

# THE NEW AND IMPROVED ARMCHAIR BOTANIST

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# ARMCHAIR BOTANIST OF THE PAST

- Former connotation:
  - Someone who made conclusions only from materials readily at hand.
- Tools
  - Personal/institutional library
  - Personal/institutional herbarium
  - Sometimes specimens elsewhere were examined, often not
  - Sometimes field experience was included, often not



# AN EXAMPLE FROM TWO FLORISTIC TREATMENTS COVERING THE NORTHEASTERN UNITED STATES

- Gray's Manual of Botany – (1848-1950)
  - 8 editions
  - Started by Asa Gray at Harvard University, continued by Sereno Watson, J.M. Coulter, B.L. Robinson, and M.L. Fernald.
- Britton & Brown Manual of Vascular Plants – (1898-1952)
  - 3 editions
  - Started by N.L. Britton at New York Botanical Garden, continued by H.A. Gleason



# PETRORHAGIA PROLIFERA – A COMPARISON

- Species is introduced to North America from Europe, initially into Bartram's garden in Philadelphia in the early 1800s.
- Range from Gray's Manual 8<sup>th</sup> edition (1950): [as *Dianthus prolifer*]  
    "s. N.Y. to Del., Va, Ky, and O"
- Range from Britton & Brown 3<sup>rd</sup> edition (1952): [as *Tunica prolifera*]  
    "N. Y. to S. C. and Cal."
- If you check the specimens at GH and NY present at that time, you find that the range statement reflects those holdings.



# HOW HAS EXTENSIVE DIGITIZATION CHANGED THE RESEARCH LANDSCAPE??

- I am both a creator (involved with two TCN projects) and a user of digital content (research on Caryophyllaceae).
- What can I do with the digital data?
- What can't be done?
- What enhancements would be useful?



# WHAT CAN BE DONE?

- Locating specimens housed elsewhere
  - Type specimens – JSTOR Global Plants ([www.jstor.org](http://www.jstor.org))
  - Specimens from a particular area – all regions not yet equal
  - Specimens of a particular taxon – coverage is likewise uneven
- Locating literature housed elsewhere
  - Biodiversity Heritage Library (<http://www.biodiversitylibrary.org/>)
  - Individual library/museum collections
- Checking nomenclature details against multiple indices
  - Tropicos (<http://www.tropicos.org/>); IPNI (<http://www.ipni.org/>)



# TRADITIONAL FLORISTICS

Oregon Flora Caryophyllaceae treatment:

- visited OSC to examine specimens
- examined selected specimens at MICH, NY, US, and WTU.
- can access many specimen records, esp. at smaller herbaria, via the Consortium of Pacific Northwest Herbaria ([www.cpnwh.org](http://www.cpnwh.org)).
  - Specimens that have been imaged – can check determinations, possible range extensions.
  - I can “see” specimens I otherwise may not have known about.



# CPNWH – CERASTIUM NUTANS - OREGON

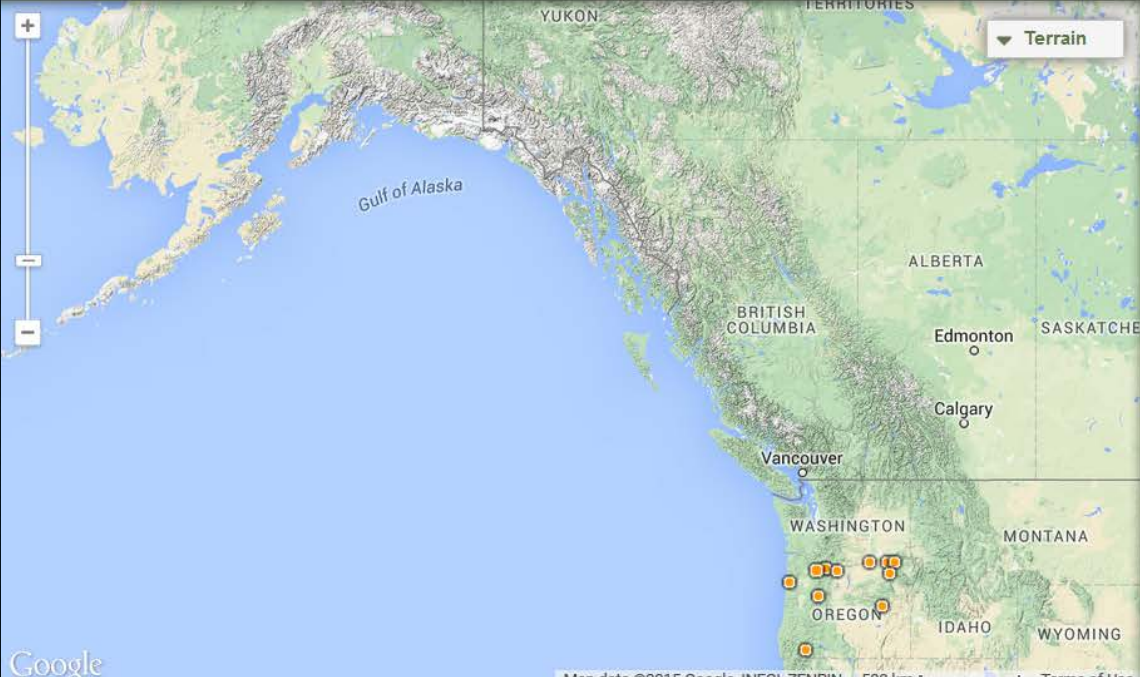
Consortium of Pacific Northwest Herbaria  
Providing access to specimen data and digital resources from herbaria throughout Pacific Northwest North America

Home | Specimen Data | Online resources | Member Herbaria | External Links | Documentation | News | About | Contact Us Log In


« Browse « Search 21 matching records found. 12 records displayed on map.  
Label Query 1: (Genus = "Cerastium" Species = "nutans" including synonyms, State = "Orego"). Sort By: Year. Options: exclude cultivated specimens.


Group by (not grouped) then sort by Collection Year Large

View as:  Table  Label & images  Images only Download



Cascade Range. Flowers white; disturbed roadsides. Origin: N.  
**Richard R. Halse 6255** Jul 10, 2002 **WS 363220**

4. *Cerastium nutans* Raf. var. *nutans* Caryophyllaceae  
U.S.A., Oregon, Deschutes County: Deschutes River.  
Reproductive state: Flowers. Origin: Native.  
**Ron & Joy Mastrogiuseppe 9263** Sep 10, 1993 **ID 141363, ID090355**  
  
[ID090355](#)

5. *Cerastium nutans* Raf. var. *nutans* Caryophyllaceae  
U.S.A., Oregon, Deschutes County: Deschutes River.  
Reproductive state: Flowers. Origin: Native.  
**Ron & Joy Mastrogiuseppe 9271** Sep 10, 1993 **ID 141361, ID090354**  
  
[ID090354](#)

6. *Cerastium nutans* Raf. Caryophyllaceae  
U.S.A., Oregon, Yamhill County: Chehalis Mts. P.M. (O.C.) north of Weaver farm on

Google  
Map data ©2015 Google, INEGI, ZENRIN 500 km Terms of Use



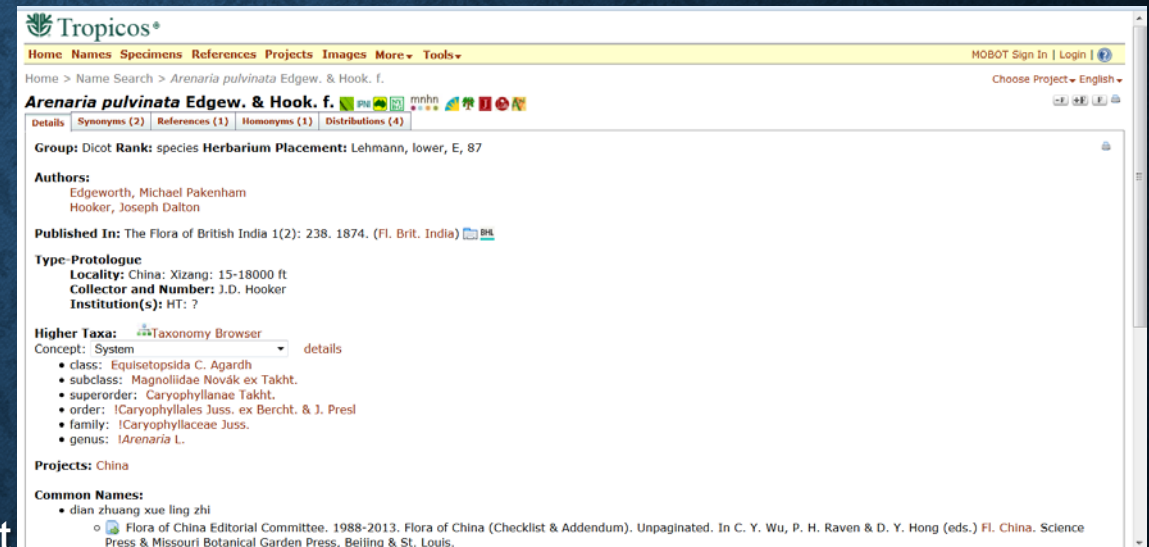
# MONOGRAPHIC SYSTEMATICS

- Traditional way: borrow widely from herbaria, accumulate a huge pile of specimens (I've seen 7-10K), study them, annotate them, and (eventually...) return the specimens.
- A new first step: examine virtual holdings from appropriate herbaria
- Create a targeted list for borrowing
- Reduces the number of specimens that one examines, but also the # that are not pertinent to the study (misidentified, etc.)



# NOMENCLATURE WORK

- Before digital:
  - printed copy of Index Kewensis, Gray Herbarium Card Index - both updated periodically.
- Now:
  - both indices integrated into International Plant Names Index (IPNI).
  - Other resources: Tropicos, The Plant List



The screenshot displays the Tropicos website interface for the species *Arenaria pulvinata* Edgew. & Hook. f. The page includes a navigation bar with links for Home, Names, Specimens, References, Projects, Images, More, and Tools. The main content area provides detailed information about the species, including its group (Dicot), rank (species), herbarium placement (Lehmann, lower, E, 87), authors (Edgeworth, Michael Pakenham and Hooker, Joseph Dalton), and publication details (The Flora of British India 1(2): 238. 1874. (Fl. Brit. India)). It also lists the type protologue, locality (China: Xizang: 15-18000 ft), collector and number (J.D. Hooker), and institution (HT: ?). A higher taxa section shows the classification path from System to Equisetopsida, Magnoliidae, Caryophyllales, and finally to the genus *Arenaria*. The page also mentions projects (China) and common names (dian zhuang xue ling zhi).



# ADVANTAGES OF DIGITAL RESOURCES

- Including data from smaller collections.
- Examining virtual loans reduces postal issues.
- some groups can be identified easily by examining images; others not (Malpighiaceae requiring examination of hairs, etc.)
- BUT, being able to check more specimens in more places makes it harder to “draw the line in the sand” to know when you have the info you need. There’s always one more specimen – out there, somewhere....



# HERBARIUM CURATION

- Pre-curation: use nomenclature resources (e.g., Tropicos) to update names on specimens prior to digitization.
- Not “true” annotation since identifications not necessarily confirmed.
- One side benefit: locating type specimens not previously recognized in a collection.
  - Example at MICH: recuration of MICH grass collection revealed 113 additional types
  - JSTOR GPI allows one to ask the question: “I wonder if that is a type”



# WHAT CAN'T BE DONE?

- Not all plants can be correctly identified from images; we can't dissect an image. That's probably good.....
- Most collections are not completely digitized.
- Hard to search in some groups (Latin American ferns, Russian/Chinese taxa, etc.)
- There is no “one-stop shopping” – have to check multiple portals – some are both difficult to find and use.
- All data are *not* equal – lots of contradictory information among indices.



# WHAT WOULD I LIKE TO SEE?

- Additional digitization of genetic vouchers
- Easier ways for researchers to offer corrections
- More creative visualization tools



# DIGITIZATION OF GENETIC VOUCHERS

- While some are available (e.g., BOLD database - <http://www.boldsystems.org/>), it's not a priority for collections:
  - likely highly dispersed in a collection
  - no resources to search for them
  - vouchers are often not annotated by researchers
  - searching GENBANK will likely be incomplete



# GENETIC VOUCHER - EXAMPLE

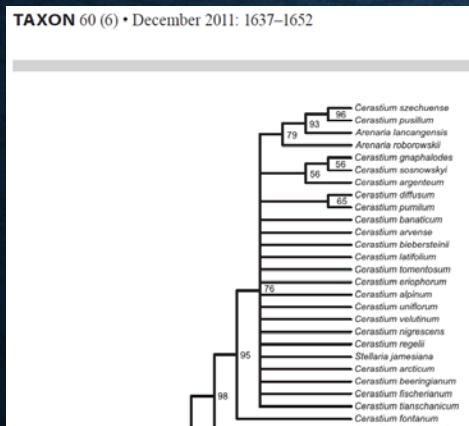
From Greenberg & Donoghue (2011):

1 *Stellaria* in clade with 23 *Cerastium* taxa  
Same taxon also appears in another clade

- Voucher = *Stellaria jamesiana* Torr.,  
*R.M. King, R.M. Garvey, 13711*, MO,  
JN589138.
- Examination of the voucher:

Specimen is *Cerastium arvense* subsp.  
*strictum*

Placement now makes more sense





# EASIER WAYS FOR RESEARCHERS TO OFFER CORRECTIONS

- While Filtered Push technology (Macklin et. al) has been developed to assist in locating duplicates and reporting corrections to data owners, it has not yet been widely adopted.
- Most portals lack any means beyond contacting the owner of the individual specimen.



# JSTOR GLOBAL PLANTS

The screenshot shows the JSTOR Global Plants interface. At the top left is the JSTOR logo and the text "Global Plants". To the right are links for "Browse" and "About". Below this is a search bar with a dropdown menu set to "Names" and a search input field containing "Search...".

The main content area displays the following information:

- Image:** A photograph of a dried plant specimen, labeled "View Larger".
- Title:** Isotype of *Silene andersonii* Clokey [family CARYOPHYLLACEAE]
- Herbarium:** University of Michigan Herbarium (MICH), MICH1111003
- Collection:** Herbarium Specimens
- Resource Type:** Specimens
- Collector:** I.W. Clokey, #7514
- Collection Date:** 1937/08/09
- Locality:** Nevada, Clark, Steep north gravelly slope, Levell Canyon, Charleston Mountains
- Country:** United States (United States)
- Collection altitude:** 2600 meters
- Identifications:** Isotype of *Silene andersonii* Clokey [family CARYOPHYLLACEAE] (stored under name); Verified by J. Sulak, 1984  
*Silene andersonii* Clokey [family CARYOPHYLLACEAE];  
with *Artemisia tridentata* and *Cercocarpus ledifolius*;
- Notes:** (partially visible)

On the left side of the record, there are several utility icons and links:

- Open Viewer
- PDF
- Save Resource
- Collection
- Partner Page

- I.W. Clokey 7514 is a type specimen of *Silene andersonii*.
- JSTOR shows 82 specimens found in 45 different herbaria.
- If I want to report a new identification/data correction that applied to *all* of them, I would like to be able to report it just once, not as 45 (82) separate “comments”.



# MORE CREATIVE VISUALIZATIONS

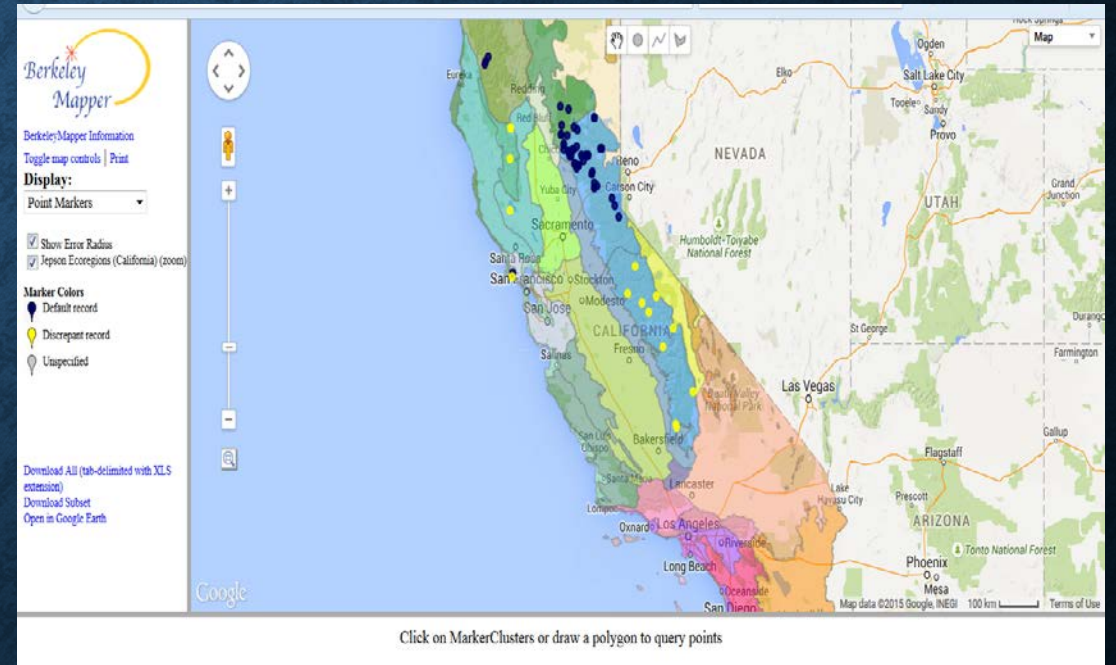
One idea we have for our Thematic Collection Network on Invasive taxa in the Great Lakes region:

- Color code and/or animate the distribution records by time of collection.
- *Where and when* were the first records of a species in a region?
- Make it easier to visualize the patterns of dispersal.



# CONSORTIUM OF CALIFORNIA HERBARIA – “YELLOW FLAGS”

- Map of distribution of *Stellaria crispera* from CCH records that have coordinates [75/114]
- Blue point – agrees with Jepson Manual distribution statement [Bioregions]
- Yellow point – record that is outside of the JM distribution
- Shows a specialist which records may be of particular interest to examine





# ACKNOWLEDGMENTS

- Efforts of portal designers that have created some heavily used references:
  - IPNI, Tropicos, CPNWH, CCH, SEINet/Symbiota, JSTOR
- Jim Solomon (MO) for providing an image of the King & Garvey *Cerastium* specimen.
- National Science Foundation:  
The logo of the National Science Foundation (NSF) is a circular emblem. It features a central blue globe with the letters 'NSF' in white. Surrounding the globe is a golden sunburst or starburst pattern with multiple points.
  - Grant to MICH – 1405302: **Digitization TCN: Collaborative: Documenting the Occurrence through Space & Time of Aquatic Non-indigenous Fish, Mollusks, Algae, & Plants Threatening North America's Great Lakes**