enough pressure to flatten the specimens without warping the press and cardboard. Presses are stacked so that the holes in the cardboard are straight up and down. This allows heat to better penetrate the pressed plant specimens. You can make a homemade dryer from plywood by building a rectangular box, open at along two, opposite sides (4 feet x 21 inches x 18 inches deep). Attach wire mesh to bottom open side (cut wire to fit 4 ft x 21 inches), leave the upper side open. These dimensions are easily large enough to handle at least 2-3 plant presses or one very large press. Build a platform about 3 ½ foot long, to which can be added 4 light sockets for 60 watt standard light bulbs, space these evenly along the 3 ½ foot length, place beneath the box you built above, calculate how tall the bulbs will protrude from sockets. Add legs so that the entire box like structure that will house your plant press is at least 10 inches from the top of the light bulbs. You can add a skirt of flame resistant, heavy cloth to help direct the heat up through the plant presses – a warning about FIRE HAZARD, do not position the light bulbs too close to the fabric skirt-keep them in the center of the dryer. I put the light bulbs on timers to burn during work hours so I can watch the dryer and also to make sure I don't burn down anything.

The plant dryer. Fresh plant materials placed in a plant press must be dried so that it can be glued onto a sheet of herbarium paper. A slow gentle drying is the best as this prevents the color of the plants from fading and delicate plant parts are less likely to shrivel. You can make your own dryer with light bulbs and a shelf. The idea is to place the plant press such that the warm air rises up through the press (between the holes in the cardboard) and wicks away the excess moisture.

Mounting specimens. Once you have dried the plant specimen thoroughly you are ready for specimen mounting. There are two schools of technique for attaching the dried plant to the herbarium sheet. One method involves the use of a glass plate which is coated with glue (this is brushed on to give an even coating across the glass – experience will dictate how thick this should be). After coating the glass, place the plant specimen on the glass sheet and gently press into the glue surface. This will coat the underside of the specimen, it can then be carefully removed and placed (glue side down) on a herbarium sheet. This method is great for large amounts of plant material as it is easier to brush the glass after pressing about 10 specimens or so into the glue, as opposed to the more labor-intensive method described next. The other method is probably more time consuming but best for smaller numbers of specimens. In this method you simply place (small globs) glue at selected areas on the underside of the specimen, by hand. You can use the applicator tip on the elmers bottle or a small brush that has been dipped in glue. Always use regular elmers glue to attach the dried plant material to the herbarium paper. The amount of glue to use for mounting is a trial and error experience. Too much glue and the specimen becomes coated with glue, not enough glue and the specimen will literally pop off the herbarium sheet. Once the glued specimen has dried onto the herbarium sheet, straps may be used for strengthening large specimens. These can be made of narrow slips of paper or globs of carefully placed glue. Straps help ensure that the specimen does not pop off the herbarium sheet when the sheet is flexed. Extra packets or envelopes (folded 8 1/2x11 sheets of regular copy paper-fold these to make a small envelope) can be created for extra plant parts. Find room to glue the envelopes onto the herbarium sheet. By the way it is traditional and probably leads to more efficient storage to never glue anything bulky to the underside of the herbarium sheet, The plant specimen, label and envelope should all be arranged on the same side of the sheet.

Plant labels. To make your specimens valuable identification tools in your work you will need to think about the label for the herbarium sheet. The label identifies the plant, use the botanical name first and include common names if you like. The botanical name should also include the author of the name so

someone else looking at the specimen will know whose taxonomic treatment you are following. Important aspects of the plant specimen that may not be preserved include the height of plants, flower color, plant/floral odor if any-is the plant fragrant or rank? Cultivated or naturalized, pollinators present? Herbivores present? Habitat details, the associated plants, soils, geologic features, chromosome number, etc. All of this kind of information should be noted on the data label if known. Other important data include the date of the collection, location (city, county, state, and country), collection number, collector, and any authority that may have verified the identification of the specimen. The contents of the label are as important as the actual mounted plant specimen. Sometimes I will also include a copy of the location information in the form of a Xeroxed topographic, aerial, road map, etc. You can put a symbol on the map showing the collection location. Quad sheets make good maps. If you have a GPS unit you might add the collection site coordinates to the label. Maps and coordinates let the viewer know exactly where you collected. In the future plant labels might be important in showing the historic ranges of plants and also show us how plants may have expanded their range in Florida. To see an excellent use of herbarium specimens see the following website: <http://www.plantatlas.usf.edu/>

Typical plant labels are in the 4-5 inch (width) x 3-5 inch (length) range. The label is traditionally placed in the lower right-hand corner of the herbarium sheet. If the space does not allow for this it can be moved to a more convenient location, the choice is yours. The following is an example of a plant label:

-----4-5 inches -----

Plants of Florida, USA

Leon County

***Acer rubrum* L.**
RED MAPLE

Family: Aceraceae

Large deciduous tree, about 80 feet tall. Leaves dark green above, paler green below to glaucous and hairy along the midvein. Petioles dark reddish-green. Bark whitish with greenish blotches, mostly smooth on smaller stems, becoming furrowed and dark brown on older stems and trunk. Lower trunk buttressed. Growing in mucky mineral soils of a bayhead swamp with sweetbay (*Magnolia virginiana*), swamp bay (*Persea palustris*), Fl. Elm (*Ulmus americana*), swamp gum (*Nyssa sylvatica* var. *bilfora*), southern shield fern (*Thelypteris kunthii*) dominated the groundcover.

Location: Growing about 2 miles northwest from the intersection of 3rd and Linneaus street.

Collection number :10 **Collector:** Asa Gray

Collection date: August 17, 2003

Why create a herbarium? Plant identification is increasingly becoming a lost art and science. Because there are so few trained taxonomists it is a good idea to have on hand those plants that you might encounter with some frequency. For example, if you work on lakes and other surface waters you might want a collection of aquatic wetland plants. Once you have a plant specimen correctly identified you can use this for comparison to any future plant collections. Often plants are seen when not in flower or fruit. Using a herbarium specimen you will be able to see morphological or anatomical details that will help identify field collected plant specimens in the sterile or non-reproductive condition. In addition plant specimens become an important learning tool. Herbarium specimens allow you to show someone distinctive morphological characters important for correct identification. You can read about the morphology in a textbook but to actually see a plant either dried or fresh gives you a much better

understanding of the verbal description. I also like to take a slide or digital photo of plants in the field to show the flower color and a three dimensional perspective. The following are four main reasons to make a herbarium collection.

1. Identification of plant specimens.
2. Basis for research and preparation of Floras. See <http://www.plantatlas.usf.edu/>
2. Teaching.
3. Preservation of voucher specimens.

You are also creating a collection that will be potentially be used for the next 300 years or so. You are also adding to the scientific knowledge base about the nature, distribution and condition of plants. Who knows how the information you collect now might be used in the future? If there is a drawback to creating a herbarium it would be the extra time it takes to collect, press, dry, mount, label and curate a collection. Collecting plants and creating a herbarium is a satisfying occupation and hobby, indeed some of the best collections were amassed by wealthy patrons. Currently, most of the larger herbaria are in public institutions and employ staff/herbarium curators to maintain the collections. To find a list of all herbaria throughout the world see **Index Herbariorum** at <http://www.nybg.org/bsci/ih/> this site is instructive to also locate experts on certain groups of plants. You might want an expert to verify a difficult to identify plant.

I am available to help identify wetland plants. You can send dried material or digital images. If digital send to my email address. Make sure photos are not blurry. Try to photograph the habitat, plant habit, flowers and/or fruit and leaf close up.

Send dried material to the following address, Attention John Tobe, 2600 Blair Stone Road, MS 2500, Tallahassee, FL 32399-2400.

Smaller Herbarium for mosses, liverworts and lichens.

Mosses and liverworts can be collected just like larger specimens except that due to their small size they can easily be stored in a sealed container as small as a shoebox. Make envelopes from standard 8 ½ x 11 typing or copy paper. Fold envelope in such a way as to create two wing-like flaps that can be interlocked, see illustration below. You can make a label to glue on the envelope. The same kinds of information about the site description, date, location, etc. should be included. Mosses and liverworts can be air-dried and do not need to be pressed although they may need to be compressed to fit into your envelope. Most moss and liverwort identification requires that you moisten the specimen and view beneath a compound microscope to see the minute but important taxonomic details. See **Mosses of the Gulf South. 1984.** By William Dean Reese and **Mosses of Florida. 1963.** By Ruth Schornherst Breen.