



COLLECTIONS MANAGEMENT

I. COLLECTIONS POLICY

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COLLECTIONS POLICY

I. WHY HAVE A COLLECTIONS MANAGEMENT POLICY?

The mission of the National Tropical Botanical Garden is to enrich life through discovery, scientific research, conservation, and education by perpetuating the survival of plants, ecosystems, and cultural knowledge of tropical regions.

Our mission is achieved through:

- A network of diverse gardens and preserves in Hawai`i and Florida, each with significant biological, cultural, and historical resources.
- Conservation, research, and reference collections (living, library, and herbarium) assembled through discovery and collaboration.
- Research in botany, ethnobotany, horticulture, conservation biology, and restoration ecology through programs and institutes.
- Educational courses, publications, lectures, and visitor programs.
- Facilities and infrastructure necessary to conduct this work.

*(Adopted October 25, 2005 by the Board of Trustees,
National Tropical Botanical Garden)*

The purpose of this Collections Policy is to guide the National Tropical Botanical Garden staff in the acquisition, documentation, curation, maintenance, and sharing of the living resources which are the basis of our work. It is designed to guide the implementation and integration of the activities which flow from our mission, and to maintain, enhance, and protect the value of our work. As a working document designed to integrate the activities of a dynamic organization, it should be reviewed regularly and modified as needed.

As a scientific organization the National Tropical Botanical Garden is defined by the quality and scope of collections and associated data. These collections are the legacy of our work and our contribution to the scientific, conservation, and educational communities. This Policy provides direction and guidance for making collections following international standards and federal and state law, in compliance with NTBG's mission, policies, and procedures. The standards set out here for our collections are also necessary to maintain a high level of professional expertise in plant identification and conservation practice.

II. COLLECTIONS GOALS

A. Science

The biodiversity of Pacific islands is under extreme threat from many factors and urgently needs to be documented and studied before species disappear. Field work is becoming increasingly expensive in these difficult economic times, and permission to collect living and

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non-living plant material is becoming more difficult and time-consuming to obtain. Therefore, it is essential that collectors maximize their efforts while in the field to obtain the greatest possible number of herbarium specimens and ancillary collections, living collections, photos, and associated data. Opportunities to botanize in such unique and often remote areas are rare and should be optimized. Compliance with this policy will help enhance the quality of the specimens and associated data collected for NTBG's non-living collections as well as the living collections, which should be authenticated by herbarium vouchers whenever possible. Collections shall be made in accordance to collection permit requirements and restrictions. The following Collections Policy applies to all accessioned material to be deposited in Herbarium PTBG (our herbarium's international acronym) and should be closely adhered to by all collectors.

Other Science Department collections goals include:

- Furthering the development and exchange of herbarium collections and plant diversity data with institutions located and/or working in the Pacific.
- Increasing knowledge and collections of Pacific Island plant diversity through further exploration and inventory of selected geographic areas, seeking both local and international collaborators.
- Collaborating with New York Botanical Garden, Smithsonian Institution, and other organizations to conduct biological inventories of Micronesia and other Pacific Islands.

B. Conservation

The Conservation Department works to discover, document, and perpetuate populations of rare and endangered plants, as well as important crop cultigens growing in Hawai'i and other Pacific island archipelagos. Conservation staff carries out their work on the various NTBG properties, as well as on private and public lands in Hawai'i and the Pacific Islands. They work to discover and fill gaps in our conservation collections of living plants in ex-situ, inter-situ and in-situ settings, and to discover, via collaborations and partnerships, new ways to preserve plant germplasm over the long term or in perpetuity.

C. Living Collections and Horticulture

The Living Collections and Horticulture (LC&H) Department is responsible for the collection, curation, propagation, storage, and management of all the plants within the gardens of NTBG. LC&H assists in establishing proper curation and interpretation through the implementation of collection procedures at all of the NTBG gardens. To ensure efficient management of NTBG resources, personnel and plant data staff are trained in established procedures for each step of the LC&H process. Procedures have been established for the collections of propagules and specimens, recording the required data, propagation and outplanting, which are outlined in detail in our **Collections Manual of Procedures**.

It is the responsibility of the Assistant Director of Living Collections & Horticulture (ADLCH) to oversee the process by which accessions are integrated into the Living Collections, and managed. This includes the review of requests for propagation, the integration and

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coordination of priorities for various projects, collections and gardens, and the management of staff who are responsible for the Living Collections.

- The maintenance of the Living Collections Database, the Nursery, the mapping and labeling of plants in each garden, horticultural maintenance of collections, and seed curation are all essential elements of curation. Coordination with other garden departments and with all Garden Directors is essential, and the ADLCH participates in interdepartmental and inter-garden meetings to discuss issues and priorities, and to refine policies related to horticulture and living collections in all the gardens.
- LC&H strives to constantly improve the ability of the NTBG to grow and perpetuate rare, threatened, and endangered plant species in our living collections and to develop strategies for growing species in unique microclimates appropriate to their ecology.
- LC&H utilizes a Nursery Inventory Control System (NICS) and other appropriate technologies to make labor-intensive processes more efficient, and to assist in the orderly flow of plant material through the Nursery.
- LC&H will conduct a comprehensive physical inventory of all plants in the gardens including digital maps that accurately document the locations of NTBG's living collections, integrating these digital location maps into the Living Collections Database.
- LC&H will define and implement strategies for preventing and correcting biological invasions originating or proliferating on NTBG properties.
- LC&H will publish a catalog of plants and collection statistics every five years, making information on the NTBG's living collections easily accessible both internally and externally.
- LC&H strives to make NTBG databases more standardized and compatible with other institutional databases, and will make appropriate levels of information accessible through the NTBG website.
- LC&H works with the Volunteer Program and the Education Department to develop programs which fully utilize the potential of volunteers, students, and interns in the work of the department.
- The department will continue to upgrade the skills of all employees for the improvement of the curation of all the living collections.

The Living Collections Department and the Education Department will work closely to ensure that the living collections support NTBG's educational goals.

D. Breadfruit Institute

The collections goals of the Breadfruit Institute are to enhance the conservation value of breadfruit germplasm at NTBG properties by:

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- Developing and implementing standards for proper horticultural care of the trees in conjunction with LC&H and Kahanu Garden Director.
- Identifying a core collection that represents the total genetic diversity within a small number of accessions.
- Developing a plan to acquire, propagate, and plant selected cultivars, including rare ones at risk in their place of origin and those with superior or desirable qualities.
- Providing a safe repository for elite selected cultivars, genetic core collection, and other important types to ensure their survival in the event of a natural disaster or disease outbreak.
- Identifying areas for test plantings of breadfruit cultivars.
- Developing in vitro propagation methods for mass-propagation, safe transfer, and conservation of breadfruit germplasm.

III. TYPES OF COLLECTIONS

A. Living Collections

NTBG's Living Collections and Horticulture Department maintains collections of three basic types of living material: economic or ethnobotanical collections, synoptic or thematic collections, and conservation collections which include ecological community level restorations (see **Appendix A: NTBG Collections and Categories, Draft 2007**).

Important examples of economic or ethnobotanical collections are Polynesian introductions or canoe plants, especially bananas, breadfruit, and taro. Breadfruit is also considered a conservation collection, as it represents considerable crop diversity.

Important synoptic collections with a geographic focus are the Polynesian, Micronesian, and other Pacific Island collections. Synoptic taxonomic collections include Areaceae, Rubiaceae, and Zingiberales. Thematic groupings of importance include flowering trees, especially in the Kampong, and historical collections like those in the Allerton Garden (see **Appendix B: Allerton Garden, Protecting a Historic Designed Landscape: Managing the Living Collections of the Allerton Garden**). These collections may be planted in one or several of NTBG's gardens, as appropriate.

Conservation collections focus on plants native to the Hawaiian Islands, including native *Pritchardia* palms, federally listed endangered species, and particularly the rarest endemics from Kaua'i and elsewhere in the Hawaiian Islands. Conservation collections may be outplanted as traditional botanical garden collections, or used in ecological restorations. The focus of ecological restorations is to preserve the elements of native plant communities, rather than individual plant specimens. Common native plants are planted in large numbers in these sites and encouraged to adapt to the site and reproduce. They recreate habitats similar to those once prevalent in Hawai'i but now relatively rare and impacted by threats that can be more effectively

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controlled in the garden or “inter situ” setting. These plant assemblages differ from traditional botanical garden collections, but the tracking and care of rare plants is no less rigorous.

B. Non-Living Collections:

The Science Department maintains a number of non-living biological and cultural collections. Primary among these is the Herbarium (PTBG) which houses dried, voucher specimens of native and introduced species from Hawai‘i, various Pacific islands, and other regions, arranged by Family, and available to staff and visiting scientists for study in the Botanical Research Center. Information for Visiting Scientists is available at <http://ntbg.org/resources/herbarium.php>. (See also **Collections Manual of Procedures, Appendices: Regulations Governing Herbarium Loans, and Herbarium Specimen Use Policies.**)

The Science Department also manages ancillary non-living biological collections including leaf tissue collections in silica gel for DNA studies (here termed “silica collections”); carpological (fruit) collections for plants with fruits or seeds that are too large or too unmanageable to mount on a herbarium sheet; a seed reference collection; alcohol-preserved collections, made primarily but not uniquely for special requests or purposes, or for certain taxa (e.g., Orchidaceae) that benefit from having 3-D specimens; and wood collections. (See also **Collections Manual of Procedures, Appendices: Ancillary Biological Collections, and Silica Collections.**) In addition, the Science Department manages a collection of Hawaiian and world insects; a collection of slides, print photos, and digital images; and the Library Collections, including the rare book collection. (See also **Collections Manual of Procedures, Appendices: Loy McCandless Marks Botanical Library User Policies.**)

IV. POLICIES FOR COLLECTION

The responsibility for administering, implementing, and interpreting the Living Collections Policy rests with the Director of each of NTBG’s Gardens, in cooperation with the Directors of Living Collections and Horticulture, Science, Conservation, and the Breadfruit Institute, and as appropriate, in consultation with Education, Facilities, Tours, or other Departments. Each Garden Director shall formulate goals and objectives in accordance with NTBG’s five-year Strategic Plan which states the goals of that particular garden’s collections, and steps to implement those goals. The Directors will also re-evaluate the collections, and review and revise the goals and procedures that implement the policy on a more frequent basis. The **Collections Policy** is to be implemented in all gardens through the procedures outlined in this policy and the accompanying **Collections Manual of Procedures**, recognizing that each Garden and each collection or area has purposes and criteria that apply to it particularly. The goals of each collection derive from NTBG’s mission and purposes, and should be articulated accordingly within each Garden-level plan. Staff should carefully select plant species that fulfill those purposes and goals that contribute to this mission, to ensure that we use our resources (time, energy, expertise, land, water, and finances) most effectively. This document outlines the steps that a living plant or propagule follows, through acquisition, accession, record keeping, propagation, outplanting, and other uses. It also outlines the procedures necessary to make scientifically valid voucher specimens and ancillary collections. By consistently following these standards and procedures,

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we will protect and enhance the value that the collections provide for our work in scientific research, education, and conservation.

A. Fieldwork

1. Documentation

Field work is conducted for both scientific research and for the collection of propagules, and is documented through the Living Collections Database and the Herbarium Database, as well as through routine reports to government agencies, contracted floristic and biotic surveys, and other publications, including floras of some of the Pacific Island groups. Complete and accurate documentation is essential to fulfilling the mission of NTBG in all these efforts. This is accomplished with the compilation of data in field books, the completion of collection reports, and online data entry into the database shell which goes into the Living Collections and Herbarium databases. NTBG also receives frequent requests for data compiled from field work, researchers, and public agencies.

a. Field books

Data for each collection must be comprehensive and written legibly in collectors' field books for database input by another person if necessary. All collectors' field books are property of the National Tropical Botanical Garden and, as such, must be deposited in the Garden's institutional archives for permanent storage. Books must be given to the Director of Science for data basing and label printing when full or immediately after field expeditions. Collectors may keep photocopies or scanned copies of the books for personal use or use by other departments such as Conservation.

b. Photographs

Photographs should also be made of vouchered collections (see photo image policy below). These photos or digital images (when taken during Garden work time) also belong to the National Tropical Botanical Garden and should be labeled and numbered according to recommendation given in the **Collections Manual of Procedures Appendices: Photo Images and Digital Collections Policies**.

2. Field Safety

Field work must be conducted within the guidelines in the **Field Safety Policy (Appendix C)**, which includes filing Emergency Contacts form and Flight Plans with the Administrative Assistant.

3. Legal aspects of collection

a. Domestic

All policies of the garden are subject to the requirements of collection permits for the collection of voucher specimens or seeds, issued to us by state or federal organizations or by private landowners that permit collection on lands they control. This is particularly important

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for rare and endangered species. Permits are required to collect plants on all State and Federal lands in Hawai‘i. Additional permits may be required from individual District offices (Kaua‘i, O‘ahu, Maui, and Hawai‘i Island), for collections of state and federally listed threatened & endangered (T & E) plants, plants in state Natural Area Reserves and plants in State Parks. On private land, the landowner’s permission is required. Information on permit application forms and guidelines is contained in **Appendix D: Application for Research/Collection/Possession Permit for Hawai‘i Threatened & Endangered Plant Species; DLNR-DOFAW Revised Permit Guidelines.**

b. International

In accordance with **Appendix E: NTBG Policy on Access to Genetic Resources and Benefit-Sharing (APGR&BS)**, and the Convention on Biological Diversity, NTBG will maintain records of permits or memoranda of agreements (MOAs) specifying terms and conditions under which genetic resources are acquired and/or shared. The Living Collections Database will track the use of these plant materials within NTBG, and any benefits arising from their use; distribution to third parties, and any terms and conditions of distribution. NTBG will report compiled data to relevant agencies as required by law; will make accession information available to cooperating scientists; and will make general information on its collections available to the public.

B. Collections Database and Database Shell

Complete and accurate documentation is essential to fulfilling the mission of NTBG in all its efforts. Collections derive a substantial part of their value from well documented provenance information, and clear and complete botanical descriptions. Field staff will enter the required collection information in the Collectors System (online database shell) in a timely manner. The database program will then sort the data into the Living Collections and Herbarium databases, which is also utilized to print Herbarium labels and Living Collections tags and labels. The Living Collections Plant Records staff and the Herbarium Manager are responsible to review information from the database shell, incorporate it into the respective databases, and print labels after specimens are processed. The **Collections Manual of Procedures** further outlines the steps and procedures for this process, as well as a list of the data fields which are included. Instructions for the use of the Collectors System and fields within the shell are contained in the **Collections Manual of Procedures Appendices.**

Geographical information will not be included in any public database, to protect plants from unauthorized collection, theft, or vandalism. This includes locations of federally listed T & E plants or plants protected under the state of Hawai‘i’s Plant Extinction Prevention Program, especially Latitude/Longitude or UTM coordinates.

Requests for plant data information or database access should be made online to Plant Records. For an example of the format in which information may be obtained, see **Collections Manual of Procedures, Appendices: Provenance Report.** These requests will be kept on file by Plant Records.

V. COMPREHENSIVE COLLECTIONS POLICIES FOR LIVING COLLECTIONS

A. Requests for Propagation

For effective collecting, propagation and outplanting, it is important to have adequate lead time for growing plants up in the nursery before the anticipated planting date. For that reason, plant lists for all prospective projects need to be generated as early as possible in the project development process, i.e., as soon as project approvals and funding have been obtained, or sooner, if all relevant parties agree on the plant list. Requests for propagation will be made by a Project Manager or other appropriate staff, in accordance with the purposes and guidelines of each individual collection or area (see **Collections Manual of Procedures, Appendices: Requests for Propagation**). These requests will be reviewed by the Assistant Director of Living Collections & Horticulture (ADLCH) and each Garden Director (Limahuli, McBryde-Allerton (Lāwa‘i), Kahanu or Kampong), discussed with the Nursery Manager on a regular basis, and adjusted as needed to coordinate the flow of propagation activity in the nursery. Requests must be approved and signed by the ADLCH, or the Director of the particular garden.

B. Acquiring Plant Material

Acquisition is the physical entry of a plant into the collection, whether or not the plant becomes a permanent part of the collection via accessioning. Any potential acquisition should be screened and selected in accordance with the purposes of the Collections Policy. All acquired plants should support the criteria set forth in the mission statement and goals of the institution. Native plants should be obtained from wild sources whenever possible, unless second generation material is more appropriate to the purpose.

C. Conservation Collection Methods, Sampling

A major role of the National Tropical Botanical Garden is *ex situ* and *in situ* conservation of native Hawaiian plant species. Conservation collections of these sensitive plants must consider the relationship of its Botanic Garden collections to reintroduction and other restoration efforts. A goal of collecting propagules from the wild for the NTBG conservation collections is to acquire founders and representatives from wild populations. It is critical to attempt to collect characteristic material from each plant species over several years to secure the broadest genetic representation of the wild populations. This may be accomplished through careful, intentional collecting from the wild with clear, accurate record keeping. (For further information see **Appendix F: Hawai‘i Rare Plant Restoration Group Collection Guidelines for Botanic Gardens.**)

For conservation collections, an effort will be made to collect representative genetic material from each plant and/ or population. Collections of federally listed T&E or Hawai‘i Plant Extinction Prevention Program (PEPP) plants with populations of 50 or fewer individuals should be identified with a permanent tag, inconspicuously attached to an adjacent plant. PEPP staff assigns a unique number for each plant they work with, but NTBG may also assign a tag with the collector's initials and collection number, the date of the field visit, and the initials of NTBG. Collectors should strive to maintain continuity in identifying each individual over successive field visits.

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When collections are made, the propagules of each individual plant will be given a unique collector's number, and a unique accession number upon entering the living collections. Vouchers should be made with the collector's unique numbers for deposit in herbaria at NTBG and Bishop Museum.

In the case of rare plants if a voucher has previously been collected from the individual, it is not necessary to collect another one but merely to cite the existing voucher. In the case of very rare plants a photo voucher should be made showing diagnostic features, and printed out for the herbarium, as well as deposited in the Digital Images Database (Resource Space). With larger populations and more common species, an accession number may be assigned to a collection of seeds taken from a representative population. Ethnobotanical and economic plant collections may be made of traditional cultivars (landraces) representing as broad a base of genetic variation as possible. In some cases cultivars of Polynesian crop species will be identified to be released to the public.

D. Accessioning and Record Keeping

The importance of record keeping and accurate data management cannot be overemphasized. A plant to be accessioned must fit within the defined goals and purposes of a specific collection or garden area. The purpose of each collection must be recorded in the Accessions Book. As appropriate, the ADLCH may provide a collector with a list of needed plants, and will determine, with a collector, the practical logistics of obtaining them.

E. Propagation and Nursery Labeling

Implementation of the propagation program is the responsibility of the Nursery Manager in each garden. Plants will be moved through the nursery as their cultural requirements dictate. The designated manager of the relevant collection or location will be notified when requested plants are available for outplanting. Requests for propagation will be considered fulfilled when the appropriate plant material has reached finished pot size and is moved to the Sunny Nursery. Project managers are responsible for the timely outplanting of materials from their tables. Any replacement of plants will require a new propagation request.

Labeling of nursery plants may be handwritten or machine printed on white plastic tags by a member of the Plants Records staff (see **Collections Manual of Procedures, Appendices**, for sample **Plastic Nursery Tag**). Groundcover plants which are designated for use in restoration projects may be labeled with one plastic greenhouse tag per tray, if the entire tray is going to one restoration. If the plants are potted up individually and may be used for more than one restoration or garden site, they should have one plastic tag per pot. For ease of labeling and tracking, it is preferable not to combine different ACC #s of the same species in the same flat in the nursery, and to keep individual plants of the same accession together until they are ready for placement on plant out tables. As much as possible, Plant Records staff will facilitate this process by preparing an appropriate number of greenhouse labels for a flat of seedlings prior to the first pricking out and potting up.

F. Nursery Inventory Control System

In order to maintain an organized flow of plant material through the nursery, an inventory control system was instituted which tracks accessions from the planting of seeds, or striking of cuttings, through the potting up to finished size. In general plants move from seeding in the greenhouse, to first potting stage, where they are in the shade house, and finally into the sunny nursery when they reach finished size. The online NICS Database thus maintains a running inventory of how many plants are in the nursery, with the table numbers where they have been placed in the Sunny Nursery. This information can be queried to determine the number of plants of a given species or accession which is currently in the nursery.

G. Germplasm Storage

The purpose of NTBG's Seed Storage facility is to be a repository for the safe-keeping, conservation, and preservation of seeds of Hawaiian native and other Pacific island plants. The ADLCH decides if the seeds will be propagated or sent to short-term storage or long-term storage. Seeds received for storage are entered into the Seed Inventory, indicating the location of storage (long or short-term, and refrigerated or frozen seeds will be designated by Living Collections for short term or long term storage. Short term storage is kept at normal refrigerator temperature – about 42 degrees Fahrenheit. Long term storage is divided into frozen or refrigerator storage, based on storage recommendations from the National Center for Genetic Resource Preservation. In general these recommend frozen storage for orthodox (non-recalcitrant) seeds, and refrigerated storage for recalcitrant seeds. Many Hawaiian seeds may not tolerate desiccation, or otherwise fall into an intermediate storage category. As research on these species continues, new storage recommendations may be developed.

H. Permanent Labeling of Collections

Labeling must be viewed in a long-term perspective, as many of our collections have been in the garden for decades, and their identity must be preserved with labels, if possible, despite weathering, natural disasters, and reorganization in the garden. Permanent labeling methods have been researched thoroughly over time to determine the most effective materials to use to ensure longevity. NTBG has invested considerable resources to implement its labeling program, but it will always require the diligence of staff to maintain its effectiveness. Permanent labels eventually deteriorate and should be checked annually and renewed periodically (at least every five years).

Because this creates an addition to the Plant Record, permanent labels must only be made by designated Plant Records staff trained in the correct use of the database and the labeling printers. As much as possible, mature plants ready for planting should be given permanent tags while still in the nursery. When the Plant Records form is submitted for a proposed plant out, the Plant Records staff will make sure all the plants have permanent tags. One exception would be common native plants which may be going into restoration projects, where a permanent tag would not be appropriate. Another exception is when a group of groundcover plants are planted together.

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Federally listed T & E plants, PEPP, or other rare plants MUST be given individual permanent tags with plant numbers (001,002, etc.) as soon as they are placed on plant out tables or reach an appropriate size in the nursery.

Permanent labels will be affixed on, or adjacent to, permanent plantings in the best manner appropriate to the type of plant material. This may be on a stake, or on a coiled wire around the trunk or large limb of a tree. If a number of individual plants of the same accession (which are not T & E or PEPP) are planted as a contiguous group, they may be labeled as a group with only one or two permanent labels, as needed to identify them. This may be the case with ground covers and in the restoration projects. However, T & E plants must be labeled individually in all situations, in order to maintain the genetic identity of plants derived from different individuals within or between wild populations of the same species.

I. Outplanting

Plants may not be taken from the nursery without:

- Required permanent metal tags
- Completed plant out record form

The designated manager of each collection or garden area will coordinate with the ADLCH or his designee, Plant Records, gardeners and other knowledgeable staff to prepare a plan for locating plants within the collections as best suited to the purposes of that collection and the needs of the plants. Each designated gardener will be given map printouts of their area. When conducting a new outplanting that person will mark the outplant locations on the map. This map page should be submitted to Plant Records with its accompanying Plant Record Form (see **Collections Manual of Procedures, Appendices**). Map print copies can also be made from the map binders available in each Garden office. For each outplanting, Plant Records staff will enter in the database the location, accession numbers and plant numbers as submitted on the Plant Records Form, and will coordinate with the GIS Manager to map new plantings. This record keeping system should facilitate access to the original collection data and present location of all individuals of a given species, or a given accession, from the database, as needed for research or conservation purposes.

J. Maintenance and Mapping of Individual Collections

1. Gardeners' Procedures Manuals

The ADLCH in conjunction with the Director of each garden will be responsible for the design and update of a Garden Procedures Manual. Each gardener will be provided with a copy of the Manual. The Manual will outline procedures to be followed in the horticultural maintenance of each garden area and collections within it. Expectations for maintenance tasks should be clearly stated in a user-friendly format.

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2. Monitoring

Ongoing monitoring of each collection will be conducted on a regular basis by the following:

- Designated manager of that collection or garden location and his/her supervisor
- Plant Records & GIS for review of tagging, ongoing mapping updates
- Integrated Pest Manager - Plant health assessment

Plants should be evaluated by ADLCH or his designee on an ongoing basis for their potential to become invasive.

NTBG is a signatory of the **Draft Voluntary Code of Conduct for Botanical Gardens** (see **Appendix G**) as part of its environmental conservation practices. Spontaneous seedlings should routinely be removed by gardeners (e.g., palms) except in restoration projects where their occurrence may be an indicator of success.

3. Evaluation

The ADLCH and Garden Director will evaluate each collection or area at regular intervals, based on a report by the Curator of the collection, or their designated staff person, and an onsite visit. These administrative staff members must ensure the completion of all evaluations for their areas of responsibility at least once every five years. The appropriate Director will utilize the information obtained from the evaluations to make necessary procedural and programmatic adjustments, and to make recommendations as needed for revisions of this policy.

K. Deaccessioning

Deaccessioning is the process of amending the records of plants removed from the garden, and not the actual removal process. Since the deaccessioning of a plant may involve some controversy, it requires the approval of the ADLCH or the Garden Director. Generally, a plant is deaccessioned if it is:

- dead, and no seed remains in storage
- no longer relevant to the purposes of the NTBG
- missing
- undesirably toxic or otherwise dangerous
- a potential weed in the State of Hawai'i (or Florida, in the case of The Kampong)
- being replaced by a more desirable accession

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Deaccessioning is appropriate when all plants of a given accession are removed. When other plants of the same accession remain in the garden, the removal of a single plant is recorded in the plant out record as dead, with an appropriate annotation as to reason. All potential deaccessions other than dead collections are to be reviewed by the ADLCH, or Garden Director before deaccessioning. Live, accessioned plants will be deaccessioned from the NTBG collection only with Director's approval. Dead or diseased plants may be deaccessioned at the discretion of the designated staff person. When inadequate provenance information is available for a particular taxon, deaccessioning is recommended, if carefully accessioned, wild collected plant material is obtained to replace it. The Plant Records Manager and the Geographic Information Systems Specialist will be notified of any plant removal or so the Living Collections Database and maps can be updated.

VI. COMPREHENSIVE COLLECTIONS POLICIES FOR NON- LIVING COLLECTIONS

A. Herbarium (PTBG) voucher collections

Specimens should be in good condition and not abnormally damaged or diseased unless the study project and specimen label emphasize such conditions. They should be representative of the population being sampled. While in the field staff should attempt to voucher as many species as possible in a given area, especially in areas that have not been documented previously or are incompletely documented. Vouchers should be made for non-native (naturalized or adventive) species as well as native (indigenous and endemic) taxa. Discretion should be exercised regarding extremely rare taxa, in which case a photo voucher may be made if it is not possible to collect a physical voucher (see **Collections Manual of Procedures, Appendices: Photo Images-Vouchers**).

Duplicate specimens should be collected wherever possible and feasible, as these duplicates provide essential material for our specimen exchange programs with other herbaria. Some collecting permits mandate that additional sets of collections be deposited in specific herbaria (e.g., Bishop Museum).

The following policy should be used for numbers of duplicates to collect, contingent on size and health of the plant:

- 5-6 for common native and non-native species
- 3-4 for larger or uncommon species
- 1-2 for very large or rare species at collector's discretion

In cases of very rare species, if the individual plant was vouchered once, it need not be vouchered again; the same original voucher number can be used each time.

A photo voucher is also appropriate in this circumstance. Specimens should be in fertile condition (with flower and/or fruit), except in special circumstances (e.g., to document a pathogen or insect damage). Collection of sterile specimens is discouraged; these will only be accepted if the specimen represents a new taxon or a new locality or range extension of a rare

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taxon. Exceptions may be made if the material is part of a documented study (e.g., ethnobotany of Pohnpei). When fertile specimens are made from those plants the sterile specimen may be deaccessioned. Sterile collections should be limited to a single specimen as those vouchers will not be sent out as either gifts or exchange.

Each specimen should be identified to family, genus, and species, if possible, with the appropriate author. Required documentation of each collection is covered in the **Online Collectors System** (see **Collections Manual of Procedures, Appendices**), and transferred from there to the Herbarium Database. Collectors are asked not to repeat a description of a species as it appears in a published flora, but rather to describe the individual plant that a particular specimen from which it is made. These specimens will be utilized by researchers and institutions all over the world that may not be familiar with the plant or have ready access to relevant floras, and may rely solely on the information provided on the label.

When collecting specimens of large, non-herbaceous plants (i.e., trees, shrubs, lianas), each individual in the population should receive an individual collection number. Collections of propagules from more than one individual should not be mixed, except for common species collected for restoration.

All specimens or parts of specimens should be made to fit on a standard sized herbarium sheet (11.5" × 16.5"). An effort should be made to show both leaf surfaces. Flowers and fruits should be easily visible. Collection of extra flowers and fruits is encouraged.

Palms, large ferns, and other “oversized” plants or plant parts may require special handling. Guidelines are provided in the **Collections Manual of Procedures, Appendices: Palm and Fern Collections for the Herbarium**.

Herbarium vouchers should be processed in the “dirty room” of the Botanical Research Center. They should be labeled, dated and placed in the designated plant dryer until dry. They will then be removed by the Herbarium Collections Manager and freeze-fumigated before entry into the main herbarium area. After freeze-fumigation, collectors may work with and identify their collections in the herbarium.

Use of Herbarium collections is discussed in **Collections Manual of Procedures, Appendices: NTBG Herbarium Specimen Use Policies and the Policy Governing Herbarium Loans**.

B. Ancillary Collections

Many herbarium collections have accessory material, such as silica collections for DNA studies, alcohol-preserved (spirit) collections, wood collections, carpological collections, and photographs. These are known as ancillary collections and are considered part of the vouchers, although they may be stored separately from the herbarium sheets. Ancillary samples must also be vouchered so that the identification of the sample can always be checked and verified. (See also **Collections Manual of Procedures, Appendices: Ancillary Collections**.)

Ancillary collections should be made in the following order of importance:

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- Leaf tissue collections in silica gel for DNA studies (see **Collections Manual of Procedures, Appendices: Silica Collections**) should be made for any species that are rare or might be anticipated to become rare, or for which there are special requests.
- Carpological collections should be made for plants with fruits that are too large or too unmanageable to mount on a herbarium sheet. Label the fruits with collector's initials and numbers using permanent marker or with jeweler's tags and dry separately in paper bags or packets. In addition to seeds collected for the living collections, collect 10-15 additional seeds (if fruiting) for the NTBG seed collection project.
- Alcohol-preserved collections should be made primarily but not uniquely for special requests or purposes, or for certain taxa (e.g., Orchidaceae) that benefit from having 3-D specimens.
- Wood collections should be made for special requests or purposes, or opportunistically if material becomes available, e.g., from a broken branch or if a very rare collection dies (e.g., *Kanaloa*).

VII. USE OF PLANT MATERIAL BY NTBG STAFF AND VOLUNTEERS

In addition to Living Collections & Horticulture purposes, plant material may be requested for use by other NTBG staff/volunteers.

All requests for plant materials, including fruits and flowers, must be submitted to and approved by the Assistant Director of Living Collections & Horticulture.

VIII. DISTRIBUTIONS OUTSIDE N.T.B.G.

A. Requests for plant materials from the Science Department

Requests from outside sources for plant materials other than seeds, plants or herbarium specimens will be reviewed by the Director of Science. Such requests may include DNA silica gel collections, alcohol-preserved collections, etc. Those requests deemed *bona fide* will be filled if possible and feasible. A minimum charge of US \$15 for the first sample and \$5 for additional samples, plus any phytosanitary inspection fees, may be applied to offset staff time, postage, and handling costs, at NTBG's discretion. The fee, which may be adjusted to cover rising costs, is payable online through NTBG's website: <https://ntbg.org/pay.php> (see Science or Conservation Department Administrative Assistant for details).

Requests for specimens or materials from the NTBG Herbarium are processed in accordance with the **Policy Governing Herbarium Loans (Collections Manual of Procedures, Appendices)**. Requests for herbarium specimens on loan or exchange should be sent to the Director of Science/Curator of the Herbarium. A copy of the **Material Transfer Agreement (Plant Use Agreements)** (see **Collections Manual of Procedures, Appendices**) must be sent with the material and signed and returned by the requestor.

B. Requests from Living Collections for Scientific Use

Requests from other institutions, including botanical gardens, arboreta, universities and individual researchers should be referred to the Director of Science and the Assistant Director of Living Collections & Horticulture (ADLCH) for approval. The request should specify the exact plant materials, amounts of material needed, and the purpose for which they will be used. NTBG's response should include an attachment of one of the following forms (found in the used **Collections Manual of Procedures, Appendices: Plant Distribution Form, Material Transfer Agreements (Plant Use Agreement), or for breadfruit, the Breadfruit Institute's Material Transfer Agreement**). This form should be completed and returned to NTBG. Restricted special collections or collections made under permits are not to be distributed without approval of original donor or permitting agency. This information will be recorded in the Living Collections Database under each accession distributed.

Those requests deemed bona fide will be filled if possible and feasible. Terms and conditions of the transfer of plant material should also be recorded in the database. Seed requests from outside institutions/individuals must be accompanied by a completed and signed **Plant Distribution Form (Collections Manual of Procedures, Appendices)** with the following information:

- Requestor identification (name, affiliation, and address)
- Purpose (namely, for research, T & E or PEP recovery, reintroduction)
- Genus and species requested
- Quantity requested

The ADLCH may deny requests if:

- The information provided is insufficient or inappropriate
- There is not enough seed in storage to send
- Permits under which the seed was collected preclude distribution

The request should be forwarded to the Director of Science, and the ADLCH for approval, and if suitable material is available, they will request that the Seed Bank Manager or Nursery Manager fulfill the request.

C. Plant Outreach Management (POM) Program

Donations of any plants or sales of non-endangered plants may be made as nursery inventory and garden needs allow. NTBG staff attend various local community events to promote the Garden. It may be appropriate to give or sell plants of particular interest to members of the community at these events to educate and encourage public support of horticulture and conservation.

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These plants should have labels which give proper care instructions. NTBG accession information should be removed. While NTBG will not ordinarily have plants of endangered species available for this purpose, in cases where excess plants of second generation (horticultural, not wild) origin are available, they may be used, if accompanied by the orange tags required by the State Department of Forestry and Wildlife. The NTBG Conservation Department may make plant material available for native plant restoration projects in compliance with State and Federal laws. These plants may be made available as part of a contract for services in which NTBG's LC&H or Conservation Department is a consultant collaborator. Reasonable costs may be assessed to recover the costs of propagation, curation, materials, and labor.

When plants are going to a community organization, school, community restoration project, or other non-commercial organizations, a list of the plants must be submitted to Plant Records on the **NTBG POM Plant Records Form (Collections Manual of Procedures, Appendices)** prior to leaving the nursery.

D. No commercial distributions

Plant materials are not to be distributed for any commercial purpose, except with prior approval of the ADLCH , and, in the case of breadfruit, the Director of the Breadfruit Institute.

APPENDICES

Appendix A: NTBG Collections and Categories, Draft 2007

Appendix B: Allerton Garden, Protecting a Historic Designed Landscape: Managing the Living Collections of the Allerton Garden

Appendix C: Field Safety Policy

Appendix D: Application for Research/Collection/Possession Permit for Hawai'i Threatened & Endangered Plant Species; DLNR-DOFAW Revised Permit Guidelines

Appendix E: NTBG Policy on Access to Genetic Resources and Benefit-Sharing (APGR&BS)

Appendix F: Hawai'i Rare Plant Restoration Group Collection Guidelines for Botanic Gardens

Appendix G: Draft Voluntary Code of Conduct for Botanical Gardens

NTBG Collections and Categories 2007

1. Economic (Ethnobotanical) Plant Collections

Definition: Economic Botany studies the past, present, and future uses of plants, and the relationship between plants and people. Economically important plants: for food, medicine, fiber, fuel, construction.

- A. Tropical Fruit including bananas, citrus, mangos, avocados (McBryde, Bamboo Bridge, Fruit Orchard, Allerton Orchard, Kampong)
- B. Spices and Perfume Plants – McBryde Garden, Spice of Life Trail
- C. Medicinal Plants- (used to be the whole Mid-Valley area of McBryde, DL thinks not enough focus has been placed on it to give it priority)
- D. Polynesian Canoe Plants; Traditional Pacific Ethnobotanical (Kahanu, Limahuli, McBryde Garden, old and new Canoe areas in Big Valley and Middle Valley)
 - a. Hala, *Pandanus* spp., (Allerton)
 - b. Awa, *Piper methysticum*, (most died, some at Pump Six area, Kahanu)
 - c. Bananas (Kahanu) and Breadfruit (Kahanu and McBryde)
 - d. Taro, *Colocasia esculenta*, (Limahuli and Kahanu)
- E. Kitchen Garden (Visitor's Center)

2. Synoptic Collections

Definition: A synoptic collection provides a thematic overview of some aspect of plants, whether geographic, functional, or horticultural, represented by one to a few from various taxa

Example: UBC gardens have a trellis garden showing many different flowering vines that grow in that climate.

- A. Geographic Groups
 - a. Pacific Island (Big Valley to east of Canoe Garden, and Waterfall areas)
 - i. Polynesia (Marquesas, Tonga, Samoa)
 - ii. Micronesia (Caroline Islands, Marshall Islands, Guam, Marianas)
 - iii. Melanesia (Fiji, New Caledonia, New Guinea)
 - b. Other island groups
 - i. Mascarene, including Mauritius (Limited area within the Middle Valley area)
 - c. Indonesian (Kampong)
- B. Taxonomic Groups
 - a. Arecaceae (Palms) McBryde and Allerton Palmetum
 - b. Rubiaceae (Dr. Lorence) McBryde, Maidenhair Falls area
 - c. Zingiberales (Lorence) including Marantaceae, Heliconiaceae, Lowiaceae, Strelitziaceae, Musaceae, Costaceae, Cannaceae, and

Zingiberaceae (NTBG is a designated repository for Heliconia Society International) areas in McBryde, Pump Six, Maidenhair Falls, and Four House Canyon, “Cutting Garden” in Allerton

- d. *Erythrina* (McBryde, Lower Valley, Legume area)
- e. Aroids
- f. Orchids

C. Other

Flowering Tree Collection (McBryde all over, especially Big Valley and could be considered to include *Erythrina*, a lot of Apocynaceae area; some of Legume area; Kampong)

3. Conservation Collections

Definition: Collections of specific taxa, intended to include representatives of most or all known populations, with a number of plants of each, widest possible genetic diversity of plants in each taxon)

- A. Breadfruit (*Artocarpus altilis*) designated repository under IPGRI Kahanu and McBryde (Ragone, Breadfruit Institute)
- B. *Pelagodoxa* palms, from Marquesas Islands (Lorence, Wood), Maidenhair Falls and two old ones at Bamboo Bridge)
- C. *Pritchardia* palms (Wood, look to collaboration)
- D. Native Hawaiian Conservation Collections, Kauai endemics, Other Hawaiian island endemics
 - a. Species Listed as Threatened and Endangered for Conservation and recovery under the U.S. Endangered Species Act (Federal T &E)
 - b. Species listed as priority for collection, propagation and restoration by the HRPRG Plant Extinction Prevention Program (PEP) (Perlman)
 - c. Center for Plant Conservation designated species
 - d. Representative of ecosystem/plant community types, including common plants (see restoration locations on maps)

4. Historical Landscape Collections

Definition: Collections reflecting cultural history, historical trust, thematic interpretation

- A. Allerton Garden: A garden paradise, transformed through time by the hands of a Hawaiian Queen, by a sugar plantation magnate, and most significantly by an artist and an architect. It is a series of garden rooms, pools, miniature waterfalls, fountains, and statues, garden as art. The focus is on landscape design, but among the plantings are botanically important species of the tropics, including varieties of palms, ki (ti), heliconias, and gingers.

- B. Kahanu: Plant collections from the Pacific Islands are the focus here, particularly plants of value to the Hawaiian people as well as to other cultures of Polynesia, Micronesia, and Melanesia. At Kahanu one learns the cultural relationships between the people and these remarkable plants that were transported around the Pacific on ancient voyaging canoes. Includes Pi`ilanihale, a massive lava-rock structure that is believed to be the one of the largest ancient places of worship (heiau) in Hawaii. This cultural site is registered as a National Historic Landmark.
- C. Kampong: Heritage collections from Southeast Asia, Central and South America, the Caribbean, and other tropical locales create a cornucopia of exotic fruit, including candle fruit, peanut butter fruit, egg fruit, coco-plums, and over 50 varieties of mango. Numerous species of palms, cycads, and flowering trees are studied by scientists from around the world.
- D. Limahuli: The lower valley was used by the ancient Hawaiians to build agricultural terraces out of lava rock and plant cultivars of kalo (taro), an important cultural food crop. These and other plants that were significant to the early inhabitants, as well as native species, make up the Garden's collections. The property includes a plantation-era garden. Limahuli Stream, one of the last pristine waterways left in the Islands, provides habitat for indigenous aquatic life. In Limahuli Preserve conservationists and restoration biologists are working to preserve species native to this habitat.

Protecting an Historic Designed Landscape: Managing the Living Collections of the Allerton Garden

Definitions

Historic Designed Landscape--a landscape that was consciously designed or laid out by a landscape architect, master gardener, architect, or horticulturist according to design principles, or an amateur gardener working in a recognized style or tradition. The landscape may be associated with a significant person, trend, or event in landscape architecture; or illustrate an important development in the theory and practice of landscape architecture. Aesthetic values play a significant role in designed landscapes.

Vernacular Landscape--a landscape that evolved through use by the people whose activities or occupancy shaped that landscape. Through social or cultural attitudes of an individual, family or a community, the landscape reflects the physical, biological, and cultural character of those everyday lives. Function plays a significant role in vernacular landscapes.

Ethnographic Landscape--a landscape containing a variety of natural and cultural resources defined as heritage resources. Examples are contemporary settlements, religious sacred sites, and geological structures. Small plant communities, animals, subsistence and ceremonial grounds are often components.

Preservation Planning for Historic Designed Landscapes

The Allerton Garden is a designed, vernacular, and ethnographic landscape which has evolved in an extraordinarily beautiful setting. It is the dynamic interconnected systems of land, water, vegetation and wildlife of this setting that distinguishes Lawai Valley as a landscape. Thus, the documentation, treatment, and ongoing management of the Allerton Garden requires a comprehensive, multi-disciplinary approach.

Landscape preservation teams are often directed by a landscape architect with specific expertise in landscape preservation. These teams may represent a broad array of academic backgrounds, training, and related project experience. Ideally the team should have access to consultants with expertise in landscape

architecture, history, landscape archeology, horticulture, planning, architecture, engineering, cultural geography, wildlife ecology, ethnography, interpretation, material and object conservation, landscape maintenance and management.

Careful planning prior to undertaking preservation or restoration can prevent irrevocable damage to a historic designed landscape. Preservation planning involves the following steps: historical research; inventory and documentation of existing conditions; decisions on the preservation or restoration of garden areas; and, the development of a strategy for ongoing maintenance.

The treatment and maintenance of the designed landscape in the Allerton Garden should also be considered in concert with the management of the entire historic property. As a result, other studies may be relevant. They include interpretive plans, exhibit design, and historic structures reports.

These steps will result in three products: a historic designed landscape report, a landscape treatment plan, and a landscape maintenance guide.

Historic Designed Landscape Report for the Allerton Garden

The historic designed landscape report documents the history, significance and treatment of the Allerton Garden. The report evaluates the history and integrity of the landscape including any changes to its geographical context, features, materials, and use. It is a powerful tool to protect the landscape's character-defining features from undue wear, alteration or loss. The report will also provide managers and curators with information needed to make management decisions

Historical Research

Research is essential before undertaking any treatment in the Allerton Garden. The documentation of the changing ownership, occupancy and development of the valley will facilitate a more informed appreciation of the associations and characteristics that make this garden significant. Research findings provide a foundation to make educated decisions for preservation and restoration work, and assist ongoing maintenance and management operations.

A variety of primary and secondary sources have been consulted to document the history of the Allerton Garden. Primary archival sources include historic plans, surveys, tax maps, U. S. Geological Survey maps, soil profiles, aerial

photographs, photographs, paintings, newspaper articles, construction drawings, account books and personal correspondence. Secondary sources include published histories, archeological reports and journal articles.

Contemporary documentary resources have also been consulted. Oral histories of residents, managers, and maintenance personnel with a long tenure or historical association have been valuable sources of information about changes to the Lawai Valley.

Preparing Period Plans

Based on a review of the archival resources outlined above, and the extant landscape today, an as-built period plan should be drawn. For all successive tenures of ownership, occupancy and landscape change, period plans should be generated. Period plans can document to the greatest extent possible the historic appearance during a particular period of ownership, occupancy, or development. Period plans should be based on primary archival sources and should avoid conjecture. Features that are based on secondary or less accurate sources should be graphically differentiated.

Inventorying and Documenting Existing Conditions

Inventory and documentation may be recorded in plans, photographs, aerial photographs, narratives, video - or any combination of these techniques. Existing conditions should be documented to scale, using a GPS unit to located features and plant material of interest. The Allerton Garden will require documentation at more than one scale. The lower Lawai Valley should be documented at a smaller scale to depict the spatial and visual relationships of the Allerton Garden, while discrete areas, such as the Diana Fountain will require a larger scale to illustrate individual plant materials, pavement patterns and other details.

The Allerton Garden should be documented in photographically at regular intervals. Registration points can be set to indicate the precise location and orientation of the camera for each series of photographs. Registration points should correspond to significant forms, features and spatial relationships within the landscape and its surrounds. The points should also correspond to historic views to illustrate the change in the landscape over time. These photographs will be used as a management tool to document the landscape's evolution, and to ensure that its character-defining features are preserved over time through

informed maintenance operations and later treatment and management decisions.

All features that contribute to the Allerton Garden's historic character should be recorded. These include physical features and the visual and spatial relationships that are character defining. The identification of existing plants should be specific, including genus, species, common name, age, and size. The plant material should be accurately located on the existing conditions map.

Within historic designed landscapes, plants may have historical or botanical significance. A plant may have been associated with a historic figure such as Queen Emma, or part of a notable landscape design feature such as the Mermaid Fountain. A plant may be an uncommon cultivar, or exceptional in size, age, or rarity. If such plants are lost, there would be a loss of historic integrity and biological diversity. Therefore, treating living plant materials as a curatorial collection should be undertaken. This process tracks the condition and maintenance operations on individual plants. Due to concern for the preservation of genetic diversity and the need to replace significant plant materials, we should propagate in our nursery plants that possess significant historic associations to the Allerton Garden.

Historic Designed Landscape Treatment Plan for the Allerton Garden

Prior to undertaking work on a landscape, a treatment plan should be developed. The two primary treatments applicable to the Allerton Garden are:

Preservation--defined as the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction.

Restoration--defined as the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period.

Adopting a treatment plan, in concert with a preservation maintenance plan, acknowledges a historic designed landscape's ever-changing existence and the inter-relationship of treatment and ongoing maintenance. Performance

standards, scheduling and record keeping of maintenance activities on a day-to-day or month-to-month basis, may then be planned for.

In all cases, treatment should be executed at the appropriate level, reflecting the condition of the landscape, with repair work identifiable upon close inspection and indicated in supplemental interpretative information. When repairing or replacing a feature, every effort should be made to achieve visual and physical compatibility. Historic materials should be matched in design, scale, color and texture.

In a landscape with the high level of integrity and authenticity of the Allerton Garden, preservation could be the primary treatment. Such a treatment emphasizes protection, stabilization, cyclical maintenance, and repair of character-defining landscape features. Changes over time that are part of the landscape's continuum and are significant in their own right may be retained, while changes that are not significant, yet do not encroach upon or erode character may also be maintained. Preservation entails the essential operations to safeguard existing resources.

When the most important goal is to portray a landscape at an exact period of time, for example at the time of John Allerton's death, restoration could be selected as the primary treatment. Unlike preservation and rehabilitation, interpreting the landscape's continuum or evolution is not the objective. Restoration may include the removal of features from other periods and the construction of missing or lost features and materials from the reconstruction period. In all cases, treatment should be substantiated by historic research and the documentation of existing conditions. Restoration and re-construction treatment work should avoid the creation of a landscape whose features did not exist historically. For example, if features from an earlier period did not co-exist with extant features from a later period that are being retained, their restoration would not be appropriate.

An historic treatment plan for the Allerton Garden will delineate which of these two treatment options should be used. The two options are not mutually exclusive but a decision must be made whether preservation or restoration will be the primary treatment.

Historic Designed Landscape Preservation Maintenance Guide for the Allerton Garden

Throughout the preservation planning process, it is important to ensure that existing landscape features are retained. Preservation maintenance is the practice of monitoring and controlling change in the landscape to ensure that its historic integrity is not altered and features are not lost. This is particularly important during the research and treatment planning process. To be effective, the maintenance program must have a guiding philosophy; an understanding of preservation maintenance techniques; and a system for documenting changes in the Allerton Garden.

The philosophical approach to maintenance should coincide with the landscape's current stage in the preservation planning process. The historic designed landscape report and the treatment plan will take several years to complete, yet during this time we will need to address immediate issues related to the decline, wear, decay, or damage of landscape features. Therefore, initial maintenance operations will focus on the stabilization and protection of all landscape features to provide temporary, often emergency measures to prevent deterioration, failure, or loss, without altering the Allerton Garden's existing character.

After the treatment plan is implemented, the approach to preservation maintenance will be modified to reflect the objectives defined by the plan. The detailed specifications prepared in the treatment plan relating to the retention, repair, removal, or replacement of features in the Allerton Garden will guide and inform a comprehensive preservation maintenance program. This would include schedules for monitoring and routine maintenance, appropriate preservation maintenance procedures, as well as ongoing record keeping of work performed. For vegetation, the preservation maintenance program would also include thresholds for growth or change in character, appropriate pruning methods, propagation and replacement procedures.

Training of maintenance staff in preservation maintenance skills is essential. Preservation maintenance practices differ from standard maintenance practices because of the focus on perpetuating the historic character or use of the landscape rather than beautification. For example, introducing new varieties of turf, shrubs or trees in the "formal" areas of the Allerton Garden such as the Thanksgiving Room is inappropriate. Older hedges and shrubs should be rejuvenated, or propagated, rather than removed and replaced. Mature specimen trees require careful monitoring and periodic arbor work to ensure that they grace the Allerton Garden as long as possible.

There is no documentation of maintenance procedures in the Allerton Garden. This has created uncertainties in horticultural and infrastructure maintenance policy decisions. Planning for ongoing maintenance of plant material and infrastructure should be documented--both routinely and comprehensively. An annual work program should record the frequency of maintenance work on built and natural landscape features. It can also monitor the age, health and vigor of vegetation. For example, assessments by the horticultural staff should document the presence of weeds, pests, dead leaves, pale color, wilting, soil compaction--all of which signal particular maintenance needs. For built elements, the deterioration of paving or drainage systems may be noted and the need for repair or replacement indicated before hazards develop. An overall maintenance program can assist in routine and cyclic maintenance of the Allerton Garden and can also guide long term treatment projects.

The most efficient approach to documenting maintenance data and recording change over time is to use a computerized geographical information system (GIS). Such a system would include plans and photographs that record the Allerton Garden's living collection of plant materials. Other layers in the GIS would include: soil types, water features, irrigation plans, historic structures, paths and roads, and archaeological sites. Using a computerized approach to weaving these complex layers together will result in maintenance procedures that are sensitive to the integrity of the Allerton Garden.

Action List

1. Complete historical documentation and archive all materials in the NTBG library.
2. Prepare existing and period plans for the Allerton Garden
3. Inventory existing plant materials in the Allerton Garden
4. Consult with a preservation landscape architect with particular expertise in English and Italian gardens
5. Produce historic designed landscape treatment plan for the Allerton Garden
6. Produce historic designed landscape maintenance plan for the Allerton Garden

NATIONAL TROPICAL BOTANICAL GARDEN FIELD SAFETY POLICY

The mission of the National Tropical Botanical Garden is to enrich life through discovery, scientific research, conservation, and education by perpetuating the survival of plants, ecosystems, and cultural knowledge of tropical regions. One of the ways we achieve this mission is by assembling conservation, research, and reference collections of living plants and herbarium specimens, collected from their native environments. Thus our mission requires field work in remote locations where threatened and endangered plants still exist.

While no organization with outdoor field staff can completely eliminate all risk in their operations, the purpose of this Field Work Safety Policy is to identify hazards and risks associated with our work, and safety measures and policies that will avoid, reduce, manage or eliminate those risks.

Most of our field work involves taking a fairly consistent set of risks, particularly with respect to terrain. Routine risks include rain, wind, poor footing, steep slopes, loose or falling rock, lack of marked trails, impure water, dehydration, and fatigue. All these risks can be anticipated and preventative safety measures taken.

A few more serious risks arise with more remote or inaccessible locations where helicopters and/or climbing equipment are utilized. Advanced training, planning and experience are necessary in this type of work.

The highest risk conditions are probably those which are created by the environment, and which can be only partially anticipated, including high water and flooding, high winds, a major failure of equipment, or serious injury.

Most risks are avoidable with proper planning and precautions. One risk is personnel with lack of fitness, experience, proper clothing or equipment or lack of caution or judgment. Screening and pre-trip checking of other persons accompanying field staff, such as researchers or students, can avoid most of this risk. Other avoidable risks include hunters or landowners with firearms, changes of weather, poor communication, and improper or damaged equipment or clothing.

Normally field staff members will work with a partner, but may at times have to work alone. When doing so, it will only be within radio or cell phone range, or with a satellite or heli phone.

Most avoidable risks result from lack of judgment, planning, or communication. These include planning too long a trip for the available time, necessitating rushing; not considering weather conditions; not communicating with co-workers any change of plan or direction; not communicating hazards or injuries; use of intoxicants, and lack of appropriate caution associated with a reckless attitude.

NTBG's field staff members have identified safety measures which will manage and eliminate much of the risk associated with their work. These include various types of training, planning, equipment, routine precautions and means to regularly re-evaluate safety.

Training

Field staff members have identified several training courses that are recommended for their type of work:

- First Aid
- Helicopter Safety
- Helicopter Sling Load
- Wilderness First Aid
- First Responder
- Ropes-Climbing
- Cardio-Pulmonary Resuscitation (CPR)

In addition field staff must be trained to use standard equipment including four-wheel drive vehicles, radios, and GPS. Climbing and rope work requires specialized training, and will only be undertaken by those staff with these specialized skills and training.

Trip Planning

All trips shall be listed on Department calendar in the Conservation-Horticulture office. Field staff will check in regularly when out on multi-day trips.

For heli-ops, a **Flight Plan** should be submitted to the Conservation Director or the Administrative Assistant, for pre-approval before it goes to the helicopter operator, then kept on file.

Emergency Contacts

A hard copy of the **Emergency Contact Sheet** will be on file with the Administrative Assistant, and should be kept current for all employees.

A copy of the **Emergency Contact Sheet** will be given to the agencies our field staff work with on the neighbor islands, to include a personal (family or friend) contact as well as NTBG Conservation contact.

Weather Warnings

National Oceanographic and Atmospheric Administration - National Weather Service Warnings and Watches should be checked. If NOAA or NWS have posted a weather warning (Floods, Flash Flood, High Winds, Hurricanes, Tsunami), field work should be postponed until the warning is lifted.

Check out/in

Each NTBG Conservation Dept field staff member will designate another staff person who will be notified when field work begins, as to intended location and duration of trip; and who will be notified when that staff person returns from the field.

Equipment

Much of the necessary equipment for field work is provided to field staff members by NTBG. This includes packs, rain gear, special clothing (for example for NW Islands work), GPS, radios, first aid kits, camping equipment including tents and water purifiers, emergency blankets, spiked tabs, ropes, helmets, head-lamps, two-way radio, remote contact radios with appropriate frequencies, and water-proof cell phones. Equipment for animal control is only used under approved permits. This equipment is the property of NTBG and must be returned to the garden at the termination of employment.

Other equipment that should be available from the garden as needed are machetes, hand saws, pole pruner-pickers, loaner cell phones, satellite phone, helicopter apparel, and maps.

Field botanists are responsible for having necessary equipment, clothing, food and other gear with them as appropriate. They are responsible for maintaining their equipment in good working order. Necessary repairs to vehicles should be scheduled and completed prior to field work. Unless suitable replacement equipment is available, field work should not be undertaken if equipment is not in good working order.

Pre-trip Precautions

- Equipment checks: ropes, radios, cell phones, vehicle.
- Check-in with helicopter company and respect their decision if not to fly
- Personnel checks: Do not take inexperienced or ill-prepared people on long hikes or steep terrain
- Weather checks – NOAA website
- Regular radio check-ins
- Check out/in with emergency contact person, leaving expected time of return and itinerary. Contact person knows who to contact at NTBG if return is delayed.

Evaluation

Fieldwork Trip Plans/Reports should be filed with the Administrative Assistant, including time out, time in, activities (surveying, collecting) unusual conditions, incidents.

Learn from "near misses" – make a note on trip report, and note how could have been avoided.

Report all accidents or injuries immediately on appropriate forms to the Administrative Assistant.

Review all "near misses" and accidents with Field Work Safety Committee at least every six months.

Research in Limahuli Preserve

All field researchers must:

1. Fill out a **Fieldwork Trip Plan/Report** indicating with high specificity where they will be and for how long, and
2. Limahuli Administration must have signed off on this plan prior to departure to ensure that researchers are not putting themselves in any dangerous situations.
3. Return two hours before sunset so there is enough time to send out a search party if need be. Overnight stays in the field will not be allowed unless specifically authorized in the **Fieldwork Trip Plan**.
4. Take a VHF radio with them so that they can communicate with Limahuli Hale or another unit in a communication network.
5. Have a cell-phone to have a fully charged battery in order to do field research.
6. No remote research in the Preserve without supervision of either NTBG staff or designated experienced field researchers. No field research will be conducted on an off-day for NTBG staff unless specifically pre-authorized.

DEPARTMENT OF LAND AND NATURAL RESOURCES

Adoption of Chapter 13-107
Hawaii Administrative Rules

May 15, 1997

1. Chapter 107 of Title 13, Hawaii Administrative Rules, entitled "Threatened and Endangered Plants" is adopted to read as follows:

"HAWAII ADMINISTRATIVE RULES

TITLE 13

DEPARTMENT OF LAND AND NATURAL RESOURCES

SUBTITLE 5

FORESTRY AND WILDLIFE

PART 1

FORESTRY

CHAPTER 107

THREATENED AND ENDANGERED PLANTS

§13-107-1	Purpose
§13-107-2	Definitions
§13-107-3	Prohibited activities
§13-107-4	Licenses
§13-107-5	Transfer of plants by licensees
§13-107-6	Commercial-use plant species
§13-107-7	Compliance with laws
§13-107-8	Penalty
§13-107-9	Exemption

Historical Note: Chapter 13-107, Hawaii Administrative Rules, is based substantially upon Chapter 13-124, Hawaii Administrative Rules of the Division of Forestry and Wildlife, Department of Land and Natural Resources. [Eff 8/10/53; am 10/10/55; am 3/28/58 and ren Regulation 6; am 9/8/73; am 3/22/82 R]

§13-107-1 Purpose. The purpose of this chapter is to conserve, manage, protect, and enhance native endangered and threatened plants. [Eff] (Auth: HRS §§195D-3, 195D-4, 195D-6) (Imp: §§195D-3, 195D-4, 195D-6, 50 CFR §§17.12)

§13-107-2 Definitions. As used in this chapter unless the context requires otherwise:

"Accidental or non-negligent death" means death of plants which occurs despite the reasonable care of the plant possessor;

"Authorized representative" means the administrator, foresters, botanists, conservation enforcement officers, or other persons within the department authorized by the board to act for the board;

"Board" means the board of land and natural resources;

"Commercial use" means the transfer of a plant by a party or their agent for any fee, charge, or other compensation.

"Commercial-use plants" means garden-grown stocks (not wild-collected), belonging to a threatened or endangered species which have been approved by the department for commercial use.

"Controlled environment" means a habitat, excluding the endangered and threatened species wild population habitat, which is horticulturally manipulated for the purpose of growing and producing offspring of select species;

"Cultivated plants" means propagules or plants germinated from garden-grown stock as well as from wild populations and grown or cared for in a controlled environment;

"Cultural use" means use of plants for traditional native Hawaiian practices;

"Department" means the department of land and natural resources;

"Educational use" means use of plants or plant parts for display purposes to aid in education about that plant;

"Endangered plants" means all species, subspecies, or sub-populations of plants that have been officially listed as endangered by the State of Hawaii, including those taxa listed in the exhibit entitled "Exhibit 1, Chapter 13-107, Endangered Plants of Hawaii" dated 5/15/97, which is located at the end of this chapter and incorporated by reference;

"Experimental populations" means any populations (including offspring arising solely therefrom), resulting from outplanting outside a controlled environment;

"Garden-grown stock" means plants and propagules

from cultivated plants;

"License" means written permission by the department to do a particular act or series of acts which without such permission would be unauthorized or prohibited;

"Native" means endemic and indigenous species which arrived and occur naturally in Hawaii without the aid of humans;

"Outplanting" means planting and growing threatened and endangered plants in the wild through human intervention;

"Plant" means any member of the plant kingdom, including seeds, roots, and other parts thereof;

"Propagule" means a living plant part such as a cutting or a seed that can reproduce a plant;

"Species" means and shall include any subspecies or lower taxa of plant(s);

"State" means the State of Hawaii;

"State land" means lands under the direct control of the state;

"Take" means to cut, collect, uproot, destroy, injure, possess native endangered or threatened species of plants, or to attempt to engage in any such conduct;

"Threatened species" means all species, subspecies, or sub-populations of plants that have been officially listed as threatened by the state, including those taxa listed in the exhibit entitled "Exhibit 2, Chapter 13-107, Threatened Plants of Hawaii", dated 5/15/97, which is located at the end of this chapter and incorporated by reference;

"Wild populations" means naturally occurring populations that do not occur as a result of outplanting. [Eff] (Auth: HRS §§195D-3, 195D-4, 195D-6) (Imp: HRS §§195D-3, 195D-4, 195D-6, 50 CFR §§17.12)

§13-107-3 Prohibited activities. (a) No person shall or attempt to take, sell, or offer for sale, deliver, carry, ship, transport, or export, any native threatened or endangered plant or parts thereof from any lands within the State of Hawaii, except as an authorized representative of the department and as provided for in this chapter.

(b) No person shall outplant any threatened or endangered species on another landowner's property without the permission of the landowner and obtaining the appropriate license from the department, except as

provided for in this chapter.

(c) Horticultural activities within a controlled environment cannot be used to either justify or mitigate transplantation, removal, or destruction of wild plants or populations of both threatened and endangered plants.

(d) No person shall sell threatened and endangered plants unless that plant species has been approved by the department for commercial use. [Eff

] (Auth: HRS §§195D-3, 195D-4, 195D-6) (Imp: HRS §§195D-3, 195D-4, 195D-6, 50 CFR §§17.12)

§13-107-4 Licenses. (a) Licenses for collecting, possessing, transporting, propagating, and outplanting threatened or endangered species of plants from wild populations may be issued by the board or its authorized representative for propagation, education, cultural, or scientific purposes or to enhance the survival of the species.

(b) Applications for licenses shall be in writing and contain:

- (1) A description of the project, including its purpose, location, methods, and study plan, and length of duration;
- (2) Information as to species, location (if known), and both number of plants and plant parts to be collected;
- (3) The name, address, and affiliation of the collector(s) or organization sponsoring the project.

(c) No license may be amended or otherwise altered without the written approval of the board or its authorized representative.

(d) An annual summary of project activities shall be submitted to the department by the license holder by July 1 of each year for the duration of the license period and shall include:

- (1) The name and address of the licensee(s);
- (2) The scientific and common names of the plants involved;
- (3) The dates collection occurred;
- (4) The number of plants or plant parts collected;
- (5) The location(s) of the collection(s);
- (6) The status and results of both research conducted and propagation of collected

plants; and

- (7) Any other information required on the license.

(e) Licenses shall be revocable for due cause and shall not be assignable unless otherwise provided by law. Any person whose license has been revoked shall not be eligible for another license until the expiration of two years from the date of revocation.

(f) In addition to a license, a Hawaii department of agriculture inspection is required to transport plants between the islands.

(g) Accidental death of plants grown from cultivated and garden-grown stock under licenses will not be subject to penalty under this chapter, provided the holder of the license has exercised due care in the performance of actions authorized by the license. [Eff

] (Auth: HRS §§195D-3, 195D-4, 195D-6)

(Imp: HRS §§195D-3, 195D-4, 195D-6, 50 CFR §§17.12)

§13-107-5 Transfer of plants by licensees. (a)

License holders may give away, donate, or sell threatened and endangered plants derived from garden-grown stocks only if they comply with all requirements under this chapter.

(b) Licensee(s) are responsible for providing written information concerning restrictions established by the department and the island of origin with all plants that are given away, donated, or sold. Licensee(s) are encouraged to provide educational materials that emphasize the need to protect wild populations.

(c) An annual summary shall be submitted to the department by the license holder by July 1 of each year for the duration of the license period and shall include:

- (1) The name and address of the licensee;
- (2) The scientific, common name, and numbers of the plants given away, donated, or sold during the past fiscal year. [Eff]
(Auth: HRS §§195D-3, 195D-4, 195D-6) (Imp: HRS §§195D-3, 195D-4, 195D-6, 50 CFR §§17.12)

§13-107-6 Commercial-use plant species. (a)

All threatened and endangered plant species from garden-grown stock can be used commercially. Petitions to exclude certain threatened and endangered plant

species from being used commercially must be submitted in writing to the department.

(b) The petition will be referred to a committee composed of a minimum of five members who are knowledgeable of the biological conditions required to grow threatened and endangered plants, which shall include at least one nursery association representative, one from the native Hawaiian community knowledgeable in traditional arts and religious practices, and one citizen at large knowledgeable in the cultivation and use of native plants. The committee shall evaluate, based upon the best knowledge available, whether commercial use of a plant species will endanger wild populations of that or any other native plant species, and will make recommendations to the department, which will approve or deny these petitions.

(c) The petitioner will be responsible for obtaining the information needed by the committee to make a recommendation as to the status of a plant species.

(d) The committee will review commercial-use plant species two years after the initial recommendation, make a second recommendation five years after the initial recommendation and every two years thereafter to recommend continuing, denying, or excluding plant species from commercial use based upon chapter 195D, HRS, protection of the wild populations, enforcement issues, and enhancement of the plant species. The committee may, however, review any plant species at anytime.

(e) Commercial-use plants may only be sold if accompanied by a tag provided by the department. Each plant must have a tag which will be sold to licensees at cost and to commercial vendors with a

§13-107-7

surcharge to cover administrative expenses. The tag will indicate to the department, the vendor, and the buyer that the plant is from garden-grown stock and not from a wild population.

(f) Accidental death of plants sold with a tag will not be subject to penalty under this chapter. [Eff] (Auth: HRS §§195D-3, 195D-4, 195D-6) (Imp: HRS §§195D-3, 195D-4, 195D-6, 50 CFR §§17.12)

§13-107-7 Compliance with laws. All persons applying for licenses under this chapter shall comply with all federal, state, and county laws, rules, and required permits or licenses. [Eff]
(Auth: HRS §§195D-3, 195D-4, 195D-6) (Imp: HRS §§195D-8, 195D-9)

§13-107-8 Penalty. Any person violating any part of this chapter shall be penalized as provided by law. [Eff] (Auth: HRS §§195D-3, 195D-4, 195D-6) (Imp: HRS §§195D-8, 195D-9)

§13-107-9 Exemption. (a) Person(s) who possessed plants or plant parts prior to their listing as threatened or endangered may voluntarily submit the following documentation to the division of forestry and wildlife:

- (1) The species' scientific and common name;
- (2) The location and number of plants; and
- (3) Where the plants were obtained, if known.

(b) Upon receiving this documentation, the department will send the possessor appropriate notification of exemption.

(c) Plants or their offspring from experimental populations established after their listing as threatened and/or endangered are exempt from the requirements of this chapter.

(d) Accidental death of exempted plants will not be subject to penalty under this chapter. [Eff

] (Auth: HRS §§195D-3, 195D-4, 195D-6) (Imp: HRS §§195D-3, 195D-4, 195D-6)

§13-107-10 Severability. These rules are declared to be severable and if any portion or the application thereof to any person or property is held invalid for any reason, the validity of the remainder of these rules or the application of the remainder to other persons or property shall not be affected." [Eff] (Auth: HRS §§183D-2, 183D-3) (Imp: HRS §§183D-2, 183D-3)

2. The adoption of chapter 13-107, Hawaii Administrative Rules, shall take effect ten days after filing with the office of the Lieutenant Governor.

I certify that the foregoing are copies of the rules drafted in the Ramseyer format, pursuant to the requirements of section 91-4.1, Hawaii Revised Statutes, which were adopted on _____, and filed with the Office of the Lieutenant Governor.

Chairperson, Department of
Land and Natural Resources

APPROVED AS TO FORM:

Deputy Attorney General

**NATIONAL TROPICAL BOTANICAL GARDEN POLICY
ON
ACCESS TO PLANT GENETIC RESOURCES AND BENEFIT-SHARING**

The National Tropical Botanical Garden endorses the following principles on access to plant genetic resources and benefit-sharing:

International and national treaties and laws related to access to genetic resources and associated traditional knowledge and benefit-sharing

- Honor the letter and spirit of the Convention of Biology Diversity (CBD), The International Treaty on Plant Genetic Resources for Food and Agriculture (The Treaty), The Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the Endangered Species Act (ESA), and laws relating to access and benefit-sharing, including those relating to traditional knowledge.

Acquisition of genetic resources

- In order to obtain prior informed consent, provide a full explanation of how the genetic resources will be acquired and used.
- When acquiring genetic resources from *in situ* conditions, obtain prior informed consent from the government of the country of origin and any other relevant stakeholders, according to applicable law and best practice.
- When acquiring genetic resources from *ex situ* collections (such as botanic gardens), obtain prior informed consent from the body governing the *ex situ* collection and any additional consents required by that body.
- When acquiring genetic resources from *ex situ* sources, whether from *ex situ* collections, commercial sources or individuals, evaluate available documentation and, where necessary, take appropriate steps to ensure that the genetic resources were acquired in accordance with applicable law and best practice.

Use and supply of genetic resources

- Use and supply genetic resources and their derivatives on terms and conditions consistent with those under which they were acquired.
- Prepare a transparent policy on the commercialization (including plant sales) of genetic resources acquired before and since the CBD entered into force and their derivatives, whether by the Participating Institution or a recipient third party.

Use of written agreements

- Acquire genetic resources and supply genetic resources and derivatives using written agreements, where required by applicable law and best practice, setting out the terms and

conditions under which the genetic resources may be acquired, used, and supplied and resulting benefits shared.

Benefit-sharing

- Share fairly and equitably with the country of origin and other stakeholders, the benefits arising from the use of genetic resources and their derivatives including non-monetary, and, in the case of commercialization, also monetary benefits.
- Share benefits arising from the use of genetic resources acquired prior to the entry into force of the CBD, as far as possible, in the same manner as for those acquired thereafter.

Curation

In order to comply with these principles, maintain records and mechanisms to:

- record the terms and conditions under which genetic resources are acquired;
- track the use in the Participating Institution and benefits arising from that use; and
- record supply to third parties, including the terms and conditions of supply.

Communicate this policy

- Communicate, as appropriate, the above-stated institutional policy as to the principles stated above, which have been adopted by the NTBG.

*— Adopted February 27, 2007 by the
Board of Trustees of the National Tropical Botanical Garden*

Note: Participating Institution = NTBG

REVISED DRAFT POLICY – COLLECTION OF ENDANGERED PLANTS BY AUTHORIZED BOTANICAL GARDENS IN HAWAII

We start with the assumption that the collectors, or the gardens they represent, already possess all relevant permits, follow appropriate protocols for collecting, and have permission of the land owner to collect at that site.

1. There are two primary concerns when collecting endangered species for propagation by botanical gardens:
 - A. Protecting the wild population from harm due to overcollection.
 - B. Collecting adequate material to assure maximum available genetic variability of the ex-situ collection.
2. For genetic safety net species, i.e., those with 20 or fewer known wild plants remaining, efforts should be made to collect material from each individual plant.
 - A. Seed collections should be made from each individual plant that has seeds, and seeds from each plant should be kept as a separate collection.
 - B. Material for vegetative propagation should be taken from each plant not producing seeds, and material from each plant treated as a separate collection.
 - C. Collecting and storing pollen may also be a useful technique to employ.
3. For seed collections:
 - A. As a general rule not more than 20% of the seeds should be removed from any one plant, if the plant is growing in a place where it appears that it could produce offspring successfully in the wild.
 - B. If the plant is surrounded by as thick growth of alien species, or fruits are being attacked by rats or other alien species, then the collector should utilize judgment and determine whether harvesting more than 20% of the seeds would benefit the survival of the species more than leaving them on the plant. If so, more seeds may be collected.
 - C. If seeds are intended for long-term storage, or for conventional propagation, they should be mature at time of collection. If seeds are intended for micropropagation, they could be either immature (preferable) or mature.
 - D. Even if very large amounts of seed are available, care should be taken not to collect excess numbers of seed, but only the number that can reasonably be accommodated in existing propagation and storage facilities. Keep in mind however, that in some Hawaiian plants, both rare and common, the percentage of seed germination is very low.
4. For collections of vegetative propagating material:
 - A. Do not remove so much material that the wild plant is harmed in any significant way. In general, if the plant is a healthy multibranched tree or large shrub one could take 5 to 10 branch tip cuttings, for either conventional propagation or micropropagation. If the plant has only a single stem, look for lateral buds or basal sprouts that could be removed and used for micropropagation, or as a last resort consider taking a couple of immature leaves or roots that might respond to micropropagation, but do not take the terminal bud.

5. Removing entire plants from the wild for propagation:

This is almost never necessary, but there may be rare occasions (see examples below) where this is the only feasible solution for conserving the taxon. Such action should be taken only after considering all possible alternatives, and seeking the opinion of appropriate experts, including U.S. Fish and Wildlife Service botanists and the Hawai'i state botanist at the Division Of Forestry And Wildlife. Examples of circumstances in which it may be necessary to remove entire plants include:

 - A. For some very small annuals, e.g., *Centaurium sebaeoides*, seedlings or pre-flowering plants may be the only propagules available at certain seasons. As annuals, the plants will die after flowering, and it may be necessary to take some pre-flowering specimens and flower them in a greenhouse.
 - B. If a plant is in the path of a new road or construction project where permission has already been given to permit "incidental take" as part of the construction, and no alternative sites or routes are feasible. (Note: removal of plants from wild populations should never be cited as an option for mitigation. It should become an option only if someone already has a permit that allows for "incidental take").
 - C. If a plant seems to be in jeopardy from some known, or unknown, cause, and fencing, treating with insecticide or fungicide, fertilizing, or other ameliorating measures do not seem likely to solve the problem, then consideration may be given to removing the entire plant to a site where it can be grown and propagated successfully. As an example, the one known population of a rare (but unlisted) *Stenogyne* was being monitored by field biologists for the Army. Three of the five known plants died within a short period of time, and the remaining two appeared to be sickly. The site was visited by an Army biologist accompanied by two horticulturists, a plant pathologist, and an entomologist. After investigation the scientists agreed that the outlook for the last two plants *in situ* was poor. The agreement was made to remove one entire plant, and some cuttings of the second plant, to a botanical garden for rescue work. That material was all propagated successfully and several plants are now thriving in the greenhouse. The remaining wild plant died shortly thereafter. In this case the right decision was made, but future cases should be subjected to similar appropriate rigorous evaluation before any decision is made.

6. Generally for wild-collected material one should prepare a herbarium voucher specimen for each plant collected and deposit it in a recognized herbarium. However, this may be difficult to do without harming the plant. Use your best judgment in determining what to collect, and if necessary to avoid damage to the plant, take only one or two of the oldest leaves, or even fallen leaves, and perhaps one flower, as a voucher. If material, including a voucher, has previously been collected from the individual, it is not necessary to collect another one, but merely to note that a voucher already exists.

7. For collections from genetic safety net species with 21-50 wild individuals, or for more common species, use the collecting guidelines given in:

Falk, D.A. & K.E. Holsinger, (Eds.) *Genetics and Conservation of Rare Plants*. Oxford University Press. 1991.

OR

Guerrant, E. & B. Pavlik, chapter in *Conservation Biology for the Coming Decade - 2nd edition*. (P.L. Fiedler & P.M. Kareiva, (Eds.)). 1997

Draft
Voluntary Codes of Conduct Re: Invasive Species
For Botanic Gardens and Arboreta
February 2002

1. Conduct an institution-wide review examining all departments and activities that provide opportunities to stem the proliferation of invasive species and inform visitors. For example, review or write a collections policy that addresses this issue; examine such activities as seed sales, plant sales, book store offerings, wreath-making workshops, etc.
2. Avoid introducing invasive plants by establishing an invasive plant assessment procedure. Predictive risk assessments are desirable, and should also include responsible monitoring on the garden site or through partnerships with other institutions. Institutions should be aware of both direct and indirect effects of plant introduction, such as biological interference in gene flow, disruption of pollinator relationships, etc.
3. Consider removing invasive species from plant collections. If a decision is made to retain an invasive plant, ensure its control and provide strong interpretation to the public explaining the risk and its function in the garden.
4. Seek to control harmful invasive species in natural areas managed by the garden and assist others in controlling them on their property, when possible.
5. Promote non-invasive alternative plants or, when possible, help develop non-invasive alternatives through plant selection or breeding.
6. If your institution participates in seed or plant distribution, including through an *Index Seminum*, do not distribute known invasive plants except for bona-fide research purposes, and consider the consequences of distribution outside your biogeographic region. Consider a statement of caution attached to species that appear to be potentially invasive but have not been fully evaluated.
7. Increase public awareness about invasive plants. Inform why they are a problem, including the origin, mechanisms of harm, and need for prevention and control. Work with the local nursery and seed industries to assist the public in environmentally safe gardening and sales. Horticulture education programs, such as those at universities, should also be included in education and outreach efforts. Encourage the public to evaluate what they do in their own practices and gardens.
8. Participate in developing, implementing, or supporting national, regional, or local early warning systems for immediate reporting and control. Participate also in the creation of regional lists of concern.
9. Botanical gardens should try to become informed about invasiveness of their species in other biogeographic regions, and this information should be compiled and shared in a manner accessible to all.
10. Become partners with other organizations in the management of harmful invasive species.
11. Follow all laws on importation, exportation, quarantine, and distribution of plant materials across political boundaries, including foreign countries. Be sensitive to conventions and treaties that deal with this issue, and encourage affiliated organizations (plant societies, garden clubs, etc.) to do the same.