



NORTH CAROLINA
BOTANICAL
GARDEN

THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

Conservation Department

Nick Adams – Natural Areas Curator

Amanda Faucette – Botanist

Neville Handel – Land Manager

Mike Kunz - Ecologist

Johnny Randall – Director of Conservation



Conservation Department Program Areas

- Land Conservation and Management
 - Nature Preserves
 - Conservation easements
- Rare Plant Programs
 - Center for Plant Conservation and associated rare plant reintroduction and other recovery efforts
- Seeds of Success Program in association with the Plant Conservation Alliance (US Bureau of Land Management) and Millennium Seed Bank
 - Collection of common species for short- and long-term storage, research, reintroduction, and plant materials development
- Public Programs, outreach and other extension activities
 - Presentations to public schools, garden clubs, Master Gardeners, rare plant groups, professional/scientific meetings; board and advisory committee participation; etc.



North Carolina Botanical Garden and other State-Owned Properties

- Mason Farm Biological Reserve * – 367
 - Parker Preserve - 118
 - Hunt Arboretum – 124
 - Gray bluff Garden- 8
 - Piedmont Nature Trails – 50
 - Coker Pinetum – 26
 - Battle Park – 93
- Total = 786

Botanical Garden Foundation Properties

- Stillhouse Bottom Nature Preserve* – 23 acres
 - Laurel Hill Nature Preserve* – 75 acres
 - Laurel Hill Residence and Grounds – 2
 - Highland Pond (Chatham Co.) – 3
 - Creekside Bluff (Orange Co.) – 1
 - Gordon Butler Nature Preserve (Cumberland Co.) – 12
 - Villa Pinea – 12
- Total = 128

Botanical Garden Foundation Conservation Easements

- Morgan Creek Easements (12 parcels) – 6 acres
 - Laurel Hill Easements – 12
 - Stillhouse Bottom – 5
 - Villa Pinea – 12
 - Morgan Creek Preserve – 92
- Total = 127

Botanical Garden Foundation Managed Lands

- Penny’s Bend Nature Preserve * - 84 acres

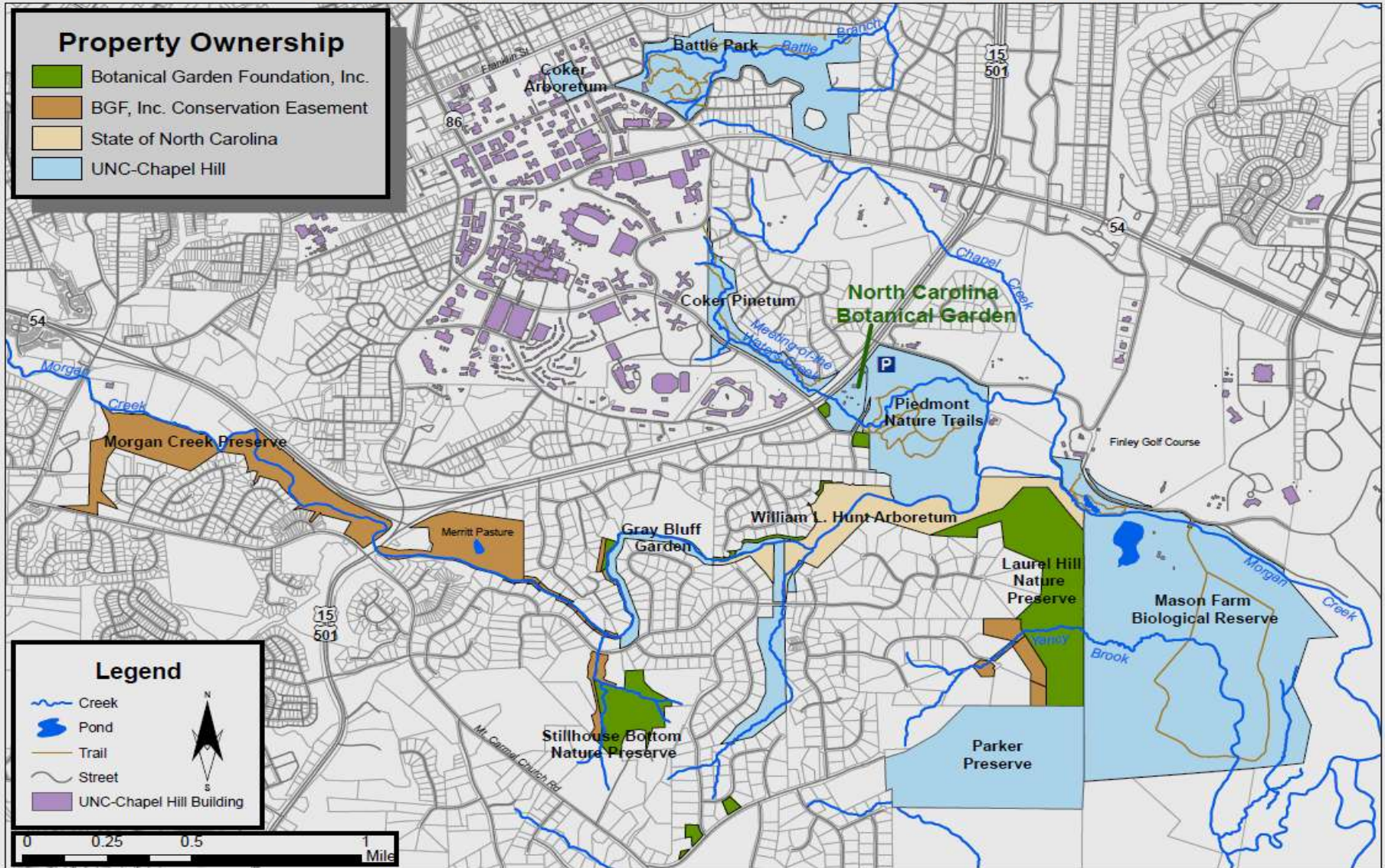
**Lands managed by the
Conservation Department**



Total = 1,125 acres

** Outstanding rating according to NCNHP (2013)*

Lands Managed by the North Carolina Botanical Garden



Conservation Program Projects (2012-2018)

- Syngenta – Seeds of Success and Mason Farm Biological Reserve restoration
- Partners for Fish and Wildlife – Mason Farm Biological Reserve boardwalk
- North American Lily Society – Sandhills lily recovery
- Department of Defense
 - Operational-scale Demonstration of Propagation Protocols and Comparative Demographic Monitoring for Re-introducing Five Southeastern Endangered and At-risk Plants
- National Fish and Wildlife Foundation
 - *Echinacea laevigata* reintroduction at Penny's Bend Nature Preserve
- Center for Plant Conservation
 - Department of Defense lands seed collection and storage
- US Fish and Wildlife Service
 - *Carex lutea* demography and seed collection
 - *Sagittaria fasciculata* restoration
 - *Symphyotrichum georgianum* seed and tissue collections
 - NCBG rare plant garden establishment and interpretation
 - *Echinacea laevigata* seed collection and recovery
 - Milkweed seed collection and propagation
 - *Amaranthus pumilus* seed increase and reintroduction
- US Department of the Interior – Seeds of Success collection along Mid-Atlantic coast
- International Carnivorous Plant Society – *Ex situ* conservation and genetic Architecture of Venus' flytrap
- Department of Energy – Switchgrass (*Panicum virgatum*) collection





Ex situ conservation





Conserving and restoring
America's native plants

America's flora
is at risk...

Today nearly 30 percent of the native flora in the United States is considered to be of "serious concern." Without human intervention, many of these plants may be gone within our lifetime. Eighty percent of the at-risk species are closely related to plants with economic value somewhere in the world, and more than 50 percent are related to crop species.



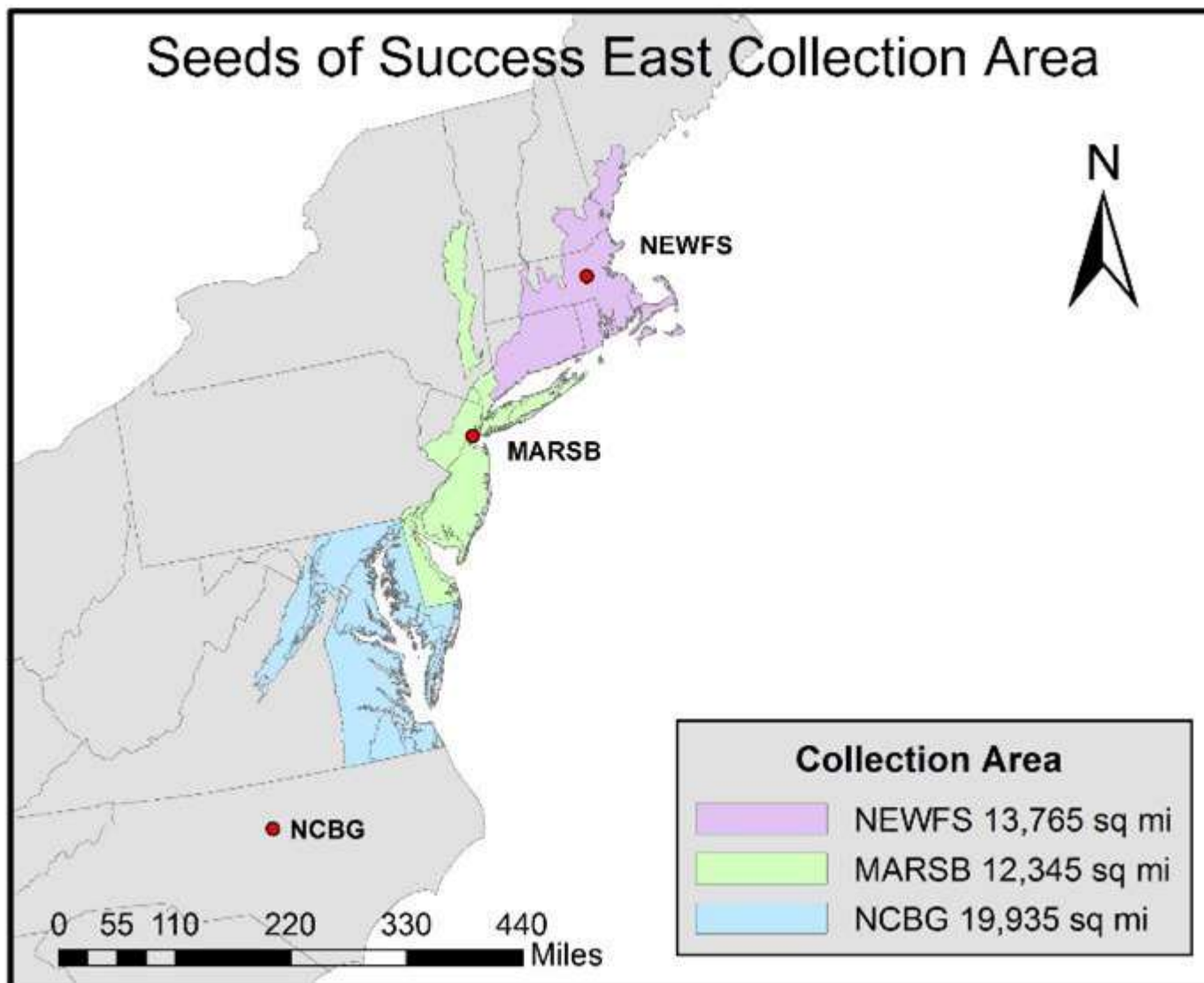
...but it can be saved.



Seed processing and storage



Seeds of Success East Collection Area





Conservation and Land Management Interns



https://www.youtube.com/watch?v=XCCRtIHbA98&feature=player_embedded

In situ conservation and
ongoing plant recovery
projects



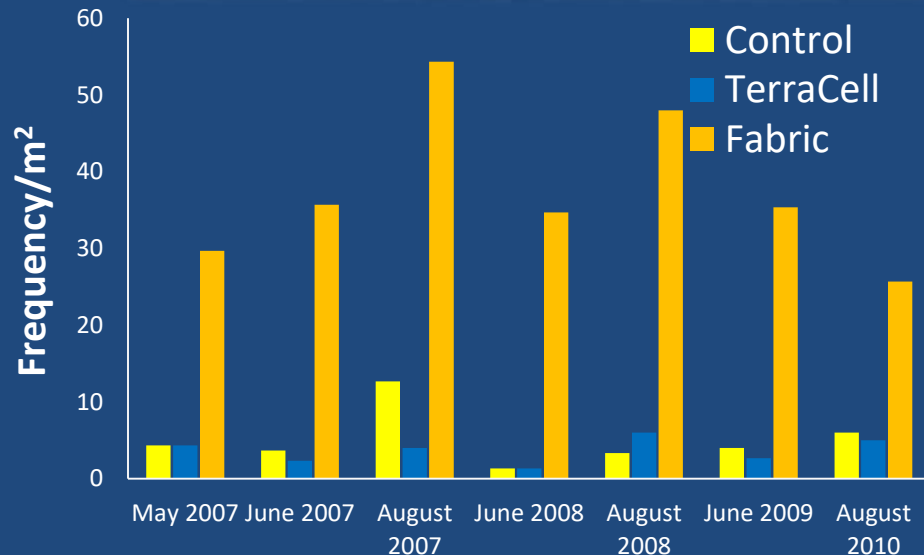
Reintroducing *Ptilimnium nodosum* to the Deep River, NC



Funded by National Fish
and Wildlife Foundation and the
Center for Plant Conservation

Project summary

- Researched mating system
- Reintroduced 700 *P. nodosum* to the Deep River, NC
- Established experimental treatments to test best practices for use in dynamic riverine systems
- Population showing declines
- But surveys are needed downstream to look for successful colonization!



Translocating *Lysimachia asperulifolia* and rhizome dynamics

Funding provided by NCDOT and ESTCP



Lysimachia asperulifolia

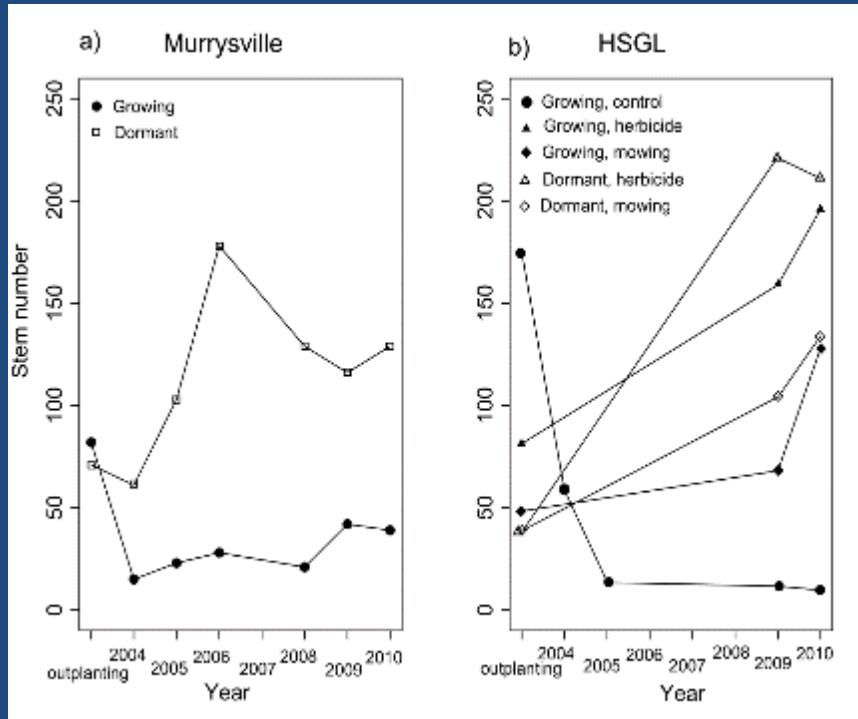
(Rough leaf loostrife)



- NC/SC coastal plain endemic
- Self incompatible, rhizomatous herb
- Pseudo-annual life history
- Limited flowering and fruiting, very limited within population pollination, varying levels of sterility and S allele diversity and low seed germination
 - (Franklin et al, 2006)

What is the cause of population growth?

From Kunz et al 2014



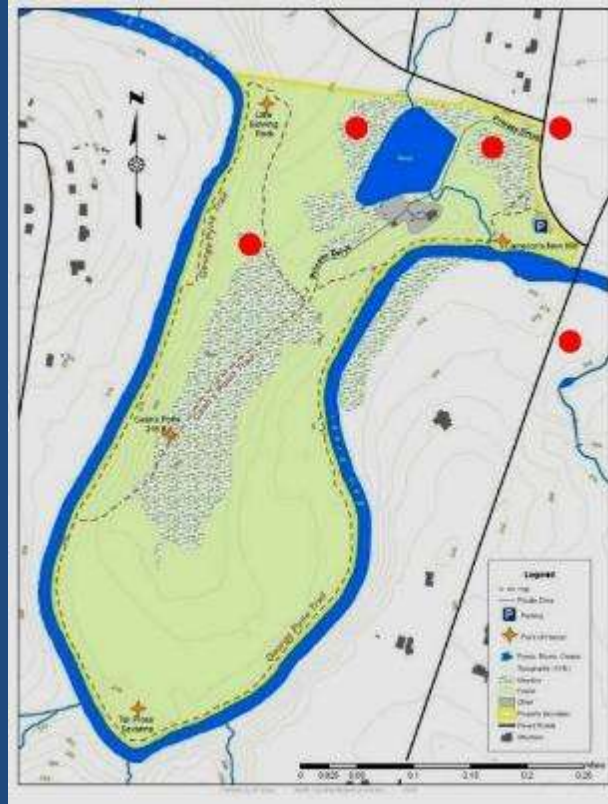
- Reintroduced populations show growth and >10 survivorship
- Since flowering/fruitlet rates low and there is no sign of sexual recruitment how/why are some populations growing?
 - Multiple stems per rhizome?
 - Natural rhizome division?



Echinacea laevigata

Smooth coneflower

Funded by **National Fish and Wildlife Foundation** and CPC

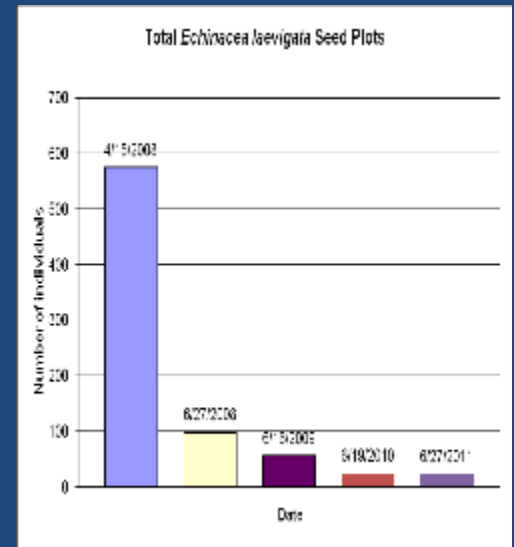
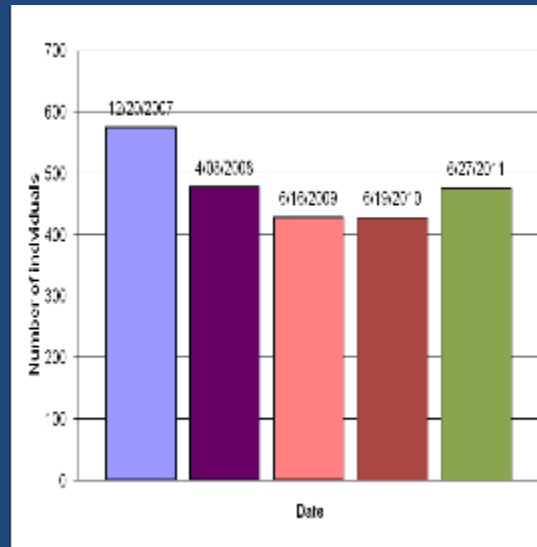


Building a Metapopulation



Tracking progress

- Whole plants are more successful than seeds
- Population showing recruitment
- Continued fire management
- Continued monitoring



Demonstration of reintroduction protocols for use in species recovery, conservation and mitigation on Fort Bragg



Sandhills pyxiemoss
Pyxidanthera brevifolia (Wells)



Environmental Security Technology Certification Program

Sandhills lily
Lilium pyrophilum
(Skinner and Sorrie)



Rough-leaved loosestrife
Lysimachia asperulifolia (Poiret)



Sandhills milkvetch
Astragalus michauxii
(Kuntze)



Georgia leadplant
Amorpha georgiana
(Wilbur)



Matthew Hohmann – US Army ERDC-CERL
Wade Wall – US Army ERDC-CERL

Michael Kunz – NC Botanical Garden
Johnny Randall – UNC-Chapel-Hill

Dale Suiter – US FWS, Ecological Services,
Raleigh Field Office

Janet Gray – US Army Fort Bragg

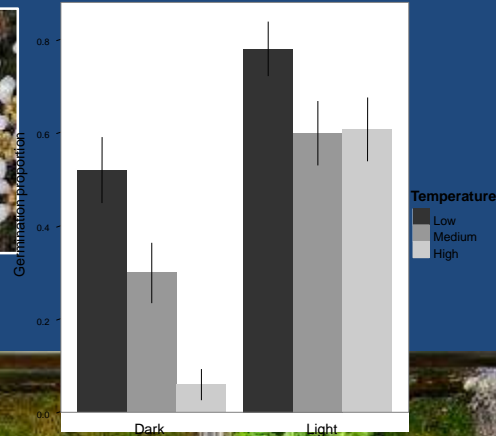
Establish Propagation Protocols for 5 endangered and at risk species



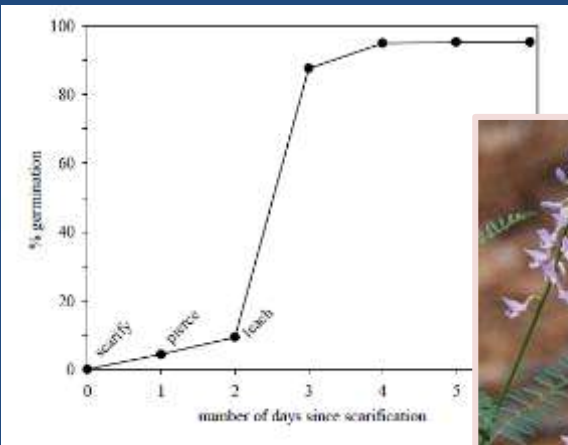
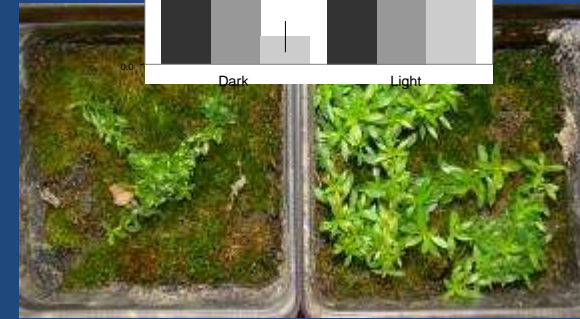
Marchin et al (2009) & USDA Woody Plant Seed Manual



Wall et al (2010)



Kunz and Randall (unpub.data)



Kunz et al (2016)



Kunz et al (2014)





Planting and labeling
thousands of seedlings...



Demographic Monitoring to measure success

- Data collected on growth, survival and reproduction on both reintroduced and natural populations



Mason Farm Biological Reserve



- MFBR proper is ca. 500 acres
- 600-acres of adjacent undeveloped private land
- 41,000-acre New Hope Gameland to the south
- 800 species of plants
- 216 species of birds
- 29 species of mammals
- 28 species of fish
- 28 species of reptiles
- 23 species of amphibians
- 67 species of butterflies



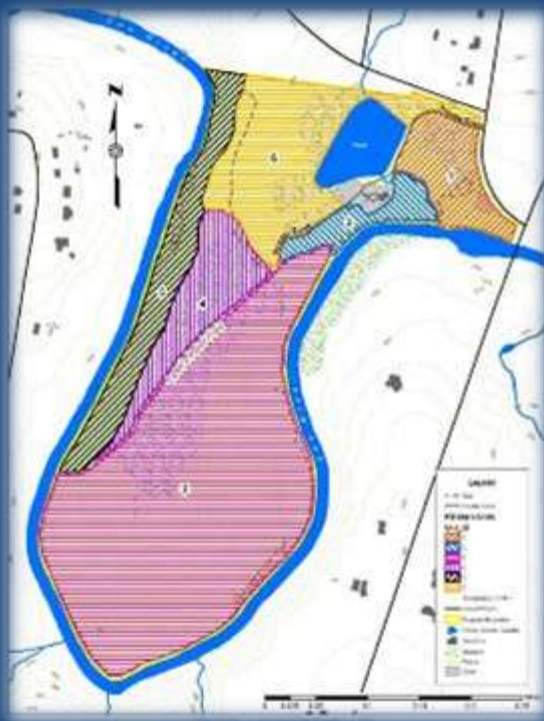
MFBR Management Plan: fundamental guidelines

- Allow and encourage the function of natural processes to the greatest extent possible
- Rehabilitate sites of impaired ecological function
- Actively manage areas that can benefit from human intervention
- Maintain habitat diversity by retaining a mix of mature woodlands, open woodlands, and savannas









Penny's Bend Nature Preserve



13 April, 2017

Penny's Bend one month later



Eastern Prairie Blue Wild Indigo



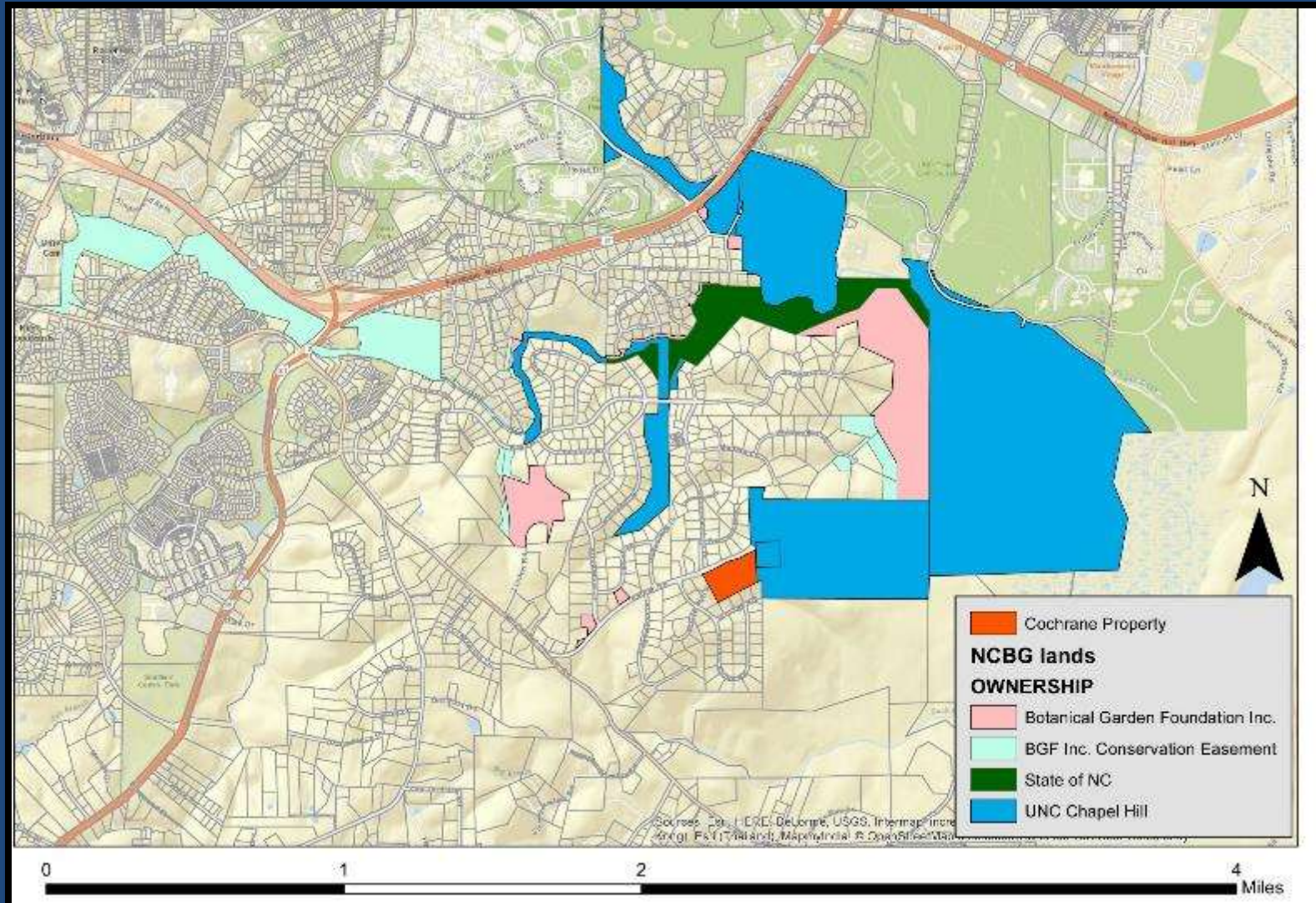


Partners for Fish and Wildlife grant to grow 7,200 plugs of common milkweed (*Asclepias syriaca*) for future distribution and to create a local seed source for additional monarch habitat projects

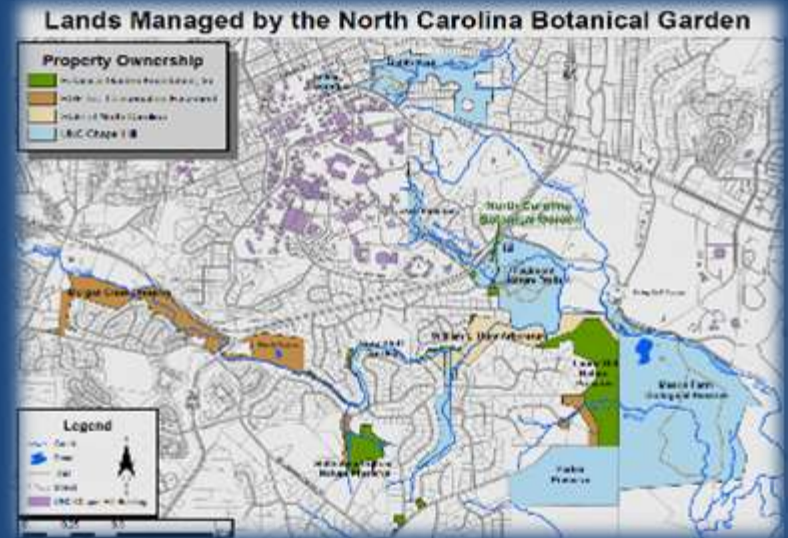




BGF Cochrane property and CWMTF grant proposal



Morgan Creek Preserve

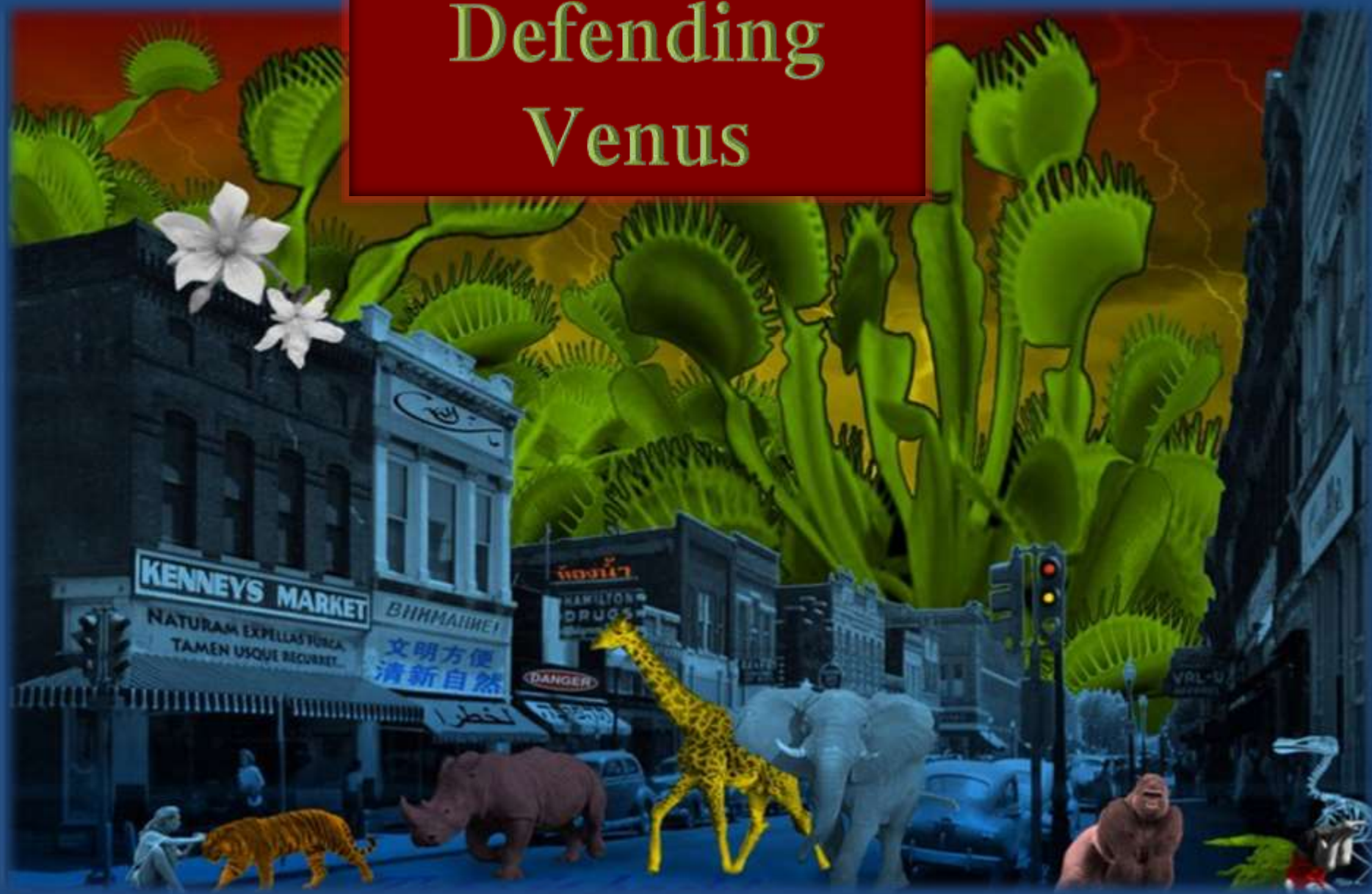


Green Growth Toolbox grant from NCWRC



Conservation Landscape Coordinator
Julie Tuttle

Defending Venus





The University of North Carolina Herbarium (NCU)

A Department of the North Carolina Botanical Garden

The Herbarium is located in 401 Cohen Hall on the main UNC-CH campus

"A traveler should be a botanist, for in all views plants form the chief embellishment."

Charles Darwin, *Journal of the Voyage of the Beagle* (1845)

The 2016 Charles J. Stohr Intern is Ellie Kravets

Featured Collector: [John Lorenz Blodgett](#)

Dionaea muscipula Ellis

Venus Fly Trap is endemic to the Coastal Plains of southeastern North Carolina and northeastern South Carolina. It is the logo of the University of North Carolina Herbarium (NCU).

The University of North Carolina Herbarium is a world wide collection of vascular plants, non-vascular plants, fossils, algae, fungi, and lichens.

The Herbarium is open to scholars and the public weekdays from 9 a.m. – 4:30 p.m.

Contact Shanna Oberreuter at soberreuter@unc.edu (919) 962-6001 to arrange a visit & parking on campus.

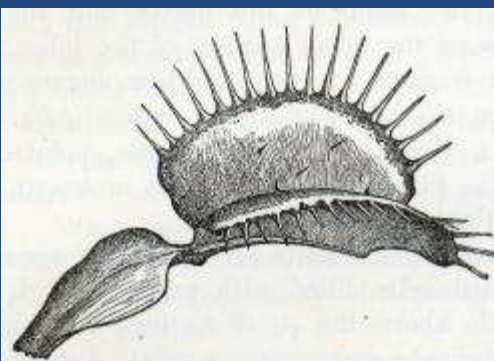


FIG. 12.

(*Dionaea muscipula*.)

Leaf viewed laterally in its expanded state.

**NEW IMAGES FROM
THE SURFACE OF VENUS**





Holiday Parade

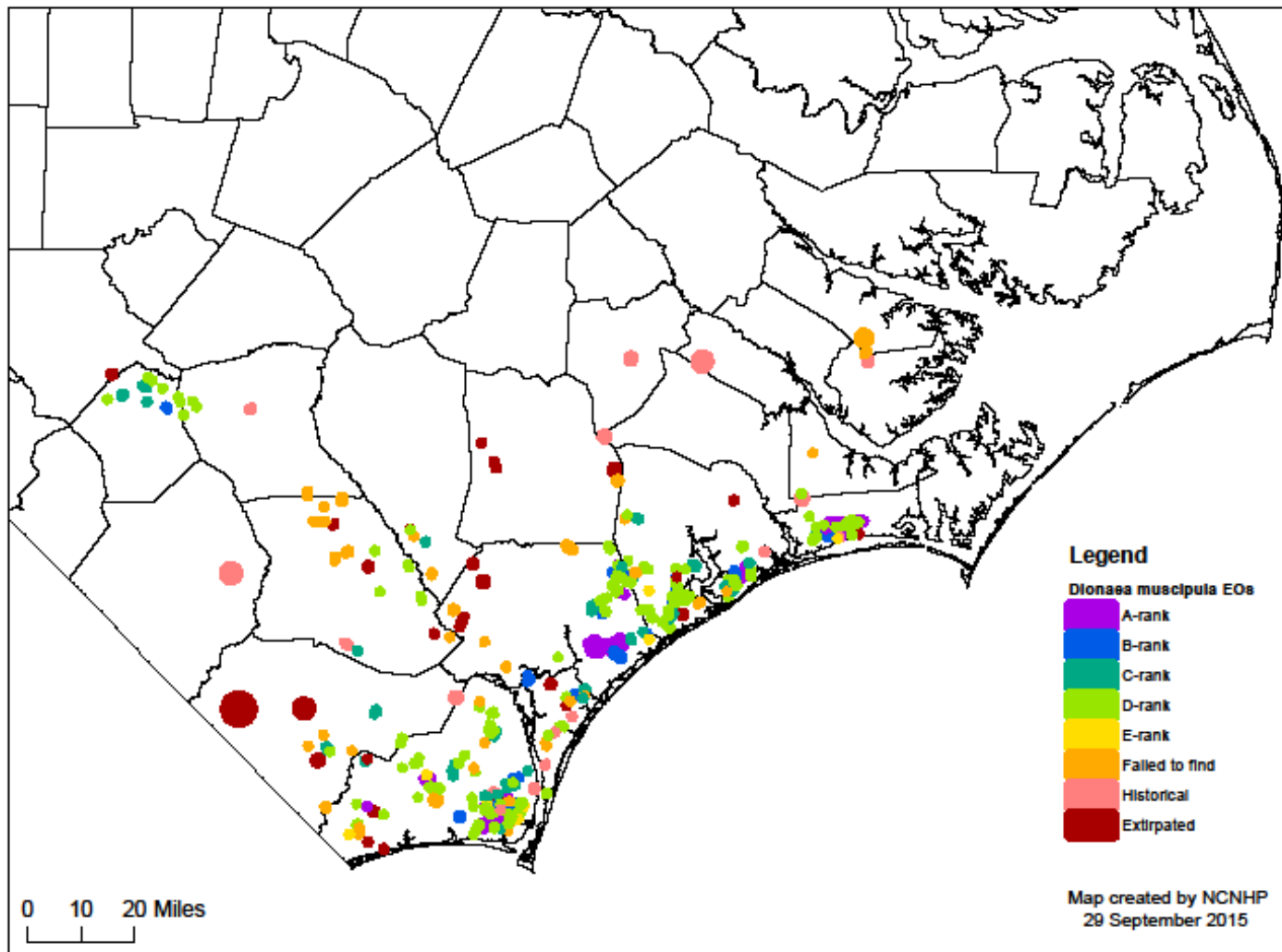


Current status of VFT in NC

- Since 1958 (1st range-wide inventory) ½ of known populations are now extirpated
- 31 EOs (across 14 counties) are considered extirpated
- From 1992 to 2002 overall population number declined 17% & subpopulation number declined 23%
- 40% of extant populations contain 10-100 individuals and these rank as “D”
- Poaching now a felony in Pender, New Hanover, Brunswick, and Onslow counties
- A candidate for state-listing through NC Plant Conservation Program



Dionaea muscipula
Element Occurrences in North Carolina



Range-wide *ex situ* seed conservation and population genetic architecture analysis in Venus' flytrap

North Carolina Botanical Garden and Carolina Center for Genome Sciences

Funded by the International Carnivorous Plant Society

Specific Aims:

- Sample 150 VFT populations across the entire existing range for both tissue and seeds and create a long-term seed bank as a conservation resource.
- Evaluate standing genetic variation in 30 select populations using restriction site associated DNA sequencing (*Next Generation* RAD-seq).



Primary research questions include:

- Do VFT form a monophyletic group or are there cryptic subspecies?
- Does VFT show isolation by distance or other population structure?
- Is there evidence of reduced genetic diversity in VFT?
- Which populations have the highest genetic diversity?
- Are the effective population sizes of peripheral populations smaller than expected suggesting population bottlenecks?
- Which populations seem most at risk for collapse and are these populations genetically distinct?
- Do specific morphologies or habitats correlate with specific populations?
- Which VFT populations should be specifically targeted for conservation actions (through land acquisition, proper management, or intense seed collection and storage)?



Over 26,415 seeds from
20 sites collected in
2017 - all by maternal
line (other than bulk
collection) – vacuum-
sealed and frozen



Very Preliminary Genetics Results



Restriction site-Associated DNA sequencing (RAD-seq) of 160 markers indicate limited genetic variation within the first population sampled.

Genetic variation was surprisingly heterogeneous across loci with some populations harboring appreciable variation and others harboring next to none.

Big penalty awaits North Carolina's flytrap pilferers

BOLIVIA — The Venus flytrap grows in the boggy bottomland of the North Carolina coast, a carnivorous plant native to the patch of swamps within 60 miles of Wilmington – a vegetative curiosity best-known as the ravenous character from “Little Shop of Horrors.”

For many years now, outlaw plant-diggers have mucked their way through that marshy territory carrying pillowcases and shovels, collecting the insect-eating flora and selling them, illegally, for dimes and quarters apiece.

Until recently, this horticultural crime ranked as a misdemeanor, punishable by a \$50 fine. But a new law enacted one year ago makes flytrap pilfering a felony – harsh news for a pair of unfortunates in Brunswick County, caught with a sackful.

On Nov. 1, sheriff's deputies charged these men with taking 1,025 Venus flytraps from Orton Plantation, the historic antebellum plantation that sprawls along the Cape Fear River. For this charge, which also included the theft of purple pitcher plants, they were jailed with bond set at \$1 million – the amount more commonly reserved for murderers.

Their arrest marks the first felony flytrap case in Brunswick County, so there are no comparative data to measure whether stricter punishment has deterred such thievery in the woods. But I predict that should these men



Laura Gadd, with the North Carolina Department of Agriculture

2 charged with poaching Venus flytrap plants from NC plantation

POSTED 1:41 PM, DECEMBER 3, 2014 BY WIS-STAFF

FACEBOOK 281

TWITTER

GO+ GOOGLE

PINTEREST

REDDIT

EMAIL

BRUNSWICK COUNTY, N.C. — Two men have been charged with poaching more than 1,000 Venus flytrap plants from a Brunswick County plantation, according to WECT.

Scottie Stevenson, 44, and David Lewis, 23, were each charged with one count of felony taking of a Venus flytrap, 149 counts of taking certain wild plants from land and one count of second degree trespassing.



WWAY-TV 3 abc .COM

VENUS FLYTRAP POACHING INCREASES OVER 3 YEAR PERIOD

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By: Sarah Murphy

Submitted: 04/16/2014 - 9:48pm

Tags: Poaching, Stanley Rehder Carnivorous Plant Garden, Venus Flytraps



BOILING SPRING LAKES, NC (WWAY) — Venus Flytraps often fall victim to poachers.

Tuesday, Myra Lawson, Betty Hill, and William Riley were caught stealing around 300 of these plants in Boiling Spring Lakes.

Investigators say a witness saw the suspects acting suspicious and called police.

Lawson, Hill and Riley all face one count of Taking Certain Wild Plants from the Land of Another.

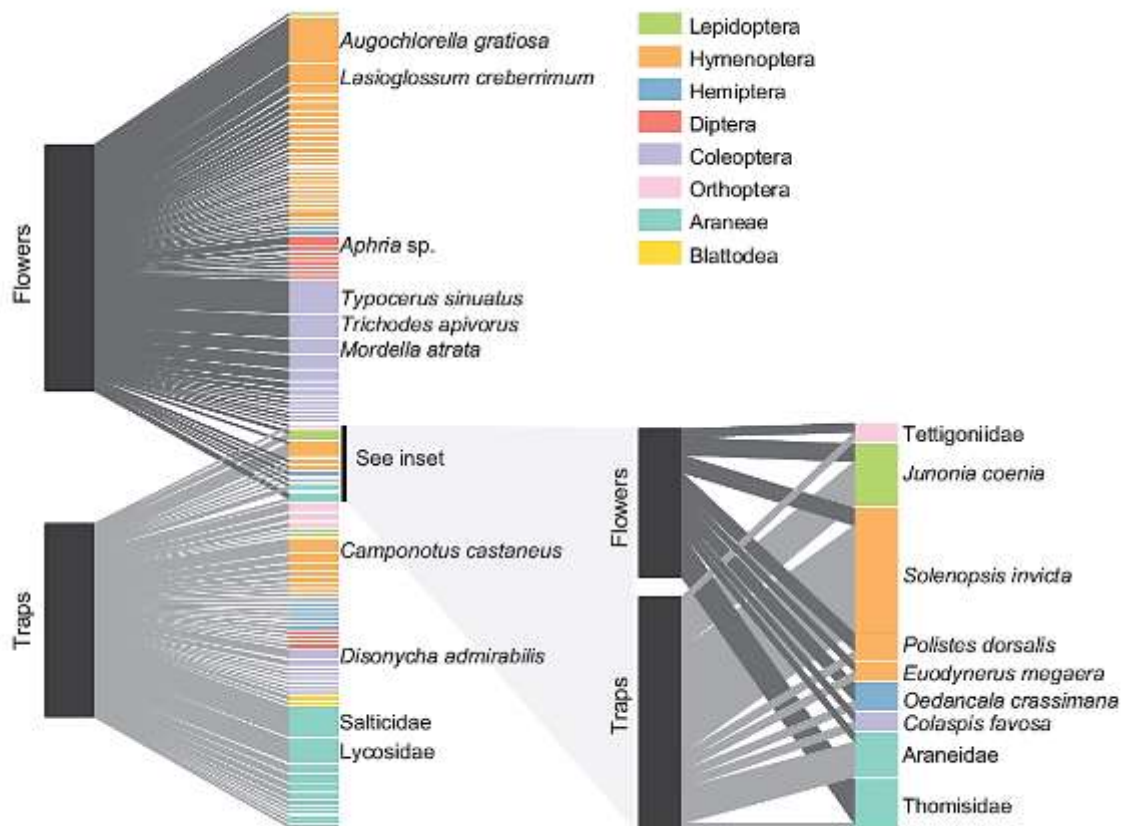
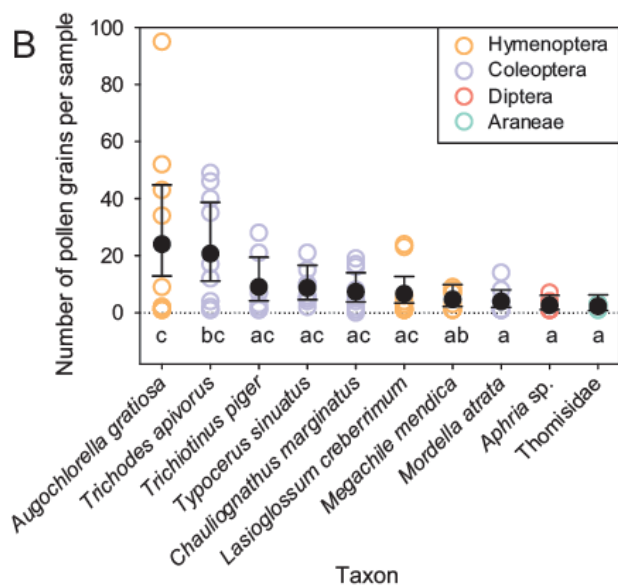
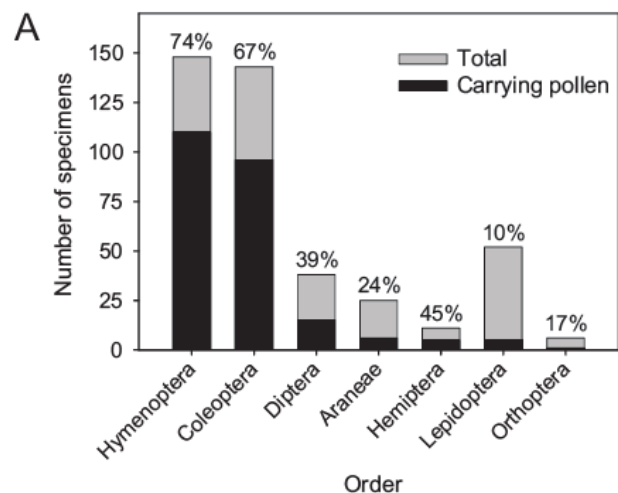
Dan Sheret, caretaker of Stanley Rehder Carnivorous Plant Garden, says Venus Flytrap poaching has been a problem in North Carolina for 25 years.

There is a reward to call these plants "Dead Flowers."

Venus Flytrap Rarely Traps Its Pollinators

Elsa Youngsteadt,^{1,*} Rebecca E. Irwin,² Alison Fowler,² Matthew A. Bertone,¹
Sara June Giacomini,² Michael Kunz,³ Dale Suiter,⁴ and Clyde E. Sorenson¹

1. Department of Entomology and Plant Pathology, North Carolina State University, Raleigh, North Carolina 27695; 2. Department of Applied Ecology, North Carolina State University, Raleigh, North Carolina 27695; 3. North Carolina Botanical Garden, University of North Carolina, Chapel Hill, North Carolina 27599; 4. US Fish and Wildlife Service, Raleigh, North Carolina 27606





Irwin lab at NC State University processing insects and pollen. Becky Irwin Jonathan Giacomini Jackie and Elsa Youngsteadt (bottom to top)

Restoration of seabeach amaranth



- Seed collection and increase
- Long term storage
- Restoration on US Fish and Wildlife Refuge throughout the species' range

