**Utilizing Digital Herbarium Specimens**

Careful observation of a variety of plant specimens will be useful in growing your appreciation of plants in general and your understanding of plant structures.

Herbaria house carefully preserved plant specimens. Many of these specimens are pressed, dried, and affixed to sheets of paper. They are then cataloged and filed in cabinets in taxonomical order. Each herbarium specimen is preserved with a label that provides the following details (at least the things in bold):

**Scientific name**: genus, species, authority [who discovered/named the species]

**Determiner (det.):** who identified the species of this particular specimen

**Plant Family**

**Detailed location**: County, State; description of the location with reference to roads, junctions, distances from permanent landmarks. Maybe coordinates and/or elevation

Habitat: the type of plant community where the plant is growing and, if known, other plants growing in association

Plant habit: describes the form of the plant (tree, shrub, vine, herb) and its height

Frequency: is the plant rare, occasional, frequent or common

Plant description: describe characteristics of the plant which may be lost upon drying, such as flower/fruit color and fragrance, and aroma

**Collector name and collection number**

**Date of collection:** Hopefully with the month spelled out or abbreviated and 4 digit year

Example:

Herbarium of Aquinas College

*Thalictrum macrostylum* (Small & A. Heller)

det. RPH, 2012

Ranunculaceae

North Carolina, Pender County

Moores Creek National Battlefield site (NPS)

Female (cryptic, pistils in addition to stamens), 35 cm tall. Found in marshy savanna directly behind Visitor’s Center. Shrubby vegetation with intermittent conifers, maintained by infrequent controlled burns.

Coll. Rebecca P Humphrey #1001 Date: 24-May-12

A specimen with its label then stores a significant amount of information. We can use them to learn about plant morphology and species characteristics to improve our understanding of taxonomical relationships, perhaps also extracting DNA for this purpose. We might apply the location information to the study of species ranges/biogeography. Dates can allow us to examine phenological differences across time and space. Preserved plants may also harbor evidences of symbioses such as fungal spores or bacterial cells.

Currently, many herbaria are in the process of digitizing their collections. This preserves morphological data in high-resolution images (with a scale bar and color standard) and label information in a searchable database.

In lab today, you will work in pairs to answer a potentially interesting question related to plant biology using digitized specimens from a variety of sources

**What you should do during lab:**

**Together, we will talk about digitized herbarium collections:**

Navigate to the [NYBG C.V. Starr Virtual Herbarium](http://sweetgum.nybg.org/science/vh/):

**Scenario 1, Re-naming:**

Use the Advanced Search for Genus = “*Thalictrum” Species = “polygamum”*

* + Click on a few of these entries and observe the notes on the sheets as well as the notes on the webpage below the image
	+ Carefully observe [this entry](http://sweetgum.nybg.org/science/vh/specimen_details.php?irn=4184198). Compare the species designation on the sheet and digital records. Compare that to these other specimens: [Example 1](http://sweetgum.nybg.org/science/vh/specimen-details/?irn=1489565) and [Ex 2](http://sweetgum.nybg.org/science/vh/specimen-details/?irn=1489444)

**Scenario 2, Taxonomic reduction:**

Use the Advanced Search for Genus = “*Thalictrum”* type = “holotype” Background: [**FNA**](http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233501269)

* + Select *T. subrotundum* [[link](http://sweetgum.nybg.org/science/vh/specimen_details.php?irn=394640)]
	+ Observe the specimen, and figure out what happened with its identification.
	For fun, find the collection location on a map.
	+ Consider this article from Rhodora: [**Rhodora** link](https://www.biodiversitylibrary.org/item/14516)
		- Use this information to explain what you observed
		- *Note: Rhodora is a peer-reviewed journal of botany devoted primarily to the flora of N America. It has been in publication continuously since 1899*

**Independent/Pair work:**
 Decide who you want to work with (or work alone), and [determine your topic](https://docs.google.com/spreadsheets/d/1Vx6C8JzPSNgqLN4aFYoC51qqWRTqp3ex7ULPjkxA6dU/edit?usp=sharing).

**Topic:**

* Locate the relevant data within the [New York Botanical Gardens C.V. Starr Virtual Herbarium](http://sweetgum.nybg.org/science/vh/), and download the data (two files) into an easily findable folder
* Download the file “Histogram Code.R” and place it in the same folder as the above
* Open the RStudio program
* Set your Working Directory to the folder where your files are located (I will show you how)
* Work through the posted code to explore the data and create relevant figures (histograms)
* Compose your report (details below)

**A report will be due on EDIT DATE & TIME**

**Your brief report should include the following:**

- A meaningful title

- A statement, underlined, of your assigned topic/question

- A report of your findings, based on observations of *at least* 40 specimens

- State what you found and why it might be interesting or useful. *Cite one primary source in this section of the report*

- You should include *your two histograms* in your report to summarize your findings.

- In a caption for your figure, in the text, or in a separate table, you should clearly indicate the number of specimens used and any categories you used to answer your question (if it’s not immediately obvious in the figure).

- If needed, clarify the rationale behind any judgment calls you had to make in classifying/assessing your specimens (e.g., how to tell if there were flowers or fruit) and/or detail any uncertainties or perceived limitations of your study (e.g., insufficient specimens available from a certain time period or region). Include images if needed/useful.

The expected length is 1.5-3 pages.

Other Potentially useful digital collections:

[Consortium of Midwest Herbaria](http://midwestherbaria.org/portal/collections/index.php) || [Harvard University Digital Collections](http://kiki.huh.harvard.edu/databases/specimen_index.html)

[Kew Herbarium Catalogue](http://apps.kew.org/herbcat/navigator.do)

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| **Herbarium Report Rubric -- Name**:  |
| **Criterion** | **Points Available** | **Points Earned** |
| Meaningful title provided  | 7 |  |
| Topic stated, underlined  | 6 |  |
| Findings stated and are clear, complete, brief, relevant to the topicStatements show clear consideration of the collected data, mentioning how the data support an explanation as well as areas where support might be inconclusive or lacking.  | 25 |  |
| Number of specimens (sample size) indicated somewhere  | 10 |  |
| One primary source included, with citation; source reasonable and relevant | 12 |  |
| Figures included with acceptable formatting; figure represents data meaningful to the topic/question  | 15 |  |
| **Total** | **75** |  |