The Making of an Online Campus Flora: College Students Joining the Flora of Rutgers Campus

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Hornbaker Chelsi, U.S. Fish and Wildlife Service, Punlic Domain image

Plant Diversity and Evolution (plant systematics)

Reason for learning about plants:
Without plants you will die.

Learning goals:
evolutionary history & biodiversity
morphology and description
identification and distribution
ethnobotany, old and new

Interactive class elements

Press plants (biodocumentation)

Labs (over 1000 species demonstrated)

Fossils, ethnobotanical items, food (taste)

Design and present poster, plant evolution/systematics topic on local plants

Need to make it **LOCAL and RELEVANT**

Field identification of the 50 most common plant families in temperate regions

(including agricultural, horticultural, and wild species)

by Lena Struwe

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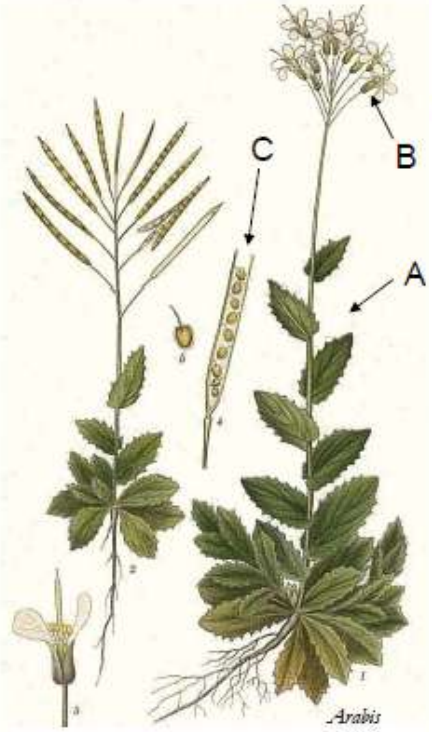
Available as free pdf on my homepage

Brassicaceae s. str.
MUSTARD FAMILY

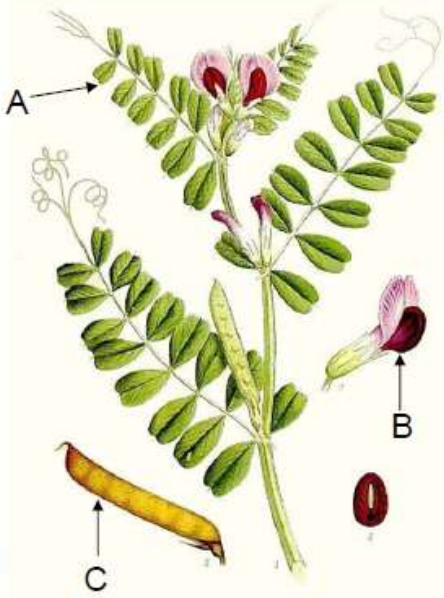
- Herbaceous
- With mustard oils
- Leaves simple, alternate (**A**), often lobed, with pinnate venation
- Leaf edge often dentate (**A**) or lobed
- Inflorescence a raceme
- Petals 4, not fused, forming a cross + from above (**B**), white, yellow, or pink
- Stamens 6
- Fruit a dry capsule with inner wall (silique; **C**)



Note: This family circumscription refers to Brassicaceae s. str. and does not include Capparaceae (capers) and Cleomaceae.

Examples: white mustard (*Sinapis*), garlic mustard (*Alliaria*), horseradish (*Armoracia*), cabbage, broccoli, brussels sprouts, kale, collards, rutabaga, canola, black mustard, turnip (*Brassica*), arugula (*Diplotaxis*, 'rustica' type), mouse-ear and thale cress (*Arabidopsis*), yellow rocket (*Barbarea*), radish (*Raphanus*), woad (*Isatis*), water cress (*Nasturtium*).

Fabaceae
BEAN FAMILY



- Mostly herbaceous, some trees and shrubs
- Leaves alternate, compound (**A**, with many small leaflets), sometimes with tendrils
- Stipules at base of each leaf (variable in size)
- Corolla of 'butterfly-type' (**B**), bilateral with 5 parts: banner/standard, wings, keel
- Keel hidden between wings
- Stamens and style hidden inside keel
- Stamens 10 , 9 often fused
- Fruit a bean (legume, **C**), a dry capsule without inner dividing walls, and with seeds attached to one side
- Seeds splits in 2, nutrients stored in dicotyledons inside seed

Note: the flower characters work only for subfamily Faboideae.

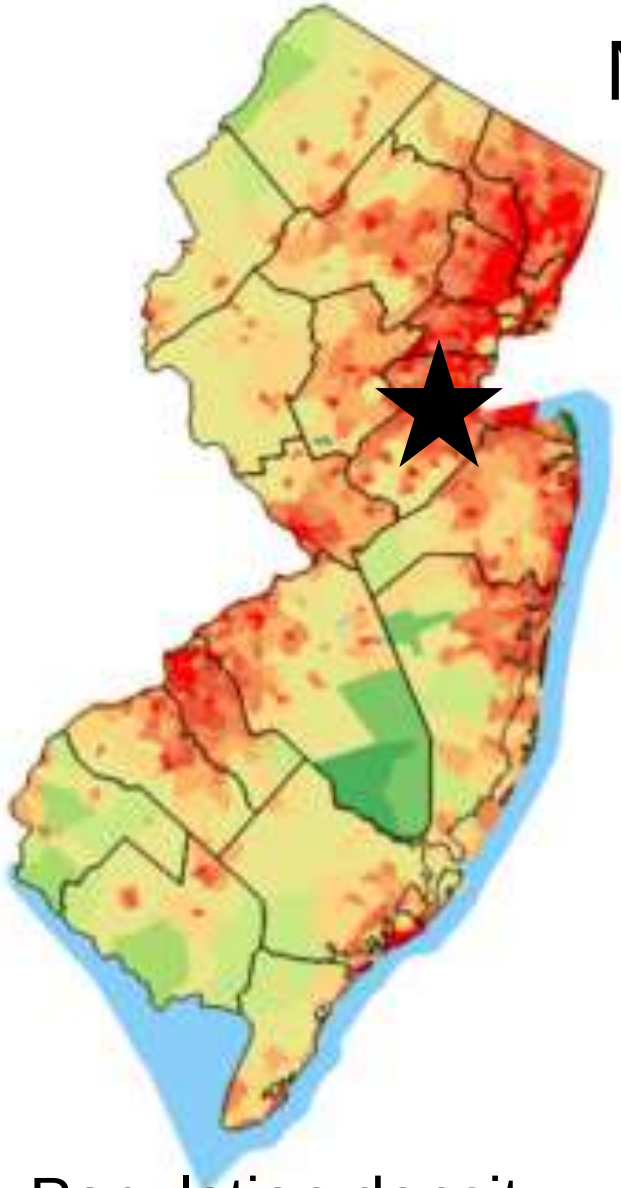
Examples: beans (*Phaseolus*), peas (*Vicia, Pisum*), licorice (*Glychyrriza*), soybean (*Glycine*), chickpeas, peanuts (*Arachis*), lentil (*Lens*), sweet pea (*Lathyrus*), carob (*Ceratonia*), alfalfa (*Medicago*), clover (*Trifolium*).

May the FoRC be with you.

- hands-on
- outdoor fieldwork
- get real data
- independent work
- focused, but open-ended question

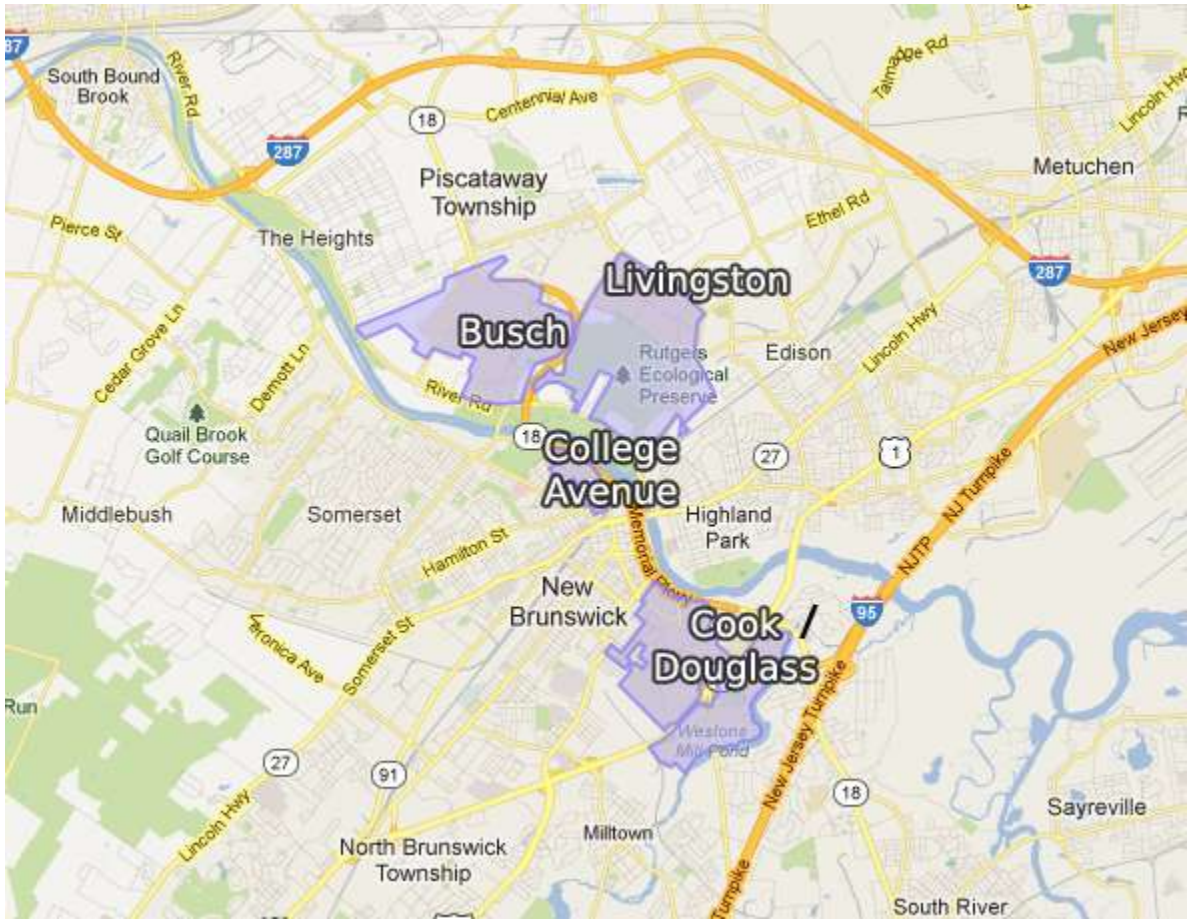
- first biodiversity inventory of any Rutgers campus

New Jersey – the Garden State



Population density in New Jersey

Source: worldofmaps.net

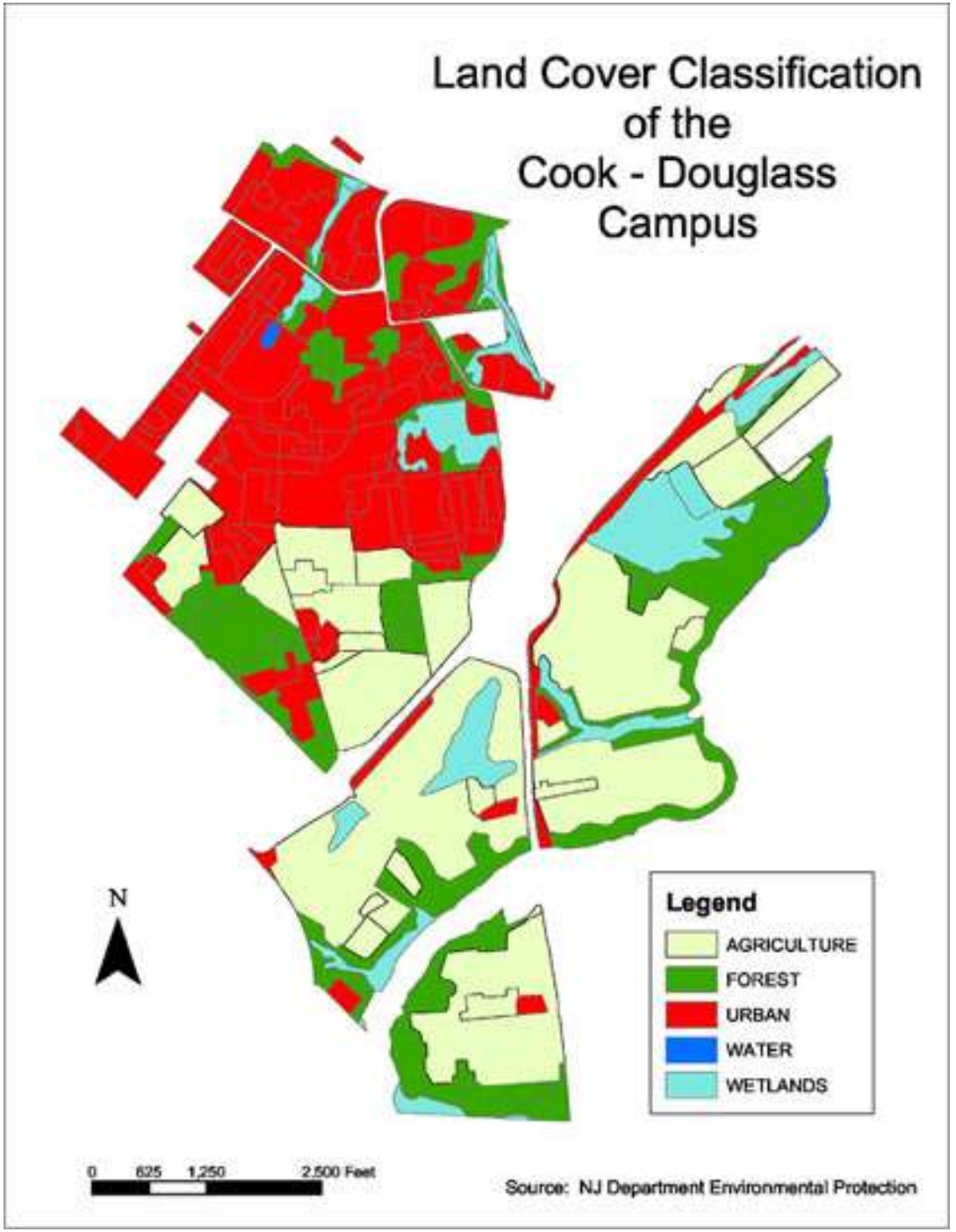


Rutgers' Cook and Douglass Campus, 317 acres

Source: Google Maps

Habitats

Lawns, hardwood forest, wetland, ponds, lakes, river, parking lots, horse fields, pig farm, horticultural garden, research farm, community garden, rocky cliffs, highways



Any new species?

Goal and merit awards

Set up a point system for students (challenge)

Get deans and departments to donate prizes (32 students)

Challenge: 250 species possible? If reached, department pays for pizza party (challenge dept chair)

New family = 10 points New genus = 5 points

New species = 5 points New observation = 1 point

(10 observations/student mandatory)

Logo challenge, voted winner

Logo Design: Clayton Leadbetter

Methodology

Only wild and naturalized plants

hand lenses, dissecting scopes

rubber boots, raincoats

Knives, sticks, bags, newspaper, herbarium presses

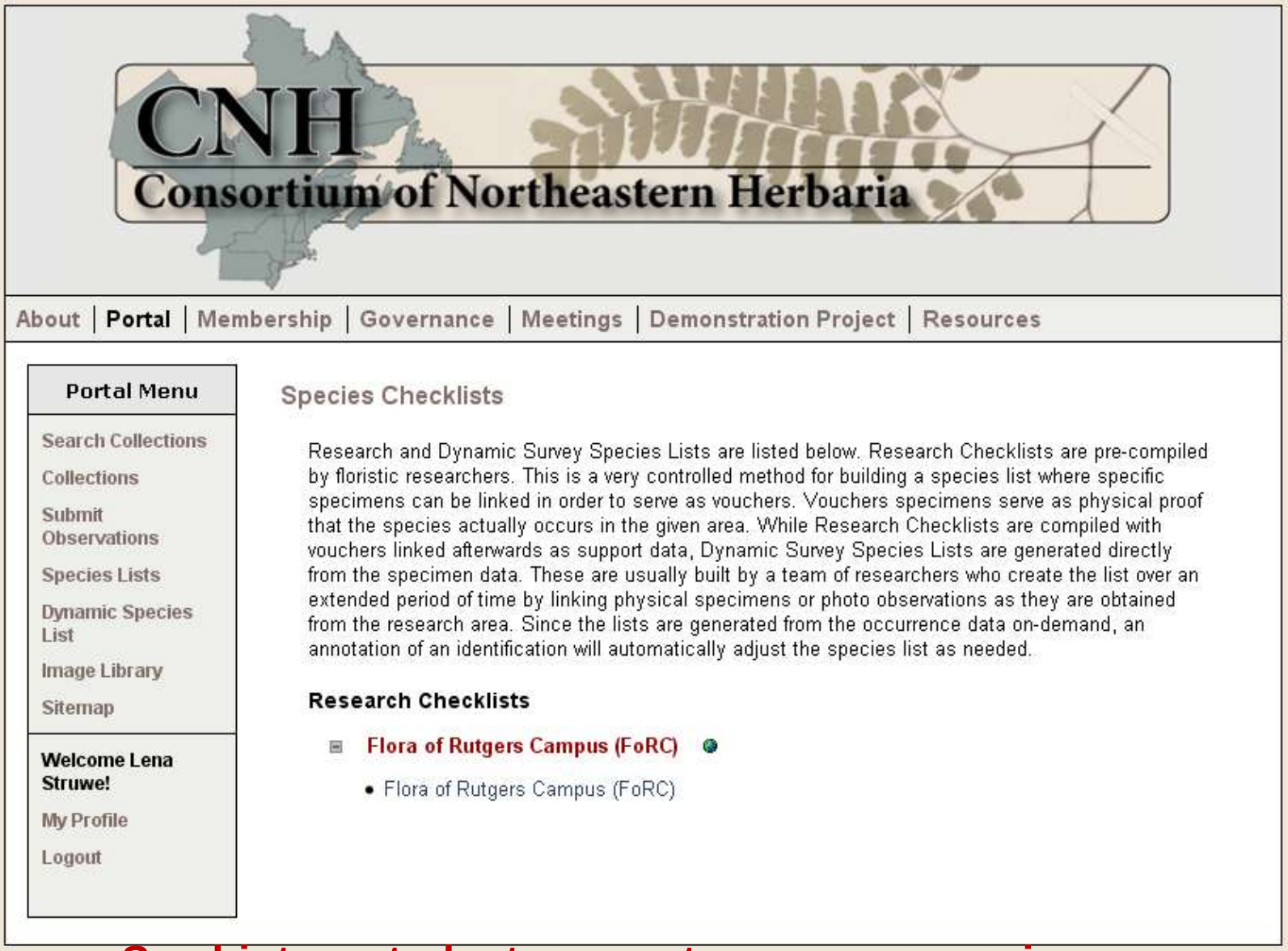
smartphones

digital cameras and GPS units

Floras and internet resources (keys)

Chrysler herbarium

Data uploaded on web portal by students.



Software: Symbiota – student accounts, no programming necessary, upload of voucher data, geospatial data, photos, after confirmed ID

End of October

November

December

Flora of Rutgers Campus (FoRC) *Games*

MD Spp.

Authors: Lena Struwe
Publication: not published
More Details

Species List

Families: 100
Genera: 215
Species: 273 (species rank)
Total Taxa: 275 (including ssp. and var.)

Options

Search:
Synonyms

Filter:
Original Checklist
Display as Images
Notes & Vouchers
Taxon Authors
Rebuild List

ADOXACEAE

Viburnum acerifolium
Viburnum dentatum

ALTINGIACEAE

Liquidambar styraciflua

AMARANTHACEAE

Amaranthus hybridus
Amaranthus retroflexus

AMARYLLIDACEAE

Allium oleraceum
Allium schoenoprasum

AMBLYSTEGIACEAE

Leptodictyum riparium

Daucus carota L.

Family: Apiaceae

[*Daucus carota ssp. carota* L., more]

Patrick Burgess

Description Not Yet Available

Samantha Lee

Yifei Wang

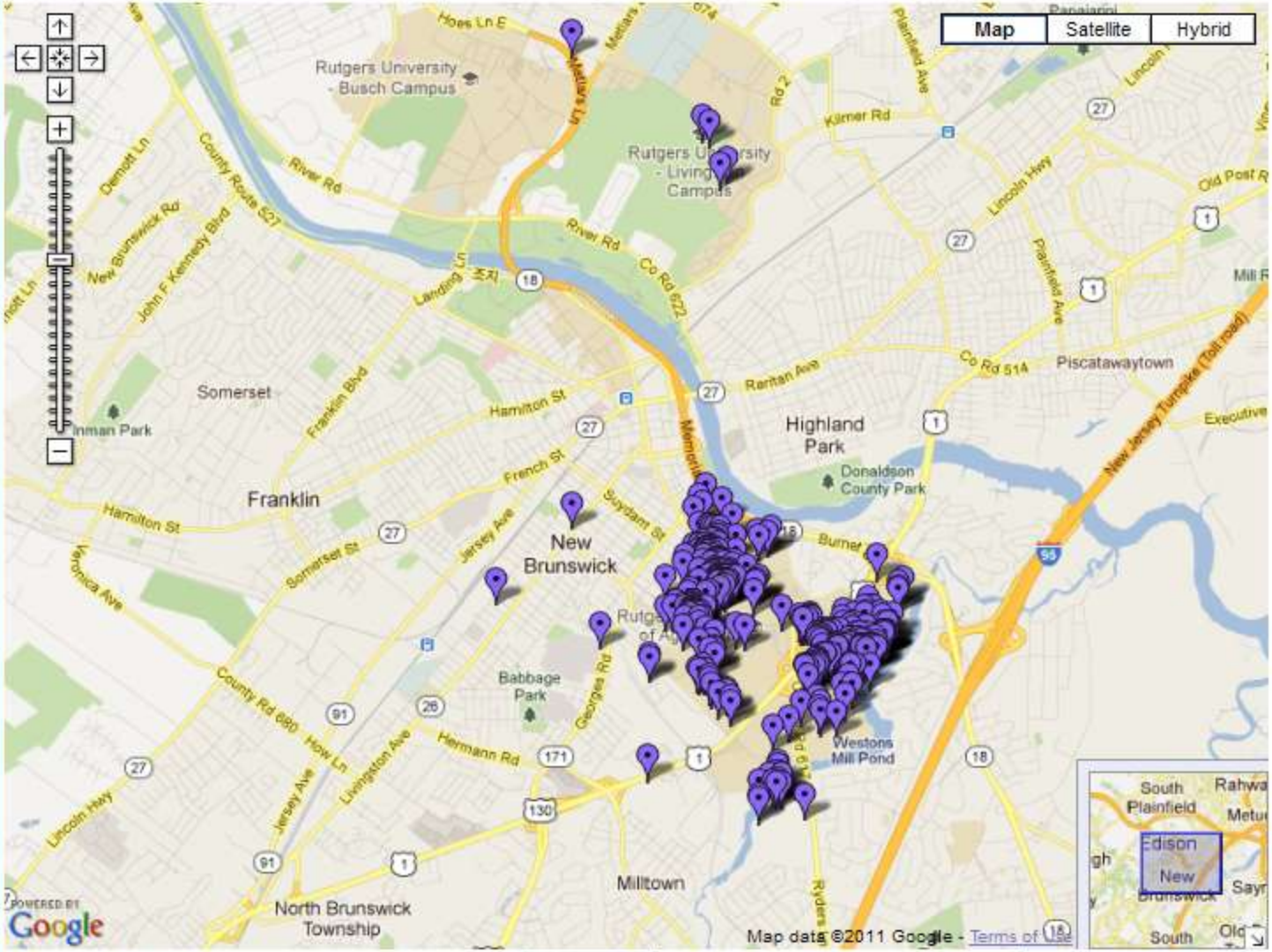
Shannon Morath

Patrick Sweeney

More Photos | Web Links | View Parent Taxon | Close window

CNH portal - Google Map - Mozilla Firefox

neherbaria.org/CNH/collections/googlemap.php



= *undefined*

Latitude decimal: eg: 34.57

Longitude decimal: eg: -112.38

Enter in D:M:S format

Marker Name:

Add Marker

FoRC Results

32 students, 3 months (Sept-Dec) =

- 100 families
- 215 genera
- 273 species **(= pizza party!)**

Ca. 10% of all species in the state (NJ)

50% of species ‘weeds’

FoRC Results

Only I got poison ivy

Guess…

The most reported plant species?

The plant family with the most species?

Most species in the same genus?

Guess…

The most reported plant species?

***Trifolium repens* WHITE CLOVER**
15 observations

The plant family with the most species?

Asteraceae
29 species (more than 10% of the flora)

Most species in the same genus?

Polygonum (Polygonaceae)

FoRC awards…

New family = 10 points

New genus = 5 points

New species = 5 points

Observation = 1 point

And the top winner is…..

Natalie Howe

It is all the lichens' and mosses' fault.

809 points

59 observations (most of any)

Winner of most families, genera, and species reported.

Clayton Leadbetter

Winner of fastest point gain in the history of FoRC: From 0 to 315 in 10 days.

499 points, 54 observations

Winner of most species and most genera within vascular plants.

Special honorary awards to…

The student that did the wettest fieldwork – nearly fell into a lake–

The student that found her plant crushed by a downed tree when she went back to recollect it after the storm–

Neatest herbarium collection –

BROADER IMPACTS and CONCLUSIONS

- campus = living laboratory
- new long-term data set for future classes and research
- students **loved** finding new species and exploring the botanical diversity

Goals reached within and outside of botany

- increased students' **knowledge** of local plants and gained critical skills
- heightened **appreciation** and understanding of the natural world and of their university campus
- opened their eyes to **'see' plants everywhere**
- worked **cooperatively** and positively **competitively**, peer-review of data and results
- increased our knowledge of **biodiversity** on campus, got baseline data

Flora of Rutgers Campus as an educational research project

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SUMMARY

Student participation in floristics at the university level is essential for the longevity and expansion of botany and associated fields, but floristic knowledge and college course options have been decreasing.

We created the Flora of Rutgers Campus, FoRC, through hands-on outdoor fieldwork as an engaging and effective way for students to experience botany first-hand.

This increased the students' knowledge of local plants, heightened their appreciation of the natural world and their university campus, opened their eyes to 'see' plants everywhere, and encouraged students to work cooperatively – all while having fun and being FoRCe-ful.

This is also the first floristic biodiversity inventory of the Rutgers campus, and we hope it can serve as a model for other universities.

METHODS

During the fall of 2011, we challenged 32 graduate and undergraduate students to create a campus-wide floristic survey of all wild and naturalized plant species on Cook and Douglass campuses (317 acres, Rutgers University, NJ, USA).

Students used both traditional tools (floras, hand lenses, and rubber boots) and high-tech equipment (phones with instant GPS, cameras, and internet).

The data was uploaded by students to an online web portal housed by Consortium of Northeastern Herbaria (cnh.org), and stored as part of the Symbiota database.

The students' resulting herbarium specimens, field observations, and photos formed a species list, image bank, and maps of species locations now online.

Included in the inventory were all vascular plants (flowering plants, conifers, ferns, lycopods, and horsetails), as well as lichens, mosses, liverworts, and algae. Obviously cultivated species were not counted.

Students were rewarded with donated prizes for most species, most families, and for new species found.

RESULTS

Four months and one giant October snowstorm later:

- 100 plant families
- 216 genera
- 276 species

= more than 10% of New Jersey's plant species biodiversity, on our little campus

- Most reported species:
  Trifolium repens (white clover), 15 times.
- Most species-rich family:
  Asteraceae, 29 species
- Most species-rich genus:
  Persicaria (Polygonaceae), 9 species.

= more than 10% of all species were in the sunflower family

- Habitats visited: mixed hardwood forest, abandoned meadows, conifer plantations, patchy wood lots, weedy parking lots, ponds, campus lawns, ditches, wetlands, mossy rock walls, and fallow garden plots.

BROADER IMPACTS and CONCLUSIONS

- the campus becomes a living laboratory
- creates a long-term data set if ongoing classes continuously collect data, useful for other classes
- students gained essential botanical skills in field identification, inventorying, and data management
- students loved finding new species and exploring the botanical diversity outside the classroom

ACKNOWLEDGMENTS and SPONSORS

Rutgers University School of Environmental and Biological Sciences; New Jersey Agricultural Experiment Station; Chrysler Herbarium of Rutgers University; Rutgers University Dept. of Ecology, Evolution, & Natural Resources; Rutgers University Dept. of Plant Biology and Pathology; Floriculture Greenhouse; Rutgers Gardens; Consortium of Northeastern Herbaria.
FoRC logo designed by Clayton Leadbetter; Photos taken by Lena Struwe.

New associated student research projects

- Biodiversity inventories of weeds in parking lots to test island biogeography hypothesis (ecology & education)
- Lesson plan development in how to use school yard weeds in biology (K-12) education (ecology&evolution/education)
- Inventory invasive weeds in EcoPreserve, check which ones that are still sold at local nurseries (biology/public policy)

2013 plans

Landscape Architecture class will add horticultural (planted) plants this fall

Plant Systematics class will add more data; revisit species from 2011

Broaden to all campuses in New Brunswick / Piscataway, NJ

Develop quick field keys/guides to difficult groups

Sponsors of prizes

Executive Dean **Bob Goodman**, School of Environmental and Biological Sciences, NJAES

Mike Green, Media and Marketing Office, School of Environmental and Biological Sciences

Chrysler Herbarium, Director **Lena Struwe**

Department of Ecology, Evolution, & Natural Resources (DEENR), chair **Henry John-Alder**

Floriculture Greenhouse, **Nicki Graf**

Rutgers Gardens, Director **Bruce Crawford**

Jean Marie Hartman, Landscape Architecture

Mark Vodak, DEENR & **Steven Handel**, DEENR & **Joan Bennett**, Plant Biology & Pathology & **Jason Grabosky**, DEENR

May the FoRC be with you.

Questions?