



HERBARIUM COLLECTION MANAGEMENT POLICY

Established – June 1993; Revised 1995, 2006, 2010, 2012

The Herbarium Collection Management Policy is written to establish a policy governing the management of the herbarium specimens of the Missouri Botanical Garden. It is intended as a working document, and will be reviewed and revised as required every five (5) years or as conditions and techniques change. The most recent revisions were made in June 2012.

The Herbarium is a service unit within the Research Division that supports scientific research both within and outside the Missouri Botanical Garden by:

1. providing access to specimens and their associated data
2. providing facilities for specimen preparation and conservation
3. managing and organizing storage facilities suitable for long-term specimen care
4. establishing policies that ensure the continued availability of specimens for present and future research

Scope of Collections

The Herbarium Collection is limited to vascular plants (ferns, gymnosperms and flowering plants) and bryophytes (mosses, hornworts and liverworts). Material of other plant groups, including fungi, if acquired, is sent as a gift or exchange to appropriate institutions with the capacity to properly care for and utilize them.

In addition to dry-preserved herbarium material, the collection may contain liquid-preserved plant parts, photographs, microscopic slide preparations, specially prepared specimens suitable for DNA or other chemical extraction, and other preserved materials.

Authority and delegation of responsibility

The Curator of the Herbarium has decision-making authority and responsibility for acquisitions, deaccessions, collections care and use of the herbarium collection, in consultation with other appropriate Research Division staff.

Code of Ethics

The research staff and volunteers conduct themselves in accordance with the Garden-wide *Employee Ethics Policy*.

Categories of Collections

The herbarium collection is composed of preserved plant parts or samples that are used to support the taxonomic research of the Garden's staff and students, as well as outside researchers from the international botanical community.

Acquisitions/accessioning

The Garden's priorities for developing its Herbarium Collection are to acquire and make available for research:

- 1) an outstanding assemblage of vascular plant specimens from the Neotropics, especially Mesoamerica and Andean South America, and Africa, and a comprehensive collection of mosses from throughout the world.
- 2) specimens from botanically unique areas or places that are being rapidly destroyed or modified.
- 3) specimens of taxa within the special interests and expertise of staff members.
- 4) significant smaller herbaria that might otherwise be dispersed or lost through neglect.
- 5) a representative collection of taxa from the remainder of the world.

Accessioned specimens should, to the extent possible, meet the following criteria (although other special considerations for acceptance may apply):

- 1) Specimens should be fertile, complete, and in good condition.
- 2) Specimens should be associated with appropriate data on collector, locality, ecology, and specific specimen information.

Specimens which do not meet these criteria may be refused, especially if the collection is vouchered in another established herbarium. Such decisions will be made after consultation between the Curator of the Herbarium and appropriate research staff.

Specimens are acquired through staff collections, exchange, gifts, purchases or bequests.

Specimens that are vouchers for Garden supported studies or its living collection will be accepted.

Some specimens may be used as gifts, exchange, or educational materials, if this will further the Garden's mission and research goals.

Deaccessioning/Disposal

Specimens which are needlessly duplicated, deteriorated, or do not fit the mission of the Garden, may be deaccessioned. Deaccession of a specimen will be undertaken only after careful consideration and consultation between the Curator of the Herbarium and other appropriate research staff.

Specimens that are deaccessioned may be sent as gifts or exchange to appropriate institutions or, if they have deteriorated to the point where they have no scientific or historical value, they may be discarded.

Loans

The Missouri Botanical Garden Herbarium serves the nation and the world as one of the leading resources of plant research material for taxonomic studies. In order to insure that these collections are used in the best interest of appropriate contemporary studies and are protected and effectively preserved in the interest of future research, the following stipulations are made:

Loan Conditions

Loans are made to botanical institutions or departments engaged in taxonomic research and postgraduate instruction. These institutions are mostly, but not exclusively, listed in *Index Herbariorum*. Ordinarily, loans are not made to individuals, but exceptions may be made.

Written loan requests must be submitted to the Curator of the Herbarium. Loan requests should state:

- 1) The name(s) of the workers on whose behalf they are made
- 2) The basic reason for the request
- 3) The precise nomenclatural or taxonomic scope of the study, including any synonyms, and the precise geographical range of the investigation, if applicable.

Upon receipt of shipment please verify the number of items sent, sign and return the pink copy of the invoice to the Curator of the Herbarium.

Loans are made for a period of one year. If there is need for further retention of the material being studied, a request for an extension of the loan period should be made to the Curator of the Herbarium.

The Garden reserves the right to request the return of its materials at any time.

Procedures, Storage, and Return of Borrowed Material

Herbarium specimens should be stored in sealed cases and kept free of insect and fungus infestation.

Under no circumstance should any contact adhesive or cellulose self-adhesive tape or labels be used on any herbarium sheet.

Herbarium sheets must not be bent, folded, or laid face down. Except during actual examination, type specimens should remain in their red-bordered folders.

Loans may be transferred to another institution only after permission is obtained in writing from all institutions involved.

Annotations

Before being returned, every herbarium sheet should be legibly annotated with typescript, ink, or indelible lead pencil, not ballpoint pen, by the investigator. Annotations, preferably on acid-free labels approximately 2.5 x 10 cm, should bear the accepted name of the taxon, the name of the investigator and his or her institution name and acronym and the date of annotation. Annotation should be glued to the specimen above or near the original label to facilitate filing and future study. Type specimens should be indicated by the basionym. All annotation labels should be placed above or near the original label to facilitate filing and future study.

Specimens that cannot be positively named, or those found to belong to groups not under consideration, should be annotated to the extent possible. Where a sheet is found to contain two or more taxa, each element of the mixture should be clearly indicated with a separate determination slip.

Amplification of herbarium labels with data from sheets from other herbaria will be appreciated, especially where locality, date, collector, or collector's number are absent. All existing labels, annotations, etc. must not be removed, obscured or altered in any way.

Removal of Material

No portion of the specimen on a herbarium sheet may be removed without the prior written approval of the Curator of the Herbarium, but routine, careful, dissection of parts on sheets or in fragment packets is permitted. Parts should be returned to the fragment packet.

Written authorization must be obtained for removal of any material for destructive sampling, SEM or anatomical study. This includes material for DNA extraction, pollen, spores, leaves, wood or any other structure. Specific guidelines for authorized sampling will be provided on request. Contact the Curator of the Herbarium for additional information. (See Use of Collection below)

Publications

All Missouri Botanical Garden specimens should be cited with the standard international acronym "MO" in any published lists of specimens. Where possible, a copy of any publication resulting from studies based on Garden specimens should be sent to the Herbarium.

Kinds of Objects found in Collection

There are three major categories of material in the Herbarium:

- 1) Herbarium specimens, (pressed, dried, and mounted plant specimens), but also including oversized parts, wood samples, etc., preserved in a dry state.
- 2) Liquid preserved (spirit) material.
- 3) Silica gel-dried samples for DNA extraction (DNA Bank).

Objects in Custody

To conduct scientific research staff of the Missouri Botanical Garden frequently need to examine additional specimens from other institutions and museums. Loans of extra-institutional material are requested by the Garden's Curator of the Herbarium upon written request by a staff member. Upon arrival, loan material is checked, recorded, and placed in herbarium storage for access by the requesting staff member. These specimens are cared for and housed under the same strict practice and procedures used for the Garden's own collections to safeguard the material obtained on loan. During the loan period the borrowed material is examined and annotated by the responsible staff member and/or project. When the study is complete the staff member returns the material to the Garden's Curator of the Herbarium for count, documentation, and return to the lender.

Care/Conservation/Storage

All specimens will be stored under the best environmental and physical conditions possible to protect the collection from deterioration and with particular consideration for the long-term conservation of the material for future research. To the extent possible all specimens will be stored in compactor shelving or in sealed cabinets. Specimens that are improperly mounted or damaged will be repaired before being refiled or sent on loan. Insect pests and other environmental factors that might lead to deterioration of the collection will be monitored and appropriate measures taken to mitigate any problems.

Housekeeping

The preservation and maintenance of the herbarium at the Missouri Botanical Garden requires an Integrated Pest Management Program to assure isolation of the collection from harmful pests. The Garden uses a variety of methods to safeguard the collection including freezing of incoming material, pheromone traps for monitoring, and archival packaging to reduce the mechanical damage to specimens or their contact to external substances. All specimens or other plant materials are subjected to the same procedures as the materials come into the collections space.

Good housekeeping is another technique used to reduce the environments suitable for pests, i.e. keeping all floors and counter tops clean and debris-free will reduce the risk of specimens coming into contact with liquids, harmful light or changes in humidity.

Maintaining good environmental controls on collection storage spaces also produces suitable storage conditions for all material in the collection. These include regulation of temperature, humidity, and lighting. A careful balance between conditions providing the best atmosphere for the collection and usable working conditions for the staff are carefully monitored to reduce the possibility for harmful conditions for the collections.

Insurance and Risk Management

The Herbarium Collection is covered under the Garden-wide insurance policy.

Documentation/Collections Records

Incoming shipments of specimens (as lots) are recorded with an entry record. This record is both electronic (with abstracted data about the shipment) and in paper form, composed

of an incoming shipment report and documentation that accompanied the shipment. Loans are given a different identifying number than other classes of specimens (gift, exchanges, etc.), so that they may be readily identified. All paper documentation is permanently retained, either in the herbarium files or the Garden's archives, while electronic records are regularly backed-up and stored off-site. Specimens that are sent out on loan, or as exchange or gifts, or returned to their home institution also have corresponding paper and electronic documentation.

Specimens that become part of the permanent collection are given an accession number when they are mounted. Once filed in the collection they are effectively cataloged. Because of the format and filing organization of herbarium specimens, the herbarium collection itself is a systematically organized "card catalog", with complete data permanently accompanying each specimen.

Inventories

Specimens are inventoried on an ongoing basis whenever they are pulled for loan or used or verified against the database in projects.

Access

Herbarium Collection:

The herbarium collection is available for consultation by any individual with a legitimate reason to do so. Specimens may be studied in the herbarium or by means of loans to established herbaria. Visitors are required to register with the herbarium secretary and are oriented to the policies of collection use and the physical organization of the collection by a member of the herbarium staff.

Electronic Data

Specimen data in electronic form will generally be available to researchers via the Internet or other networks, except as outlined below.

The value of data as an institutional resource is increased through its widespread and appropriate use; its value is diminished through misuse, misinterpretation, or unnecessary restrictions to its access.

This policy applies to institutional scientific data and is intended to improve access to these data. The policy does not apply to notes, records, or databases that are the personal property of individuals. In all cases applicable legal statutes and regulations that guarantee either protection or accessibility to institutional records will take precedence over this policy.

Access to the Missouri Botanical Garden's scientific institutional data, i.e. the permission to view or query institutional specimen data, will be granted to a wide range of users, from employees to the general public. Missouri Botanical Garden data stewards will be responsible for assigning each item of institutional data and each standard view of that data to one of two categories: public or limited-access.

As appropriate, data stewards will identify specimen data elements or views that have no access restriction and that may be released to users outside of the Garden. These will be designated public data. When deemed necessary, data stewards may designate some data elements as limited-access data. Limited-access data may include information which is part of active, ongoing research projects. Data considered to be limited-access may be made available on a specific request and approval basis. When necessary, the Computer Steering Committee will make the final determination on data restriction and requests for access.

Data users will be expected to observe any ethical restrictions that apply to data to which they have access, and to abide by applicable laws or policies with respect to access, use, or disclosure of information.

Expressly forbidden is the disclosure of limited-access institutional data or the distribution of such data in any medium to third parties without express written consent. Also forbidden is the access or use of any institutional data for one's own personal gain or profit or for the personal gain or profit of others.

Use of Collections

The herbarium collection is used primarily to support taxonomic studies using traditional types of non-destructive morphological measurements and dissections to obtain data. At the same time judicious and careful sampling from specimens with appropriate material for destructive analysis can yield a wealth of additional information on phylogenetic relationships.

The following policies have been established to guide appropriate sampling from herbarium specimens for destructive sampling.

Sampling for Pollen/Spores from Herbarium Specimens

1. The investigator must have made a diligent and good faith effort to obtain appropriate material from other sources (field collections, horticultural sources, other herbaria, etc.) before requesting permission to sample from the Garden's collection.
2. There must be adequate flowers or spore-bearing structures available so that removing a sample does not diminish the scientific value of the specimen for future research.
3. Pollen/spores may be removed from no more than one flower/structure per sheet (i.e. only the minimum amount of material needed should be taken.). If possible the entire flower/structure should not be damaged.
4. Fragments from the fragment packet should be sampled preferentially.
5. Only one or two specimens per taxon may be sampled.
6. Sampling is restricted to non-type specimens.
7. Samples may not be taken from historical specimens, (i.e. from collections made before 1900).
8. Any sampled specimen must be clearly annotated with what material was removed, by whom, for what purpose, including the place of deposit of prepared slide(s).

9. The Missouri Botanical Garden must be acknowledged in any publication in which data derived from any sample are used.
10. A reprint of any publication in which data from any sample are used must be provide to the Garden.
11. Exceptions may be made to this policy in specific instances, but are only granted after consultation with the Curator of the Herbarium at the Missouri Botanical Garden.

Sampling for Structures Other Than Pollen/Spores from Herbarium Specimens

1. The investigator must have made a diligent and good faith effort to obtain appropriate material for sampling from other sources.
2. Structures (seeds, fruits, leaf fragments, wood etc.) may be removed only if there is ample material from which to select. Material in the fragment packet should be selected whenever possible. The entire structure or any other parts of the specimen should not be damaged in removing the sample.
3. Only the minimum amount of material needed should be sampled.
4. Only one or two specimens per taxon may be sampled.
5. Sampling is restricted to non-type specimens.
6. Samples may not be taken from designated historical specimens, (i.e. from collections made before 1900).
7. Any sampled specimen must be clearly annotated with what material was removed, by whom, for what purpose, including the place of deposit of any preparations.
8. The Missouri Botanical Garden must be acknowledged in any publication in which data derived from any sample are used.
9. A reprint of any publication in which data from any sample are used must be provide to the Garden.
10. Exceptions may be made to this policy in specific instances, but are only granted after consultation with the Curator of the Herbarium at the Missouri Botanical Garden.

Policy on Destructive Sampling from Herbarium Specimens for DNA

1. The investigator must have made a diligent and good faith effort to obtain appropriate material for extraction from other sources (field collections, horticultural sources, other herbaria, etc.).
2. The investigator must have enough experience with the laboratory techniques and the characteristics of their group to insure that there is a reasonable probability of successfully extracting useable DNA from the sampled material.
3. Obtain approval in advance to pass either material provided by the Garden or extracted DNA to third parties. This action will be accomplished by completing a new material transfer agreement with the third party approved by the Curator of the Herbarium.
4. Acknowledge both the Missouri Botanical Garden and each individual collector of material provided in each publication in which data is used.
5. Provide the Garden with reprints from all resultant publications.
6. Publish jointly with Garden staff members or their collaborators whenever appropriate.

7. Register DNA sequences with GenBank/EMBL accession numbers.
8. Acknowledge that the material is provided by the Garden without any warranty of any kind whatsoever.
9. Comply with these specific sampling requirements:
 - Only material in the fragment packets may be used.
 - Only the minimum amount of material needed may be taken.
 - Only one or two specimens per taxon may be sampled.
 - A given specimen may not be sampled a second time.
 - Sampling is restricted to non-type specimens.
 - Sampling is only allowed from the most recent collections, i.e. those collected since the 1970's.
 - Any sampled specimen must be clearly annotated with what material was removed, by whom, their institution and for what purpose.
10. Exceptions may be made to this policy in specific instances, but are only granted after consultation with the Curator of the Herbarium at the Missouri Botanical Garden.

Laws and Permit compliance

Any plant materials acquired must have been gathered and prepared in compliance with state, national, and international laws and regulations, and must have been collected in a rational, scientific, and ethical manner. Preserved materials of endangered species will be handled in compliance with the provisions of the Endangered Species Act (ESA) of 1973 and/or the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) of 1977.

Photography

Users of the herbarium collection are permitted to make images of any specimen or parts of specimens. Use of these images in scientific publications or presentations is permitted as long as the Garden is clearly acknowledged as the source of the specimen.

The Garden retains copyright to the images of specimens taken by the Garden and made available in various media for other users. These images may be made available for use in non-commercial scientific publications and presentations without cost, as long as the Garden is clearly acknowledged as the copyright holder and provider of the image. Use of these images for commercial purposes is permitted with payment of the appropriate licensing fees.