Southern Rocky Mountain TCN

ADBC Summit 2019

October 2nd 2019

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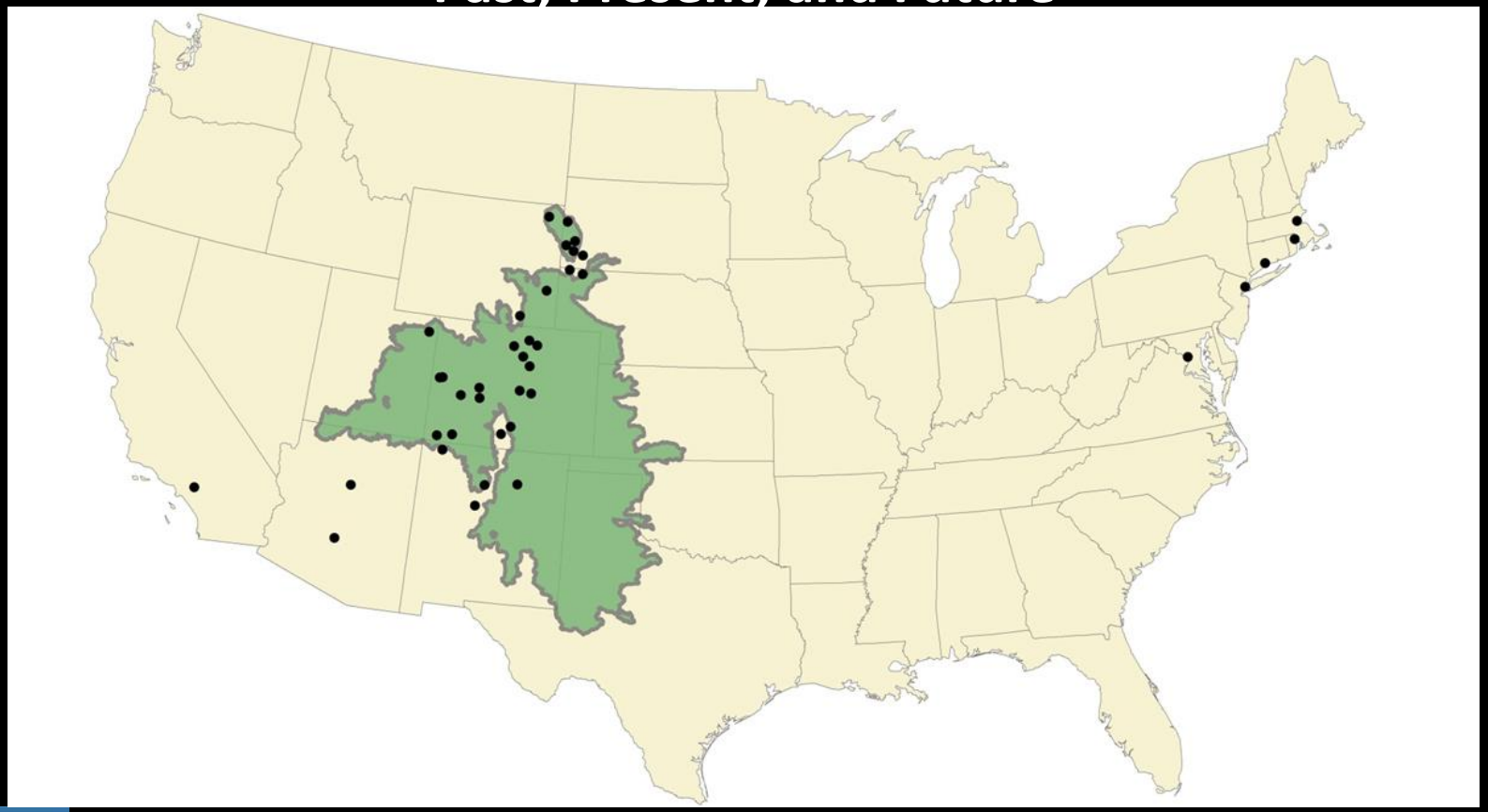
University of Colorado Herbarium

NSF

Using Herbarium Data to Document Plant Niches in the High Peaks and High Plains of the Southern Rockies - Past, Present, and Future



Southern Rocky Mountain TCN

Project Scope

- 40 Partners (including non-digitizing federal partners)
- 19 Partners Digitizing new records
- 1.7 million specimens from the Southern Rocky Mountain Region
- 503,000 new database entries
- 814,000 new specimen images
- 560,000 new georeferences
- Rancho Santa Ana Botanic Garden added as a PEN September 2019 (Adds 60,700 specimens; 42,640 new records, 49,000 new images and 56,600 new georeferences).

Funded Partners

- Adams State University
- Arizona State University
- Black Hills State University
- Chadron State College
- Colorado College
- Colorado Mesa University
- Fort Lewis College
- Harvard University
- Navajo Nation Herbarium
- New York Botanical Garden
- Northern Arizona University
- Rancho Santa Ana Botanic Garden
- Rocky Mountain Biological Laboratory Herbarium
- San Juan College
- University of Colorado
- University of New Mexico
- University of Northern Colorado
- University of Wyoming
- Western State Colorado University
- Yale University

Project Progress

2018

- 91,154 database entries completed (~18%)
- 367,436 specimens barcoded (~47%)
- 345,588 specimens imaged (~43%)
- 12,130 specimens georeferenced (~2%)

Project Progress

2019

- 242,484 database entries completed(~48%)
- 753,843 specimens barcoded (93%)
- 727,475 specimens imaged (89%)
- 59,175 specimens georeferenced (~11%)

- 2.5 fold for data entry 2 fold for imaging and barcoding and over 5 fold for georeferencing.

Project Progress

2019

Georeferencing is going to be the biggest focus of years 3-4.

Held a Georeferencing Workshop September of 2019 aimed at bringing collections up to speed on georeferenced process for SoRo. Expect Georeference numbers to climb quickly in the back half of the project.

Project Progress

- soroherbaria.org integrated into SEINet/Symbiota infrastructure
- 95% of the funded partners now have data in the Southern Rocky Mountain Portal
- Over 80 volunteers, undergraduate and graduate students have been trained in biodiversity informatics tasks under the project
- 2 collections switched from Specify to Symbiota
- 1 collection is transitioning from home grown to Symbiota

Lessons Learned

- Staggering start dates allows maximum contact time with new institutions (4 PI and 9 subawards started digitizing year one 5 subawards plus COLO collection started year two). Also splits collections into themes (small scope under 15,000 mid scope under 100,000 large scope over 100,000)
- Site visits are invaluable

Lessons Learned

- Do not take silence for “everything is okay”
- Collections are worried about the future of Specify
- Collections are worried about georeferencing
- Skeletal and controlled data (dropdown menus) help to filter data, reduce keystroke errors and create a searchable database
- Students thrive when working on various tasks
- Equipment changes / backups / updates?

Outreach

- Workshops through NAVA, SJNM and BHSC trained and give museum experience to Native American students. Two workshops one in Farmington and one in Spearfish
- Worked with St. Johns University for a GIS class using SoRo Penstemon Data
- Georeference workshop ~16 participants across SoRo to learn georeferencing and best practices for recording data.
- Update on Ross's class module

Southern Rocky Mountain TCN Field to Digital Workshop in New Mexico

- Field to Digital Object Workshop
- Nineteen students from Dine College, Northwestern Indian College, San Juan College, Fort Lewis and Northern Arizona participated.
- Arnold Clifford, co-author of the Flora of the Four Corners Region, shared both his taxonomic and Navajo ethnobotanical expertise.

SoRo

SoRo

Field to Digital Object
San Juan College

SoRo

Field to Digital Object
San Juan College

SoRo

Field to Digital Object
San Juan College

Southern Rocky Mountain TCN Field to Digital Workshop in South Dakota

- Black Hills State University (BHSU) and Oglala Lakota College (OLC) held a workshop for students and faculty from Oglala Lakota College.
- Field to Digital Object Theme. Two days in the field and one day in the museum.

SoRo

Field to Digital Object
BHSC

SoRo

Field to Digital Object
BHSC

Collaberation with NYBG, St Johns and the SoRo Consortium

- Built Story Maps using real SoRo Penstemon data.
- Several collections stepped in to georeference Penstemon specimens to be used by the class.

ADBC Summit 2019 - iDigBi | Mail - James Ryan Allen - O | Analysis of the Penstem

sju.maps.arcgis.com/apps/MapSeries/index.html?appid=5de6c1fc7c3746d19491852703e941d6

Analysis of the Penstemon griffinii and Penstemon degeneri by Deion Awah and Mikayla Doherty

Deion and Mikayla

esri

1 Analysis of the Penstemon griffinii and Penstemon degeneri

For this project we did extensive research on two Penstemon species. We created maps using ArcGIS to compare contrast different attributes of the two species. Throughout our research we compared the plants through highlighting different elevation levels, vegetation land-use, precipitation in inches, and slope and terrain. There is analysis next to each map explains our findings and a brief description of our species is also listed below as well.

https://cnhp.colostate.edu/rareplants/guide.asp?id=21773

2 About the Penstemon degeneri

3 About the Penstemon griffinii

4 Penstemon Species Distribution (Interactive)

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A Story Map

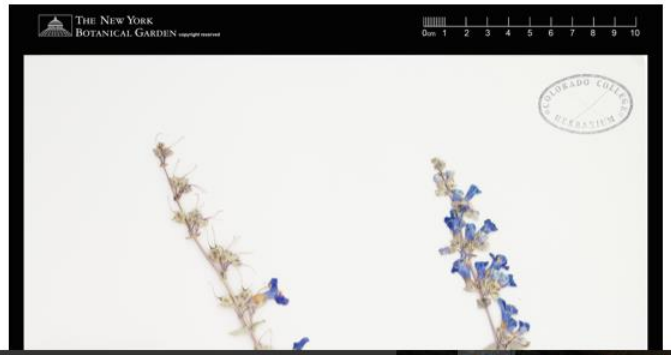
esri

Penstemon Auriberbis and *Penstemon Versicolor* Distribution within Colorado

Penstemon Versicolor

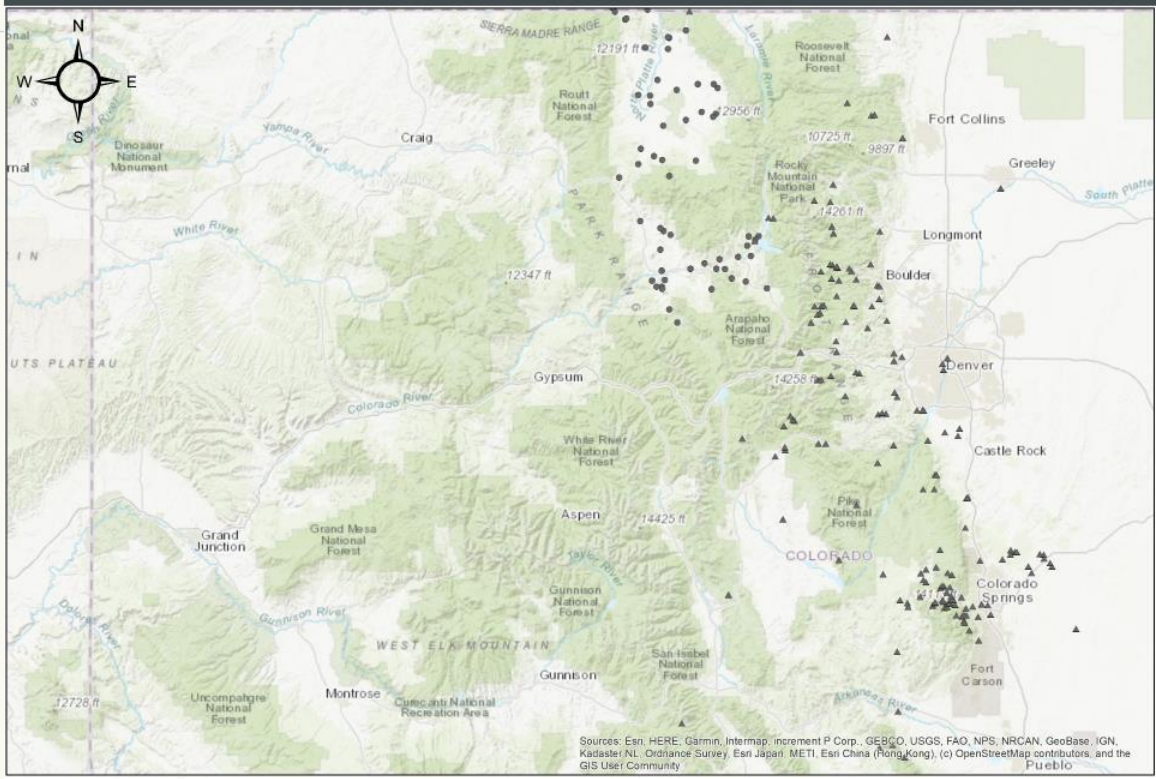
- Habitat: dry rocky slopes
- Color: rose to blue
- Soil: Dry, sandy, sandy loam well drained
- Size: 20-30cm
- Bloom Period: May-June
- Annual Precipitation: 8-15 inches

Description: flowers are second, glabrous, glaucous, leaves thick, the basal obovate, 3-4cm long, stem leaves cordate-amplexicaule, ovate, acuminate, 3-5 cm, sepals 5-6 mm, ovate, corolla 2cm long, glabrous



A Story Map

Distribution of *Penstemon cyathophorus* and *Penstemon glaber* in Colorado



Penstemon cyathophorus

- **Duration:** Perennial
- **Size Class:** 20-60 cm
- **Bloom Color:** Purp
- **Bloom time:** May-Jun

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Northwest Colorado Penstemon Distribution

A Story Map

5 Elevation Map

6 Map showing Landcover

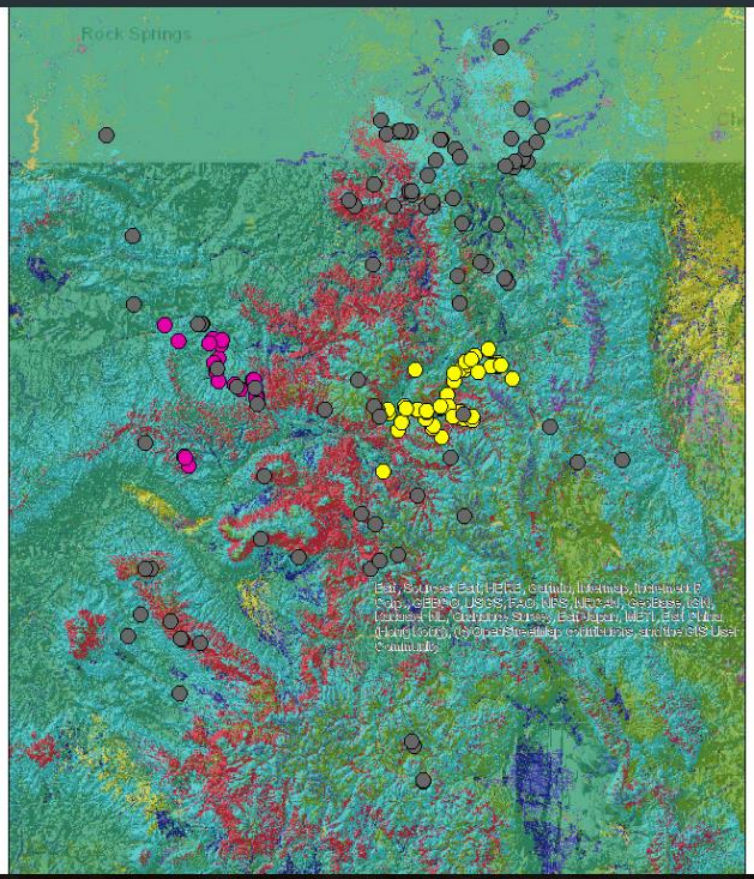
P.Saxosorum : This species frequents areas with conditions similar to that of deciduous forests and evergreen forests. These locations have alfisols which are common in the midwestern region and are the most fertile type of forest soil.

P. Harringtonii : This species frequents areas where there is lots of shrubland and the land is barren and avoids areas where the land is snowy or icey. From this I can tell that this species does not thrive in areas where the land is wet. Since this species is the one found in one main central area on the map, its growing conditions are very specific and crucial to its survival as opposed to the Penstemon Saxosorum plants that is found across a wide variety of land types in the state. It can be concluded that this penstemon species would not thrive in areas of the state that shrubland also does not.

P. Fremontii : A large number of plants of this species is found in shrubland that runs along pastures or hay. Pasture land is normally grazed by domesticated livestock such as horses, cattle, sheep and pigs.

7 Map of Colorado's Precipitation

8 Soil Map of Penstemon Distribution



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A Story Map

The Distribution of Two Penstemon Species in Colorado State

Conner Cummings and Samantha Caimares

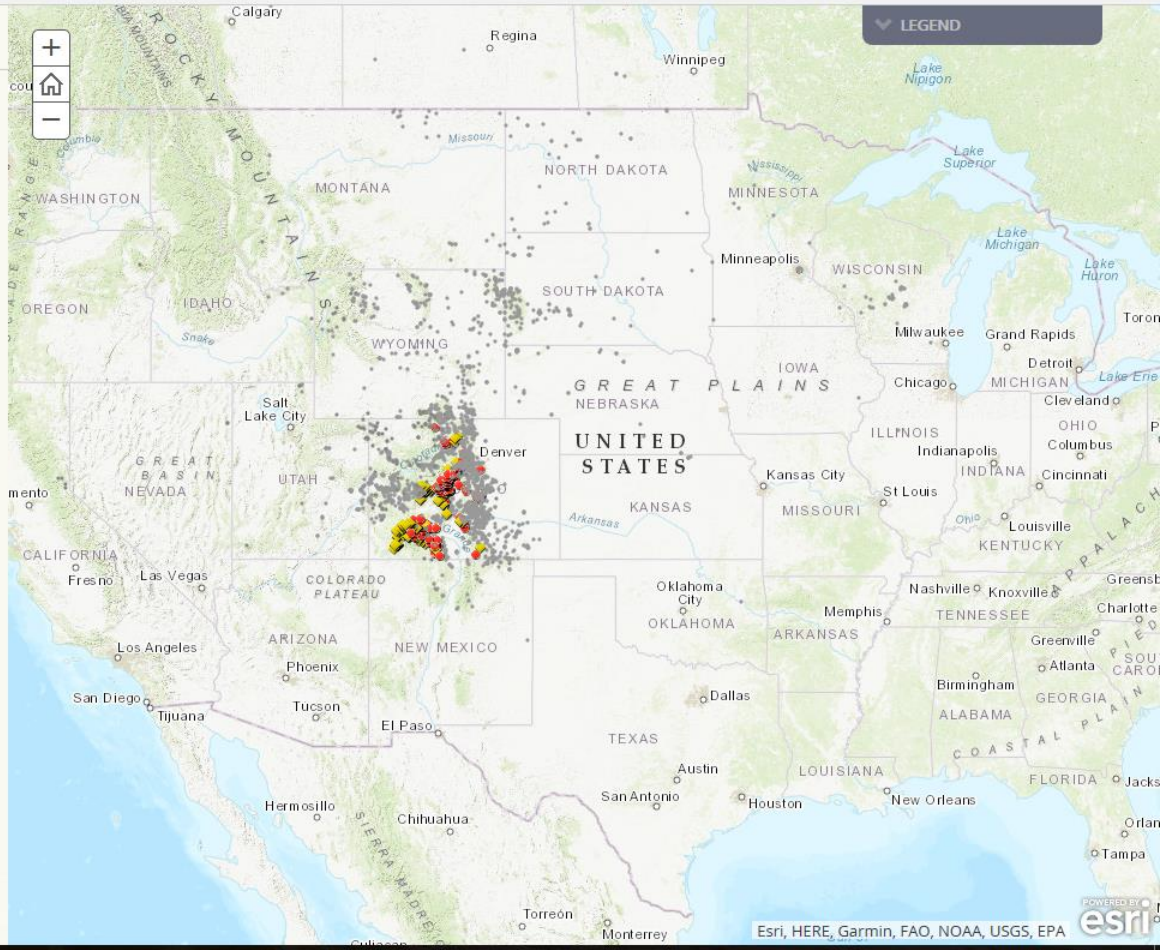
We have been assigned two species in the *Penstemon* genus and were tasked with investigating why they were distributed as such

Some info:

- There are 275 species in the *Penstemon* genus
- All species except one originate from North America
- *Pentstemon* grows on the poor, well-drained rocky or sandy soil

Distribution of P. hallii and P. harbourii

Hallii distribution: Archuleta, Boulder, Chaffee, Clear Creek, Conejos,



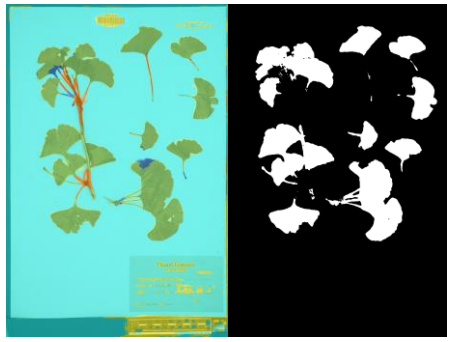
Georeferencing Workshop

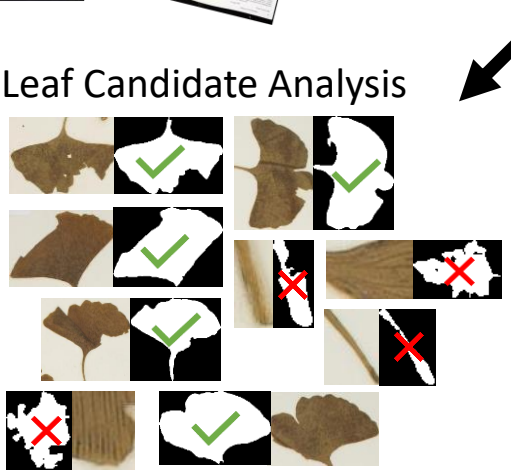
- 16 participants from SoRo collections
- Held over 3 two hour online sessions
- Hands on experience with the focus of data quality and documentation
- Fill out those DarwinCore Georef Fields!

LeafMachine

- Fully autonomous software that leverages a pair of machine learning algorithms to extract leaf area measurements from herbarium specimen vouchers
- COLO Herbarium Collection
  - 9,940 randomly chosen specimens from 20 families
  - At least 1 leaf measurement achieved in 88.6% of specimens
  - 78.6% of measurements were accurate upon inspection
- Manuscript in press

Megapixels	Processing time Average PC	Processing time High-end PC
3	20 seconds	10 second
24	20-50 seconds	10-40 seconds
60	90-120 seconds	60-90 seconds





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www.LeafMachine.org