

# Santa Barbara Botanic Garden Tissue Bank:

## A Resource for Plant Genetics Research

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### Biorepository Basics

Tissue banks are important resources for DNA-based research, providing material from which researchers can conduct studies of population genetics and investigate taxonomic questions. These explorations range from understanding the structure of rare populations on the landscape, to description of new or cryptic taxa based on improved phylogenetic inference. The Santa Barbara Botanic Garden has established a repository for plant tissue collections that will soon be connected to the Global Genome Biodiversity Network ([http://www.ggbn.org/ggbn\\_portal/](http://www.ggbn.org/ggbn_portal/)), an international consortium, fueling research within the Garden as well as collaborations with other institutions and individuals. Tissues gathered locally can be used by international colleagues in studies of trait evolution and biogeography for groups of taxonomic interest for which costs or permits prohibit their own fieldwork.

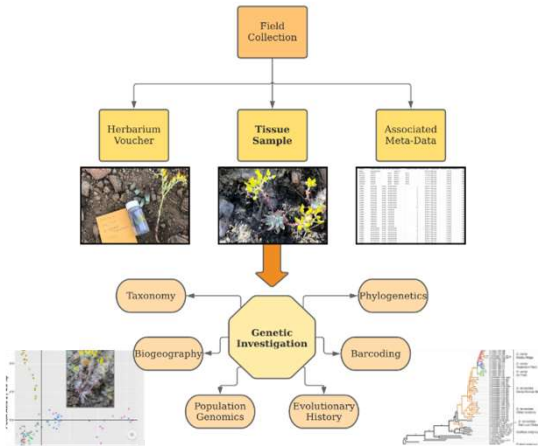


Figure 1: Workflow diagram for documentation of tissues deposited into the tissue bank, and possible studies that result from use of those tissues. Genetic analysis of tissue samples can lead to multiple different methods of investigation and research outcomes important for both science and conservation.

### Materials and Methods

When collections are made in the field for the SBBG Tissue Bank, care is taken to ensure that samples are well-preserved and that sufficient metadata is recorded (Figure 1). Collectors place tissue samples in manila coin envelopes labeled with taxon, name of the collector, and collection number, date, and location. To ensure that downstream DNA isolations represent a single genetic individual, each envelope should contain tissue from only one individual. Sample envelopes are then placed into plastic bags containing silica gel, drying the tissue quickly to avoid genetic degradation (Figure 2B). It is crucial that tissue collections have associated voucher specimens, for purposes of identification, although a single voucher specimen can represent an entire population when taking tissue from many individuals of a single population.

Metadata associated with tissue collections is transcribed into SBBG's Genomic Tissue Bank Database, as well as the Global Genome Biodiversity Network.

Tissues collected for the SBBG Genomics Tissue Bank are stored in air-tight plastic containers, labeled by plant family, and tissues are organized alphabetically by taxon (Figure 2A). Silica gel is recharged when color-changing beads indicate that the gel is saturated with moisture (Figure 2C).



Figure 2: The Tissue Bank at Santa Barbara Botanic Garden. A) Tissue samples are stored in air-tight containers labeled with plant family. B) Coin envelopes are used to collect tissue collections in the field and store them in the tissue repository. Their size encourages collection of enough tissue for multiple DNA extractions. C) Silica gel is used in both collection and storage. Rapid dehydration of leaf tissue using silica gel keeps genetic material stable, and gel is placed within each air-tight container to prevent the accumulation of moisture. D) Using Garden-provided collection forms ensures that the appropriate metadata is associated with tissue contributions.

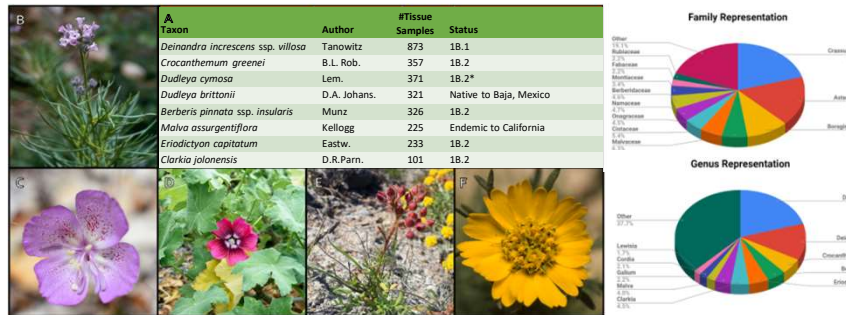


Figure 3: Focal Taxa in the Tissue Bank, and representation of families and genera within the tissue bank. A) This table summarizes the focal taxa represented in the tissue bank. Several of these taxa are rare, as is indicated by their CNPS status. B) *Eriodictyon capitatum*, Lompoc Yerba Santa C) *Clarkia jolonensis*, Jolon Clarkia D) *Malva assurgentiflora*, Island Mallow E) *Crocanthemum greenei*, Island Rush-Rose F) *Deinandra increscens* ssp. *villosa*, Gaviota Tar Plant G) These two charts break down the makeup of the tissue bank collections by plant family and genus. With over 1,400 tissues, the genus *Dudleya* in the family *Crassulaceae* comprises 20% of the entire collection.

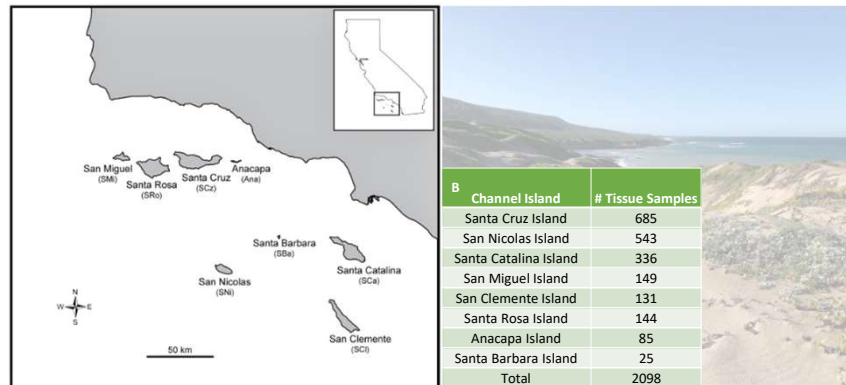


Figure 4: The Santa Barbara Botanic Garden is the designated repository for botanical specimens from the Channel Islands National Park, which is comprised of five of the eight California Channel Islands. Additionally, the Garden has 90 years of botanical expeditions and collections representing all eight of the islands. This resource is particularly valuable for collaborators outside of the Garden due to the cost associated with reaching the islands and difficulty obtaining permits for collecting botanical specimens. A) The eight California Channel Islands are located off the coast of Southern California. B) This table outlines the number of tissue collections from each of the islands.

### Current Holdings

The Tissue Bank at SBBG currently contains 7,050 tissue samples representing 1,500 taxa. Prominently featured plant families include *Crassulaceae* with 1,400 tissues, *Asteraceae* with 1,200 tissues, *Boraginaceae* with 700 tissues, and *Malvaceae* with 400 tissues (Figure 3). These collections span more than 120 plant families and 460 genera, expanding far beyond the California Floristic Province with samples from 30 countries.

Island taxa currently make up nearly 30% of the tissue bank, 2,000 of the 7,000 collections (Figure 4B). Every taxon known to be present on San Nicolas Island will be represented in the tissue bank due to collection efforts spurred by genetic barcoding projects. Island endemics and rare mainland species are among the most highly represented taxa in the repository, including several species of *Dudleya*, *Crocanthemum greenei*, *Eriodictyon capitatum*, and *Berberis pinnata* subsp. *insularis*. The tissue bank is growing with every field season as researchers contribute collections.

### Collaboration

Santa Barbara Botanic Garden is happy to accept tissue collections from outside sources, as well as fulfill requests for tissue loans. Contributors are asked to provide accompanying metadata extensive enough to be research-grade:

- Taxon Name
- Associated Voucher Information
- Locality and GPS Coordinates
- Collection Number
- Collector Name
- Collection Date

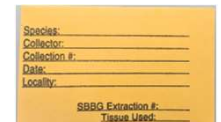


Figure 5: An example of the format with which to label tissue collection envelopes

Upon request, the Garden can provide contributors with collection materials: silica, manila coin envelopes (Figure 5), and collection forms (Figure 2D). As is expected with other collection efforts, when collecting tissue for the Garden, researchers must have acquired the appropriate permits and used responsible collection methods.

To request tissue samples or collection materials, contact the following SBBG personnel:  
 K. Hasenstab-Lehman – [klehman@sbbg.org](mailto:klehman@sbbg.org)  
 M. Williams – [mguilliams@sbbg.org](mailto:mguilliams@sbbg.org)

### Acknowledgements

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### References

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