NATIONAL PARK SERVICE

Conserve O Gram

November 2009 Number 11/12

Preparing And Storing Herbarium Specimens

Introduction

A herbarium consists of preserved plant specimens, each with a label bearing documentary information. Herbaria are repositories for vascular plants, bryophytes, lichens, algae, and fungi. Specimens are used as references for comparison and identification with unknown samples, documenting species distribution and variation within species, and identifying times of fruiting and flowering, among others.

Herbarium specimens are curated, documented and stored in accordance with procedures outlined in the NPS *Museum Handbook*, Part I, Appendix Q, Curatorial Care of Natural History Collections, Appendix T, Curatorial Care of Biological Collections and the *Museum Handbook*, Part II, Appendix H, Natural History. See related NPS *Conserv-O-Grams* (COGs) 2/16, 2/17, 2/19, 3/6, 3/7, 3/8, and *Museum Handbook*, Part I, Chapter 3, Biological Infestations.

The method of preparation and storage depends on the type of plant being processed. Most specimens are mounted on standard herbarium sheets. They include reproductive and vegetative organs, features critical to identification. Plant parts that can't be easily pressed, such as large flowers, bulbs, fruits, cones, bark, or large-diameter woody stems, can be dried in boxes or paper bags. Lichens and bryophytes, which include mosses, liverworts, and hornworts, are usually dried in packets, paper bags, or boxes, as pressing irreversibly distorts material for adequate identification. Lichens are usually collected attached to their substrate (e.g., rocks, stems, soil crusts) and are not amenable to pressing.

Mounting Herbarium Specimens

Dried, pressed vascular plants should:

- be mounted on a 11x 17 inch herbarium sheet composed of either 100% alpha cellulose or cotton rag paper that is acid free and pH neutral
- be accompanied by a label printed on acid free and pH neutral paper
- have sufficient space on the herbarium sheet to allow placement of a label (figure 1)
- have an acid free pH neutral fragment envelope

Strapping of the specimen to the sheet is strongly recommended. Strips of adhesive linen tape provide additional support for woody stems or relatively large, bulky materials such as fruits.

Should an adhesive be needed to attach a specimen, use Grade A methyl cellulose with a molecular weight of 4000. Grade A methyl cellulose with a molecular weight of 1500 can be used to attach labels to herbarium sheets. Either adhesive can be premade as a thick gel in water

and then diluted to the desired consistency with deionized water or undenatured ethanol. These adhesives remain stable and reversible over time.

Note: The use of poly (vinyl acetate) emulsion adhesives is discouraged because these become acidic as they age (Down et al. 1996). While there are some reasonably stable vinyl acetate/ethylene copolymer adhesive emulsions (such as Jade 403); however, these become permanent when they set. They can be reversed only with solvent chemicals.

Figure 1. Herbarium sheet with label.

Store objects in acidfree boxes that cannot be satisfactorily mounted on sheets, including flowers, fruits, cones, and bark (figure 2). Store bryophytes and lichens in acid free packets.

Figure 2. Archival box with plant specimens that cannot be mounted on herbarium sheets.

Specimen Storage

Store mounted herbarium specimens in standard herbarium cabinets in accordance with the *Museum Handbook*, Part I.

- Ensure that plants are thoroughly dry and free of pests before placing in cabinets.
- Do not place plants in ovens to dry or dry them at temperatures greater than 50° C (120° F). This causes damage to the internal structure of leaves and flowers.
- Never use a microwave oven to dry or treat herbarium specimens for pests.

If there are signs of infestation, place specimens in a freezer for 7-10 days to eliminate pests (e.g., insects, insect eggs, fungal spores) (COG 3/6).

Place vascular plant specimens of the same species collectively within a single, labeled "genus" folder. Different sizes are available, depending on the number of sheets to be enclosed. Store archival boxes holding fruits and cones, and packets of mosses and lichens in trays that fit a standard herbarium shelf.

Herbarium Organization

Organization of the herbarium (figure 3) varies depending on the size and scope of the collection, including:

- arranging labeled genus folders or packets in alphabetical order by genus and species, which in turn are arranged by plant families in alphabetical order
- organizing families either alphabetically or in a phylogenetic sequence

Refer to *Museum Handbook*, Part II, Appendix H, Natural History.

Figure 3. Herbarium cabinet with folders holding herbarium sheets organized alphabetically by family.

Handling Specimens

To minimize damage when handling or moving specimens from storage for study:

- Keep specimens mounted on sheets flat so that they do not bend during examination.
- Place specimen folders on stiff card board or in a box when moving them from cabinet to workspaces
- Limit stacked folders so that the weight of the top specimens does not damage the lower specimens.
- Examine most prepared specimens on the flat surface of a work table or bench, and preferably under a microscope and task light attached to an adjustable arm (boom stand).
- Remove specimen sheets from each folder one at a time. Don't flip through them.
- Keep mounted specimens in folders specimen-side up, never turning them over so the specimens are face down or turning the specimen sheets in a folder like the pages of a book.
- Remove each specimen from the folder "specimen-side up," arrange them in a pile or individually if space permits.
- Replace specimen sheets in the same order as they were removed from the folder or shelf.

Before refiling, review specimens for potential maintenance, (i.e., loose specimens, pests, broken fragments, and incorrect labels). Make necessary repairs, and decontaminate specimens that may have been exposed to pests, especially if the specimen has been out on loan.

Pest Management

Common herbarium pests include:

- silverfish
- book lice (*psocids*)
- cigarette or tobacco beetles (*Lasioderna*), depending on geographic location
- dermestids
- drugstore beetles (*Stegobium paniceum*.)

Reduce pest infestations with regular cleaning of floors, cabinets and work spaces in accor-

dance with the NPS *Museum Handbook*, Part I, Chapter 5, Biological Infestations and Chapter 13, Museum Housekeeping. Inspect herbarium cabinets regularly to ensure that gaskets between doors and frame provide an effective seal (COG 4/3).

Note: The use of moth balls (naphthalene or paradichlorobenzene) to repel insects has been discontinued because of their toxicity (COGs 2/16, 2/17). For information on NPS Integrated Pest Management, visit http://www1.nrintra.nps.gov/BRMD/ipm

If pests are discovered on specimens or within folders, immediately place on a rigid handling board, wrap them in plastic and place in a freezer at -20° C for at least 7-10 days (COG 3/6).

References

Bridson, D. and L. Foreman, eds. *The Herbarium Handbook*. Royal Botanic Gardens, Kew, Great Britain. Third edition. 1998.

Down, J.L., M.A. MacDonald, J. Tétreault, and R.S. Williams. *Adhesive testing at the Canadian Conservation Institute - an evaluation of selected Poly(vinyl acetate) and acrylic adhesives.* Studies in Conservation 41:19-44. 1996.

Judd, W., C. Campbell, E. Kellogg, P. Stevens, and M. Donoghue. *Plant Systematics: A phylogenetic approach.* Sinauer Associates, Inc. Third Edition. 2007.

Metsger, D. and S. Byers (editors). *Managing the modern herbarium: an interdisciplinary approach.* Society for the Preservation of Natural History Collections and the Royal Ontario Museum. 1999.

Smith, E. E., Jr. Preparing herbarium specimens of vascular plants. USDA Agricultural Information Bulletin, 348. Washington, DC. 1971.

Schepanek, M. and R. Waller. Herbarium Rules! Canadian Museum of Nature. Ottawa, Ontario, Canada. 1999. http://nature.ca/prodserv/herbrules_e.cfm

Herbarium and Archival Supplies

Herbarium Supply Company
2317 Birdie Drive
Bozeman, MT 59715-8420
www.herbariumsupply.com

Gaylord Brothers
Box 4901
Syracuse, NY 132221
www.gaylord.com

Dieter H. Wilken, Ph. D.
Vice-President, Programs and Collections
Santa Barbara Botanic Garden
Santa Barbara, CA 93105

The Conserve O Gram series is published as a reference on collections management and curatorial issues. Mention of a product, a manufacturer, or a supplier by name in this publication does not constitute an endorsement of that product or supplier by the National Park Service. Sources named are not all inclusive. It is suggested that readers also seek alternative product and vendor information in order to assess the full range of available supplies and equipment.

The series is distributed to all NPS units and is available to non-NPS institutions and interested individuals on line at <http://www.cr.nps.gov/museum/publications/conserveogram/cons_toc.html>. For further information and guidance concerning any of the topics or procedures addressed in the series, contact NPS Park Museum Management Program, 1849 C Street NW (2265), Washington, DC 20240; (202) 354-2000.