Specimen Stories: Student exploration of places, plants, and people using herbaria

Every sheet - a story

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THE STATE UNIVERSITY OF NEW JERSEY

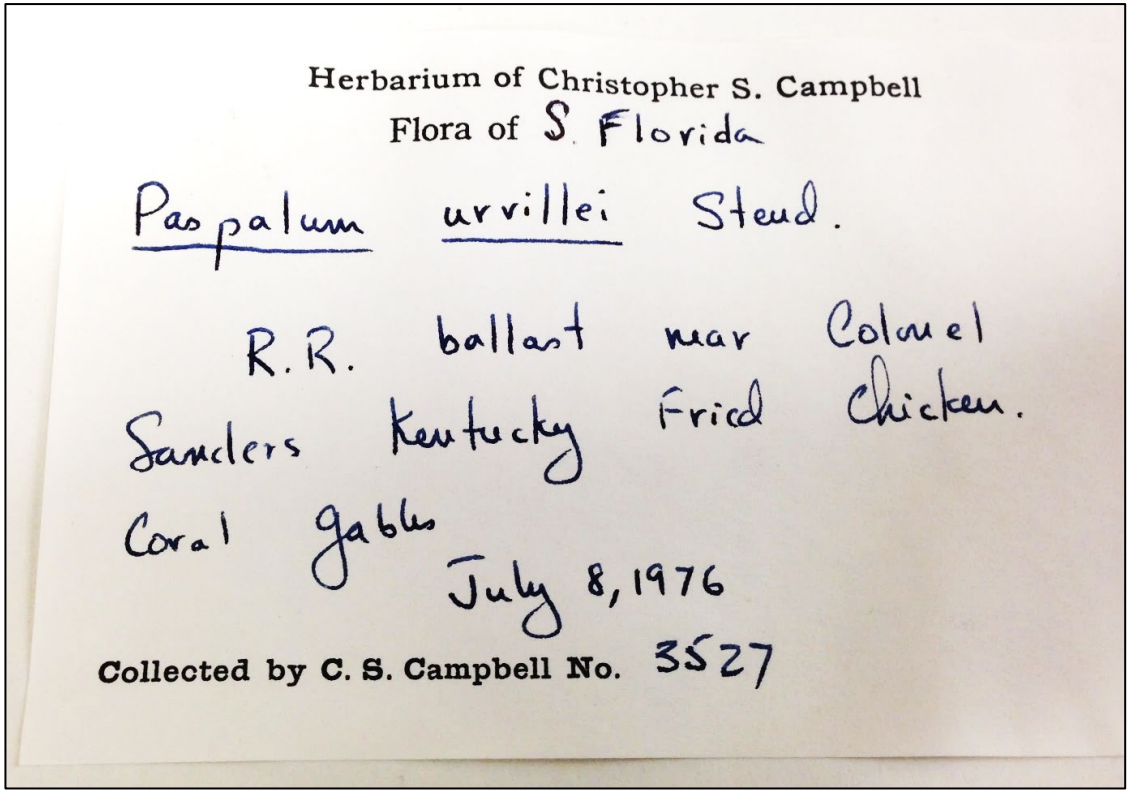
A herbarium sheet is a unique snapshot of biodiversity in time and place, linked to land and people.

Botanists working with thousands of natural history collections know that specimens are unique, likely invaluable, and irreplaceable. Sheets carry information about taxonomic identify, morphology, DNA, and chemistry, and are linked to all other living (and dead) organisms. But this can still be too abstract or disconnected for many students. The value of and information contained in a dried, dead and flattened plant specimen can be hard to grasp and personalize.

Specimen Stories for in-person and remote learning

- A new type of student project using the **individual story of a specimen and links it to the plant, person, and place at a specific time**.
- Leads to understanding of the broad and deep value of natural history collections.
- Creates a personal connection and relevance.
- Results in a unique research product that nobody has written about or researched before.
- Adds to our body of knowledge, creating pieces for the puzzle.

The Plant, The Person and The Place (PPP)



What can we learn about the person that collected it?

Has the place changed?

Can we find the place?

What happened to the collector?

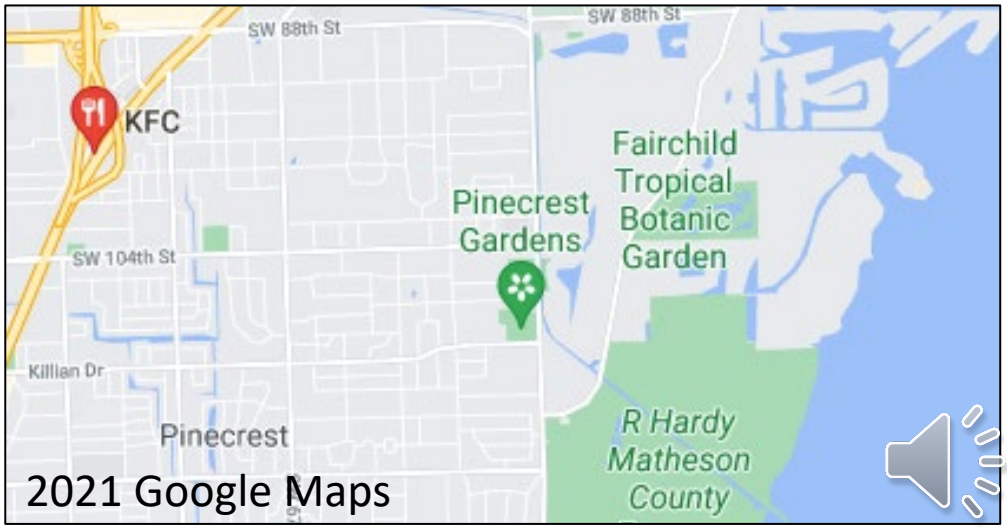
What was going on at that time?

Why was this species in that location?

Why might have it been collected?

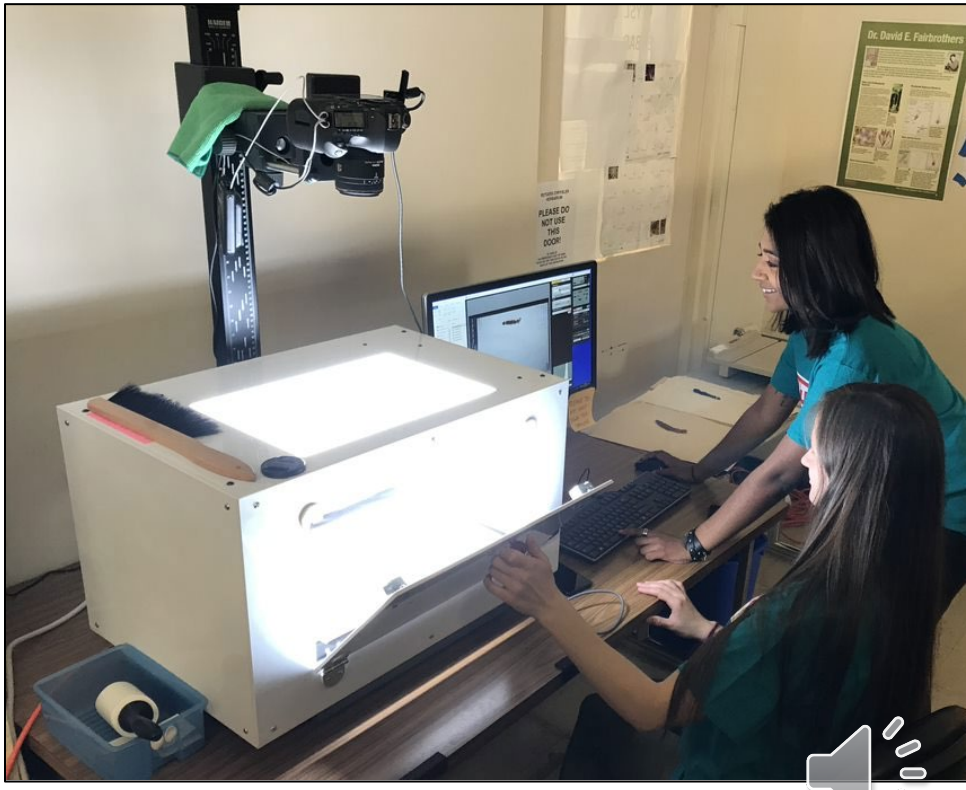
Could this still be collected there?

What is the specimen's total story?



Specimen Story Student Assignment Instructions

1. Use a web portal to access digitized specimens (iDigBio, etc.)
2. Select a 20+ years old herbarium sheet with full date, collector, and locality information.
3. Investigate the three themes (Plant, Person, Place) by using a variety of resources:
   A. Google and other search engines are your friend
   B. smart and innovative keywords
   C. historical maps and other works
   D. floristic works
   E. genealogy databases and obituaries, alumni resources
   F. newspapers and books (check libraries)
   G. other specimens from the same day, same collector, or same place? (iDigBio, Bionomia).



Digitization of herbarium specimens in Chrysler Herbarium

Take a path into the unknown – with risk and surprises for students and teachers

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Trust your students. Let them be curious. Let them explore on their own.

One theme might not yield much information; another might lead down a sidetrack, either is fine.

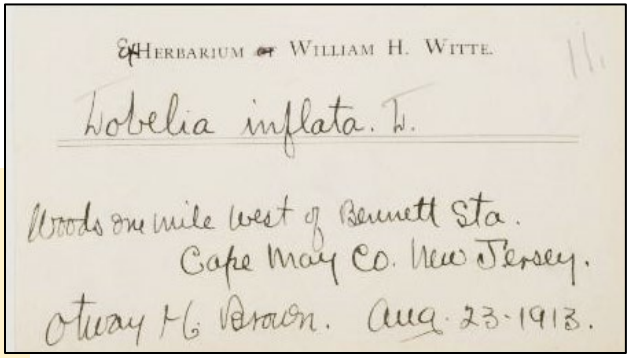
Students will:
- create new connections about biodiversity
- write biographic data about collectors and their careers and lives
- understand and highlight change in floras and landscapes.

Students may include screenshots, images, maps, and obscure facts in their report. Include sources of information.

Interesting findings and reports can be posted on your herbarium's website for public engagement and long-term sharing (with students' consent).

As a teacher, how to grade it when you don't know the right answer?

Student examples


Herbarium of William H. Witte.

Lobelia inflata. L.

Woods one mile west of Bennett Sta.
Cape May Co. New Jersey.
Otway H. Brown. Aug. 23-1913.

(cc) Chrysler Herbarium, Rutgers University

"**Otway H. Brown** was a Cape May county local that collected from the late 19th century to approximately the 1940s. […]. While he is not present in Harvard's database of botanists, he was known to be an expert on Cape May's flora and plant enthusiast in general. His prolific collections record and newspaper clippings detailing his involvement with flower exhibitions prove this. Regardless of whether or not he was a professional botanist, he was without a doubt a botanist."
-Bonnie Semmling, 2020 (*Lobelia inflata* from 1913)

"This invasive aquatic plant was found **near Lock #4 along the Morris Canal** [in 2001], which was used to ship New Jersey's agricultural products across the state to Jersey City for distribution in New York, […] The canal is no longer in use, but the towpath still remains as a popular trail network from the re-constructed canal village of Waterloo, south to Allamuchy. I believe the canal still stands as a body of water, so it is very possible that *L. salicaria* can still be found by the lock, since the area has not changed much in land use."
- Emily Hughes, 2020 (*Lythrum salicaria*)

Spotted knapweed from northern New Jersey 1933

Collected along with four other specimens by Russell Zesch and Minton A Chrysler in 1933, this specimen of a knapweed (*Centaurea nigra*) is a **non-native species introduced into the state with most of its first recorded collections in port cities** such as Camden and Jersey City. [..]

This species seems an outlier having been collected in the early twentieth century **far from the state's port cities** in the town of **Springdale in Sussex County**. [..] A **railroad** was constructed to provide a market for the iron ore being mined within the area. […]

[…] the plant's connection to the port cities of the state is illuminated due to the interconnectivity provided by the railroad tracks that spanned from this small town in rural Sussex County to the large port cities where the species was likely introduced.

It is likely that this species is still able to persist in this town as the area has not changed in its composition in very profound ways.

- Ryan Schmidt, 2020

SPECIMEN LABEL: **Purple pitcher plant (*Sarracenia purpurea*, Sarraceniaceae)**
Location: NJ, Middlesex County, New Brunswick, Ryders Lane Bog
Collector: Frederick H. Blodgett; *Collection number*: s.n.
Date: 9 May 1896

Specimen: The plant is pressed in an unusually artistic manner with parts of the flower pressed separately and marked with morphological names. Most likely this beautiful specimen was part of an assignment for a botany class at Rutgers.

Collector: In 1896 Frederick H. Blodgett was a 23-year old Rutgers College senior. He was born in Illinois, got his masters degree at Rutgers in 1899, worked as a field assistant at The New York Botanical Garden, State Pathologist for Maryland, and got a PhD at Johns Hopkins in 1910. In 1912 he took a job as a professor and extension specialist at Texas A&M University, worked a variety of plant pathology issues, such as the influence of climate and diseases on crops (apples, cotton, etc.). He was a Fellow of AAAS and many other national scientific societies. He died in 1926.

Place: The collection place was in New Brunswick, in fact at the 'Ryders Lane bog', and it is likely that this was close to the current areas on Cook Campus, Douglass Campus, or Rutgers Garden, but no bog with pitcher plants is known to exist in this area anymore. In fact, we have no record of pitcher plants being present in the current flora of all of Rutgers campuses in New Brunswick/Piscataway.

Specimen Origin: Rutgers University student collection.

Fun fact: Pitcher plants are terrestrial plants that have leaves formed into pitchers that become water filled and act as trapping organs for small invertebrates. The tissues of the captured animals are digested inside the pitcher by enzymes excreted by the plants, and the plant can take up nutrients through its inside leaf surface to amend its resources in the nutrient-poor, acid bog environment.

SPECIMEN LABEL: **Parsnip (*Pastinaca sativa*, Apiaceae)**
Location: NJ, Somerset County, Blackwell's Mills;
Notes: Low ground by road bordering canal.
Collector: Mintin A. Chrysler; *Collection number*: s.n.
Date: 16 July 1943

Species: Wild parsnip, the same species as the cultivated parsnip you can buy in food stores, is commonly seen along roadsides in New Jersey. It belongs in the carrot family, and just as many other members of this family it contains phototoxic compounds (furanocoumarins) that can develop into bad dermatitis after exposure to the plant together with UV (=sunlight).

Collector: Mintin A. Chrysler was a professor in the Botany department at Rutgers University, New Brunswick, from 1923, and he was the curator of the herbarium. The Chrysler Herbarium is named after him.

Place: Blackwell's Mills is along the Delaware-Raritan Canal, a hand-dug narrow canal from the 1800s, that provided a shortcut between New York and Philadelphia. Soon after it was opened, railroads provided faster and more economical transport. .

Time: July 1943 was in the middle of World War II.

Research Use: This specimen (and many others from herbaria around the US) was used in a study on the co-evolutionary chemical interactions between wild parsnip and its pest, the parsnip webworm (a little beige moth, *Depressaria pastinacella*). Wild parsnip arrived to the US long before the European parsnip webworm became established in the US. The scientists sampled parts from historical herbarium specimens representing 152 years in the US to check levels of phytochemicals. Parsnip plants present in the US before the parsnip webworm had much lower levels of toxic furanocoumarins, than after the 1890s when this insect became common in the US. The toxicity of this common weed thereby increased due to the presence of another non-native species. (Reference PNAS 104: 15529–15532)

SPECIMEN LABEL: **Black Cherry (*Prunus serotina*, Rosaceae)**
Location: NJ, Burlington County, New Gretna
Notes: Dry sandy, fence-row thickets
Collector: Bayard Long. *Collection number*: 10697.
Date: 26 July 1914.

Species: Black Cherry is native to New Jersey and is a small tree with tiny cherry-like fruits. The flowers are small and white cherry blossoms. The seeds contain small amounts of cyanide (like almonds and cherries).

Uses: Native Americans used the fruit as a food source, and the timber is still used for carpentry.

Collector: Bayard Long (1885-1969) was a botanist and curator for the Local Herbarium in Philadelphia, and extensively collected local plants, some of which are now in Chrysler Herbarium. His collections were donated to the Academy of Natural Sciences when he died.

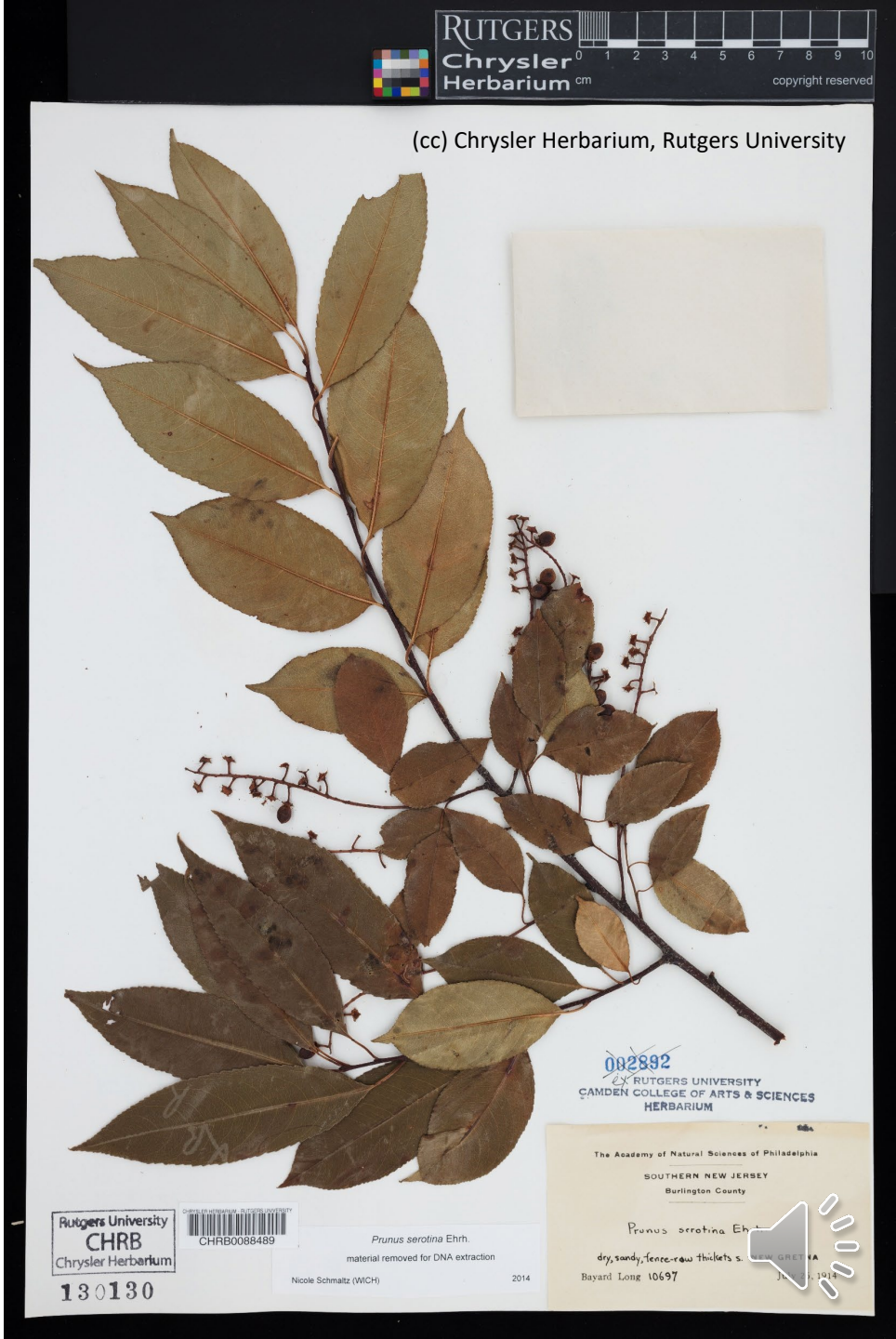
Place: New Gretna is a small village in the eastern part of the Pine Barrens, near the Bass River. You could reach it from Philadelphia by taking a train, then by stagecoach (or car).

Time: This specimen was collected during World War I, during what is called the July Crisis.

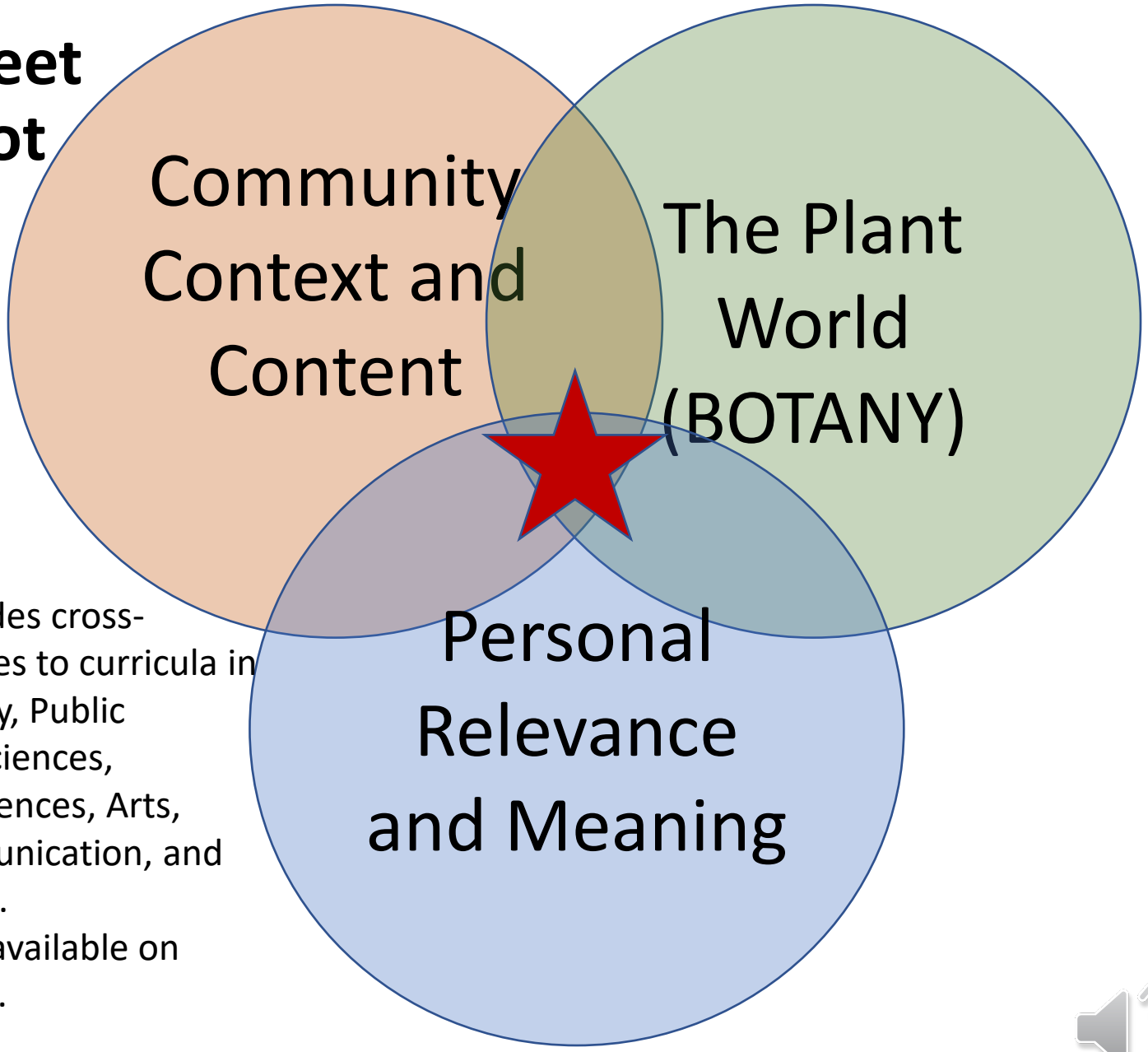
Research use: DNA from leaves of this specimen was used in a study to see if genetic variation existed across distribution of North America of this species (those that are closer in distance would have more similar genetics that those that are farther). Results were found to show little to no variation in genetic diversity across North America, but that there is widespread gene flow across vast distances.

Origin: Specimen originally from Rutgers-Camden herbarium, likely donated from the Academy of Natural Sciences in Philadelphia.

Fun fact: Specimen number 130130.



You have to find the sweet learning spot for your students



This project provides cross-disciplinary linkages to curricula in Geography, History, Public Planning, Social Sciences, Environmental Sciences, Arts, Media and Communication, and Natural Resources.
The worksheet is available on BotanyDepot.com.

Questions?

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Private donations.

Photos by Lena Struwe and Megan King (unless otherwise marked).

Resource links:

Botany Depot (free educational materials):
https://botanydepot.com/

Botany Education in the 21st Century (Facebook group):
https://www.facebook.com/groups/1056168897735912