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Beyond the Digitization Project:
Using Digitized Specimen Data to Inform Collections Management of an Aggregated Herbarium

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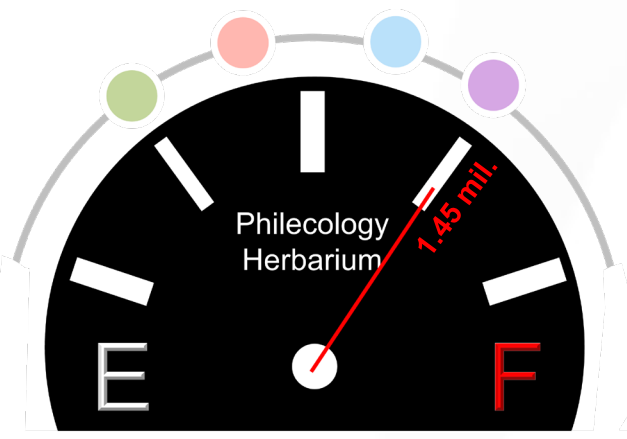
1997: VDB herbarium
Vanderbilt University Herbarium developed by Robert Kral moves to Fort Worth, Texas.

2017: NLU herbarium
R. Dale Thomas Collection from the University of Louisiana at Monroe moves to Fort Worth, Texas.

1987: SMU herbarium
Lloyd H. Shinners Collection in Systematic Botany of Southern Methodist University is incorporated into a newly formed Botanical Research Institute of Texas.

These four herbaria (identified by their Index Herbarium Code) interacted as active exchange partners for the distribution of duplicate specimens.



Cont.: BRIT herbarium
Botanical Research Institute of Texas Herbarium grows through staff deposits & specimen exchange programs.

Expansion space
Space exists to house ca. 2 million specimens in a fully compactorized arrangement with a major investment.

Collections management professionals face restrictions on space, staffing, and other resources necessary to safely house specimens. The ability to use digitized specimen data to inform strategic planning and time allocation for the integration of their holdings, and deaccession of duplicates, cannot be overstated.

Proposed method & paths forward

1) Obtain dataset for completely transcribed specimens and identify purported duplicate specimen sets (collector name and number match).
   - ➢ *Standardization of collector names can be improved (collab.: Bionomia)*
2) Evaluate specimens for deaccession using above dataset and online specimen images: (1) multi-sheet specimens will be kept (Fig. D-E); (2) one specimen from a set of duplicates will be kept and others deaccessioned (Fig A-C).
   - ➢ *Build process to more efficiently compare specimen data and images of purported duplicates (collab.: Symbiota)*
3) Ground-truth deaccession plan and update individual sheets to reflect current determination mined from all duplicate specimens before distribution.
   - ➢ *Improve methods for digitally and physically updating sheets with annotation for current dets (collab.: Symbiota)*
4) Make duplicate sheets available as gift/exchange to herbarium community.
   - ➢ *Community creation of an online resource of available dups (collab.: Society for Herbarium Curators, Society for the Preservation of Natural History Collections).*

Herbarium specimens:
A-C: Duplicate *Xyris* specimens (coll name & number match) of a single herbarium collection and
D-E: a multi-sheet *Arisaema* specimen representing a single collection. Across these five examples, two sheets among A-C will be deaccessioned, and all three remaining specimens will be kept.

How much space can we save?

Comparison of two datasets from the Philecology Herbarium suggest that digitized specimen data can be used to create a strategy to deaccession duplicate specimens that can be utilized by curatorial staff and volunteers, thus freeing up significant amounts of space for future growth. Presuming the actual % that might be deaccessioned is somewhere between the conservative estimates of *Xyris* **(12%** to deaccession) and *Arisaema* **(4%** to deaccession), considering only the Texas holdings of the Philecology Herbarium, (188,977 specimens), deaccessioning duplicates could **free up between 8 and 28 cabinets** (using an average of 791 spec/cab).

Taxon	*Xyris* (Texas)	*Arisaema* (global)
# specimen records	342	1733
# unique colls	287	1639
# unicate colls (1 spec/coll)	235	1553
# duplicate colls (>1 spec/coll)	52	86
# specimens in dup sets	107	180
Max # specimens to deaccession (keep 1 sheet only)	55 (16.08% to deaccession)	94 (5.42% to deaccession)
(conservative) # specimens to deaccession (coll exists in 2 or more herbaria)	41 (11.99% to deaccesion)	61 (3.52% to deaccession)
# specimen dups requiring evaluation of multi-sheets	19	59

Acknowledgements: Funding was provided for digitization of *Xyris* and *Arisaema* by the US National Science Foundation, Award Nos. 1902078 and 1802019, respectively. ▪ Volunteers have assisted in the digitization and curation efforts required for this preliminary look at space savings. **References:** hyperlinked in text above. **Contact:** trehman@brit.org.