Standard Operating Procedure (SOP) #12

Collecting and Vouchering

Version 2.0 (May 3, 2021)

Change History

New Version #	Revision Date	Author	Changes Made	Reason for Change	Previous Version #
2.0	5/3/2021	Kathryn Akamine	Edits to reflect updated field procedures.	To promote thorough species identification and collaborate with Bishop museum and park herbariums.	1.0

Only changes in this specific SOP will be logged here. Version numbers increase incrementally by hundredths (e.g., version 1.01, version 1.02) for minor changes. Major revisions should be designated with the next whole number (e.g., version 2.0, 3.0, 4.0). Record the previous version number, date of revision, author of the revision, changes made, and reason for the change along with the new version number.

Based on: Williams, A., S. O'Neil, E. Speith, and J. Rodgers. 2007. Standard Operating Procedure (SOP) #4 Plant Collecting and Vouchering, Version 1.0. *In* Early Detection Monitoring of Invasive Plant Species in the San Francisco Bay Area Network: A Volunteer-Based Approach. Department of the Interior, National Park Service, Pacific West Regional Office, Oakland, CA.

Only PARK STAFF are allowed to collect without a permit.

Contents

Purpose

This SOP describes how to collect voucher specimens in the process of Pacific Island Inventory and Monitoring Network (PACN I&M) Focal Terrestrial Plant Communities (FTPC) Monitoring. Having a physical voucher of a plant, especially a potentially new record in a park, is the preferred method of proving an observation. Specimens should not be collected by non-staff unless the individual has the proper Scientific Research and Collecting Permit. Volunteers and inexperienced field crew members should only take photographic vouchers of any unknown species. More experienced staff may field-key or choose to voucher for expert identification, or to record a new species for the park plant list or significant range expansion for an invasive species (e.g., the first record in the park or on an island), but should also photograph the plant *in situ* to capture characteristics that may be lost during pressing. Contact park vegetation staff for a list of plants that lack voucher evidence of their presence in the park.

In the Field

Collecting Ethics and Regulations

- Refrain removing any species from a plot.
- Only collect native individuals if the plant's population will not be seriously affected by the taking (i.e., if there are over 20 individuals in the vicinity). If the population is small, but you must collect, take only enough to key without destroying the plant (e.g., a flower and stem without roots).
- If native plants are suspected to be rare, do not collect. Hawaii Plant Extinction Prevention program (State of Hawaii 2011), state and federally listed species should not be collected without consultation with the park supervisory botanist and the appropriate permits.
- Nonnative individuals can be collected regardless of population size, but if there is any uncertainty as to whether a rare individual is native or not it should not be collected.

Collecting a Specimen

- Collect representative parts of the entire individual, including the roots, fruits/flowers (if possible), and vegetative growth of grasses and forbs. A piece of a branch is usually sufficient for trees and shrubs. If reproductive parts cannot be found, technicians can keep an eye open for an individual in flower for the rest of the sampling effort, but are not expected to return to a particular plot for the exclusive purpose of finding the individual in flower at a later date.
- Place unknown specimens in sealable plastic bags. Each collected specimen should have a label. A piece of Rite-in-the-Rain paper should note the community, sampling fame, plot number, and the Unknown Name (either "Scientific name?" or unknown alias code). The Unknown Name should match exactly with the Unknown name written on the Presence Form.

- Whether collection is possible or not, all unknown species should have photos. Take photographs of the individual (multiple photos should be used to capture important plant features (e.g. buds, flowers, fruits, leaf arrangement, venation, stipules, hairs, etc.).

- Related notes should be recorded (e.g. description of characteristics not obvious in the photos, such as measurements, aromatic properties, texture, etc.).

- At the end of the field day, place plastic bags in a refrigerator, or cooler if camping, until they are identified and/or placed in a plant press and dried for identification at a later date. It is imperative that the label information remain associated with the specimen. Ideally, specimens should not be left in the refrigerator for more than a few days. Identification often requires a variety of dichotomous keys, a dissecting microscope, and a dissecting kit.

Collecting Tips

- Plants are best keyed fresh, so field-key when possible.

- Tiny-flowered plants are especially difficult to key when wilted or pressed. If field-keying is unsuccessful or not possible, press some of the plant, and store the rest in a plastic bag or container.

- If plant is stored in a sealed plastic bag, blow the bag up with air and keep the plant moist (a small piece of wet paper in the bag helps); refrigeration will help keep the specimen fresh.

Voucher Specimens

If you decide to collect with the intent of creating a pressed and mounted specimen:

- Collect a representative example of the species, not the largest or smallest. Try to capture any phenotypic variation.

- Collect enough of the plant to make pressing worthwhile. If the plants are tiny, collect enough to fill about half an herbarium sheet. Take enough to make a good voucher, plus a little extra for keying if necessary.

- Collect as much of the individual plant as possible, including roots (or a portion if rhizomatous, roots are necessary for vouchering grasses), bulbs, vegetative and flowering/fruiting matter. Park herbarium accepts sterile vouchers, but Bishop Museum will not accept sterile samples.

- Collect as many phenological stages as possible (flowering and fruiting), since many keys use characteristics of fruit and flower. If necessary, snip flowers or fruits off an additional plant to complete the collection.

- Press carefully; the standard plant press is the same size as a standard herbarium sheet (11”x17”). How you place the plant in the press will generally be how it will look mounted. If a plant is large, fold it or cut it to fit, keeping branches and general form intact. Note

original dimensions and photograph if possible. Plants may occasionally require more than one sheet for proper representation.

  - For vouchers collected in HAVO, HAVO herbarium will accept pressed vouchers and museum curator will mount.

- The following information should be recorded to submit with vouchers (Figure SOP 12.1).

  - Date
  - Name of collector
  - Family, genus, species, common name, and authority
  - Location, general region and/or area notes are sufficient. Exact location in Lat/Long may be useful for field records but it is not necessary.
  - Elevation
  - Habitat description (dominant species); associated species
  - Field description (e.g., lifeform, height/length, etc.)
  - Characteristics that may be lost in pressing (e.g., smells, flower color, habit, etc.)
  - The following is necessary for unknown species documentation for field crew: Protocol name (i.e., FTPC or EIPS), Sampling Frame, and plot number/transect number. This is not included when submitting vouchers, but it is a good habit for the field crew.

- Wash as much dirt as possible from the roots and pat dry before pressing.

- If flowers are large enough, cut one or two open and press flat so the interior/cross-section can be seen. Do the same for fruits. Turn over at least one leaf so the underside will be visible in the final mounting.

- When photo-vouchering, many of the above guidelines still apply. For key characteristics such as flowers and fruits, be sure to get close-ups from several angles. Also photograph the whole plant including an object for scale.

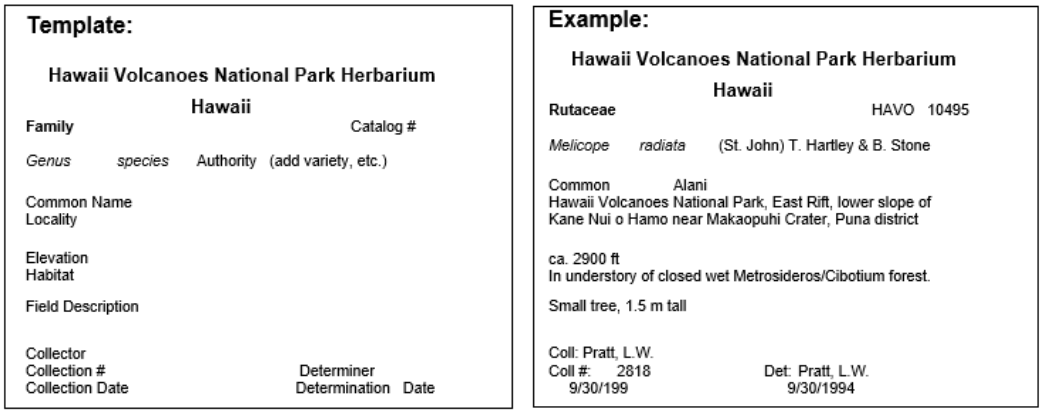

Figure SOP 12.1. Template of vascular plant label.

Post-collection Processing

Identify the Specimen

Do your best to identify the plant to species level; it is a good idea to confirm this identification by asking a local expert and comparing to an existing herbarium specimen or online photo.

Determining Formal Accession of Specimen into the Herbarium Collection

If the specimen meets any of the following criteria, you should consider accessioning it, if it does not then you may consider adding it to a field collection (an informal notebook or set of specimens that can be used in the field for reference) or you may discard it once you are finished identifying it for whatever purpose you had.

- Is the species under-represented (less than 5 specimens) in the herbarium?
- Does specimen display a unique feature?
- Is this a unique voucher associated with a study or monitoring project?
- Was the specimen previously undocumented in that section of the park?
- Is the specimen exceptional in some other way?
- Is there complete collection information associated with the specimen? Plants that lack location, habitat, collector and/or identifier information should not be accessioned.

Independent Verification

If plants will be verified, do not accession until they are returned. This makes loan paperwork unnecessary. A receipt for property is sufficient.

Whether or not to verify: If the specimen is to be formally accessioned, independent verification of the specimen's identity should be considered when one or more of the following conditions are met:

- There are no preexisting specimens of the same species in the collection;
- The collection represents a new species to the park;
- Designated park staff are unable to confirm its identification with certainty;
- The specimen is otherwise unique or problematic.

Where to get them verified: If independent verification is desired for a quantity of specimens, the herbarium manager or curator should arrange for a contract through a recognized herbarium; current options include informal assistance from the Bishop Museum in Honolulu or Smithsonian Institute in Washington DC. Independent verification can pose a problem, because many herbaria want to keep specimens or duplicate specimens after identification, but NPS property guidelines will only allow for "permanent loans" which may not suffice in the eyes of some herbaria. Be sure to discuss with local or regional NPS curation staff that has experience with natural resource collections.

Documenting and packing specimens for shipping: Include proper documentation including a spreadsheet listing the specimens with collection numbers. Place a label with each specimen. See Figure SOP 12.1 for an example of a label that can be used.

- Dry and press, but do not mount them. This facilitates identification.

- Place them in folded, numbered sheets of newsprint, occasionally layered between cardboard, and tie the entire bundle with string to facilitate removal from the box.
- Pack the box tightly to prevent anything from moving around within it.
- Send it via a reputable carrier (FedEx, UPS, USPS), insured. If feasible, hand carry.

Accessioning the Specimen into the Formal Herbarium Collection

A collection of dried plants to be added to the parks' herbarium needs an accession number, as a group, and individual catalog numbers for each specimen. Obtain these from the museum curator. Specimens collected as part of a study should be accessioned together, clearly indicating relevant study information. Researchers who have collected specimens under a Scientific Research and Collecting Permit must provide cataloging data in the form specified by the museum curator in the permit. Catalogued specimens must be entered into the ANCS+ database. Contact the herbarium manager or museum curator for procedures and permit requirements if applicable. Remember that in entering the specimen you should be preserving the process as well as the final identification, so original identifications and identifiers should be recorded even if incorrect. Information needed for ANCS+ includes the data from the sheet above, as well as the date of any subsequent identifications and the name of the person identifying (verifying) the specimen.

Adding the Specimen into NPSpecies

Currently, some duplication of data exists between park herbaria and NPSpecies. Researchers who have collected specimens under a Scientific Research and Collecting Permit under I&M must also provide data in electronic format suitable for upload into NPSpecies. Updates to the park species list and to NPSpecies need to be accompanied by a voucher specimen, or adequate photos, and coordinated through the data manager. The data manager works with the project lead to make any additions or edits to NPSpecies.

Mounting the Specimen

Once specimens are identified and verified, they may be mounted. Mounting can take place before or after accessioning. Not all pressed material must (or should) be mounted: only the most complete plants, plus additional fertile material or leaf variations, should be adhered to a sheet—enough to show the plant's characteristics, but not so much as to crowd the page. Split into "a" and "b" sheets if necessary and be sure to leave room for label information. Additional information is available in the NPS Museum Handbook (NPS 1990) which is a complete reference guide on how to manage, preserve, document, access and use NPS museum collections. If you are inexperienced at mounting, consult I&M or local experts and/or look into one of the references listed at the end of this document.

Glossary

Accession number: The number assigned to an object or group of objects to be added to the parks' collection.

Authority: The original publishing author for a scientific name.

Binomial: The genus and species of a scientific name. Taken here in the broad sense to include subspecies.

NPSpecies: The National Park Service catalog for natural resource inventory data.

Phenotypic: The outward expression of genetic; flowers of Scotch broom show phenotypic variation in that some are all yellow and some have red wings.

UTM: Universal Transverse Mercator (or latitude/longitude) in pinpointing a location.

Voucher: A physical representation of a plant observation; the pressed, mounted plant "vouching" that a plant was found in a given location.

Suggested Reading

Bridson, D. and Forman, L., editors. 1992. *The Herbarium Handbook*, rev. ed. Kew, Royal Botanic Gardens.

National Park Service (NPS). 1990. Museum Management Handbook. Available at https://www.nps.gov/museum/publications/index.htm (accessed 3 May 2021).

NPS Museum Management Handbook for collections

United States Department of Agriculture, Agricultural Research Service. 1971. *Preparing Herbarium Specimens of Vascular Plants*. U.S. Government Printing Office. Washington, D.C.

Literature Cited

State of Hawaii. 2011. Plant Extinction Prevention Program website. https://dlnr.hawaii.gov/ecosystems/rare-plants/ (accessed 3 May 2021).