Invasives to Natives:
Old fields as rehabilitation sites

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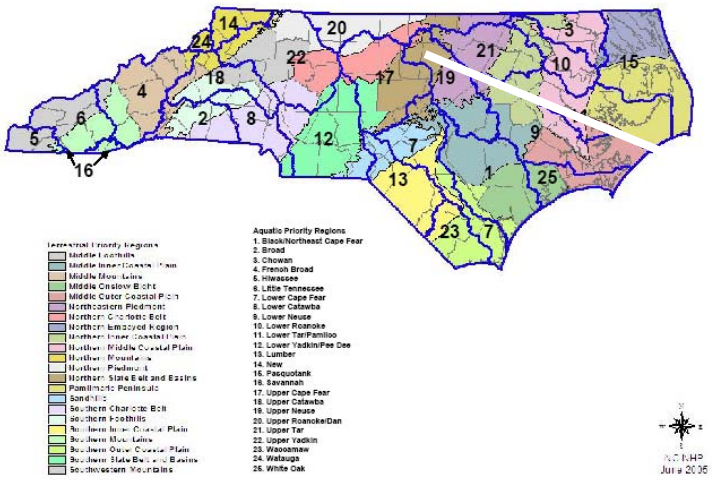
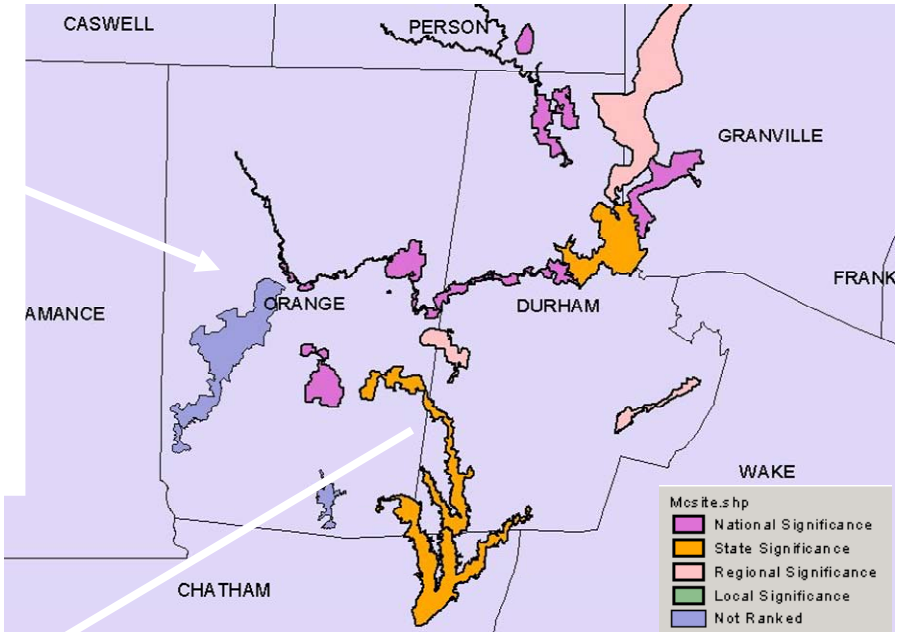
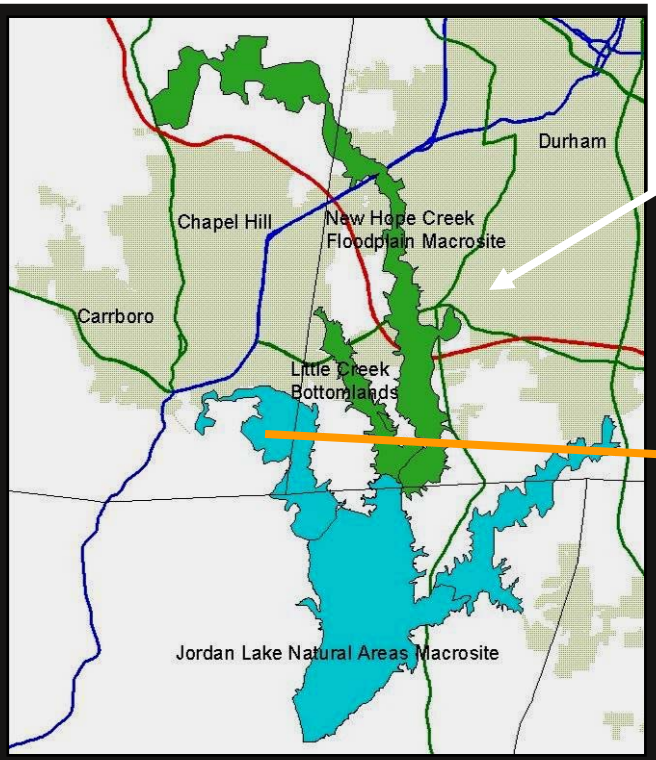
Conservation in a fragmented world….

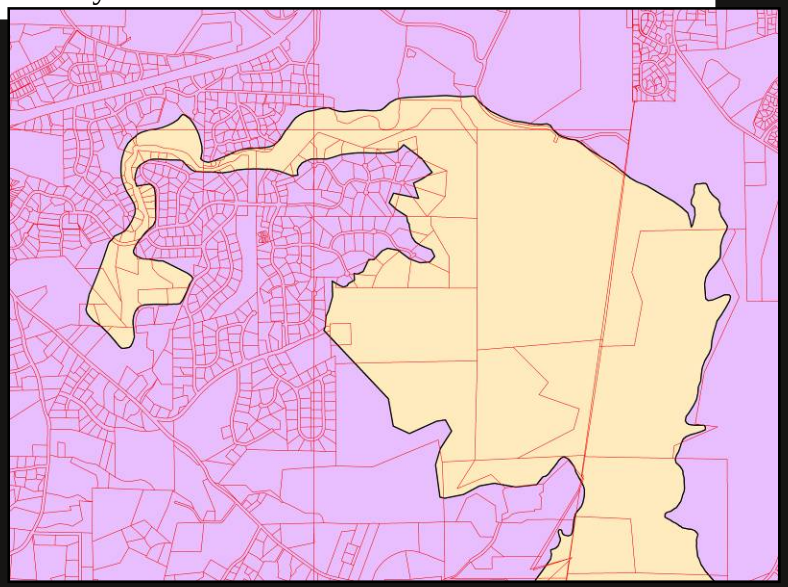
Let the Macrosites be your guide…



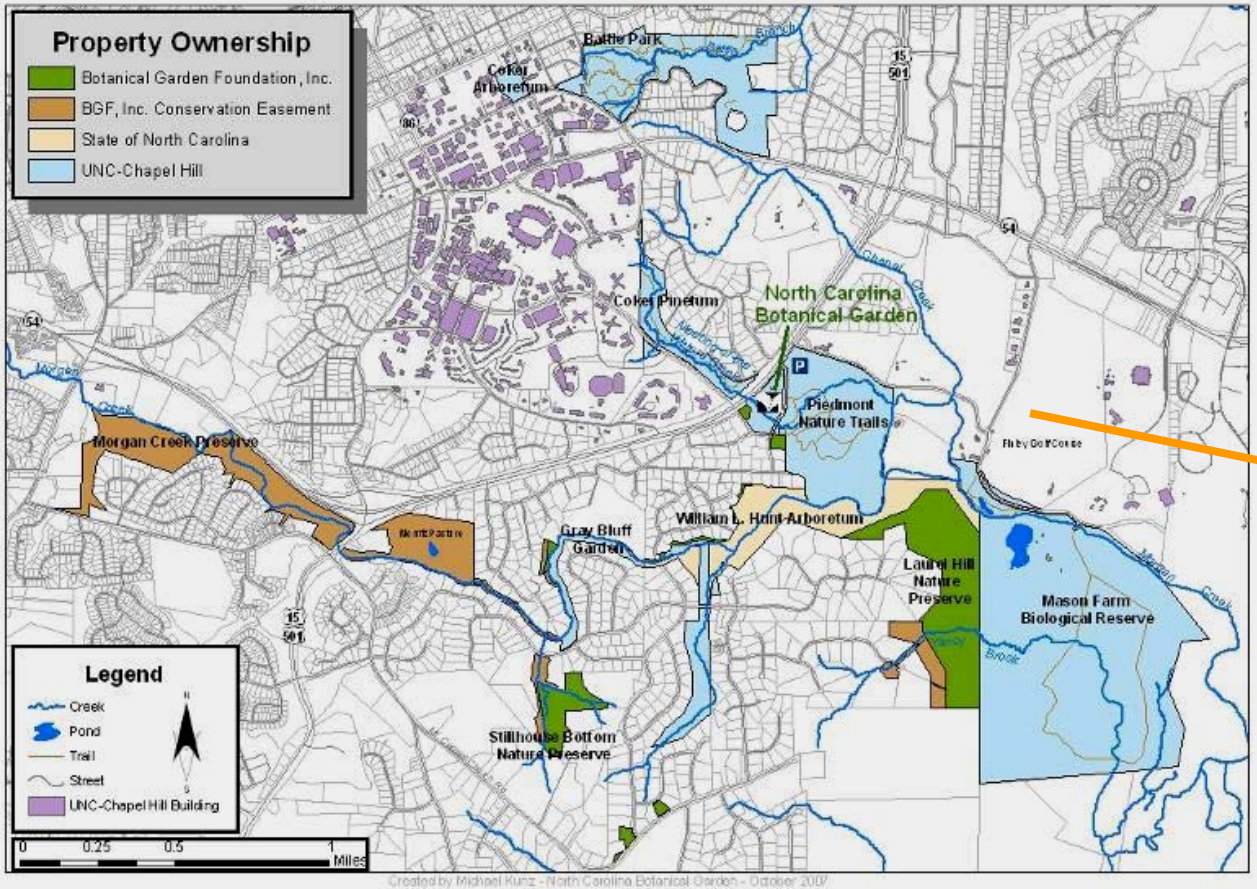


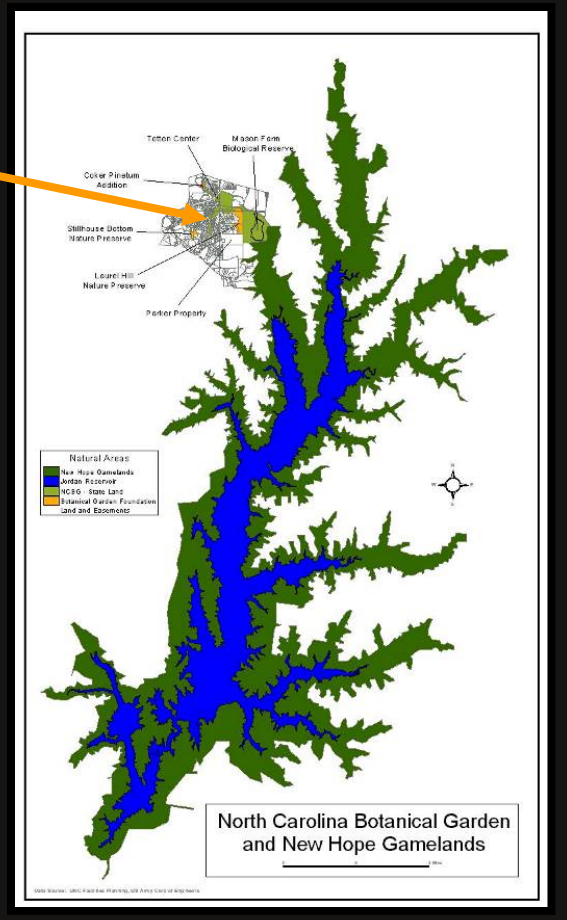
Updated Orange County Macrosites





Lands Managed by the North Carolina Botanical Garden





Mason Farm Biological Reserve

- MFBR proper is 367 acres
- 600-acres of associated undeveloped private forest land
- 41,000-acre New Hope Gamelands 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
- Big Oak Woods, a 65-acre hardwood bottomland *forest of continuity*

Mason Farm Biological Reserve Management Plan: First Principles

- 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 primarily by retaining a mix of natural woodlands and early successional habitats

Critters

Why remove invasive plants?

- Poor wildlife habitat
  - Physical structure of community inhibits movement of ground nesting birds/foraging mammals
  - Refugia and cover inferior to that of native plants
- Poor food sources
  - Fescue seeds in the summer and most ground nesting birds need seed in the winter
  - Hosts toxic endophytic fungi
  - Lespedeza inferior to native legume seeds
  - Both are poor forage for wildlife (and livestock)
- Crowds out native species
- And they’re just plain ugly….

Soil Conservation Service Nursery harvesting seed of Kentucky Fescue No. 31 at Mason Farm in 1947

Still nothing but Fescue in 2003

Why encourage native warm season grasses and forbs?

- Diversity
  - Plant species diversity = animal species diversity
  - Variety in food type and availability (across season)
  - Structural diversity
  - Aesthetics
- Improved habitat
  - Ground-nesting birds
  - Foraging mammals and other critters
  - Disturbance-dependent predatory birds (Hunter et al. 2001)

Methods

- spray fescue with herbicide during winter (broadcast spray)
- burn field in spring
- spray again for lespedeza (target spray)
- plow and level
- plant locally collected seeds and seedlings (derived from these)
- manage with fire on a 2-3 yr. return, but vary burn season






Methods – Plot locations

Methods - Planting

- Seeds of native warm season grasses and forbs collected in winter of ‘08 on local rights-of-way
  - Local is better? →Knapp and Rice 1997

Species	Collection Site
Sorghastrum nutans	Jones Ferry Rd. and George King Rd.
Chrysopsis mariana	George King Rd., Buckhorn Rd., and Mt. Oive Church Rd.
Eragrostis spectabilis	Mason Farm Biological Reserve
Saccharum alopecuroides	Duke Forest
Saccharum brevibarbe var. contortum	Chicken Bridge Rd.
Panicum anceps	Mason Farm Bioogical Reserve
Liatris graminifolia	Chatham County
Eupatorium rotundifolium	Mason Farm Bioogical Reserve
Andropogon ternarius	NC-86, Buckhorn Rd.
Andropogon elliottii	Orange Gove Rd. and George King Rd.
Tripsacum dactyloides	Mason Farm Bioogical Reserve
Paspalum floridanum	Mason Farm Bioogical Reserve and Jones Ferry Rd.
Silphium asteriscus	Buckhorn Rd.
Solidago pinetorum	Mason Farm Bioogical Reserve
Helianthus atrorubens	Buckhorn Rd.
Chasmanthium laxum	Orange Grove Rd.
Andropogon gerardii	Suther Prairie
Solidago erecta	Buckhorn Rd.

Methods – Seedling Study

- Sowed in plug trays

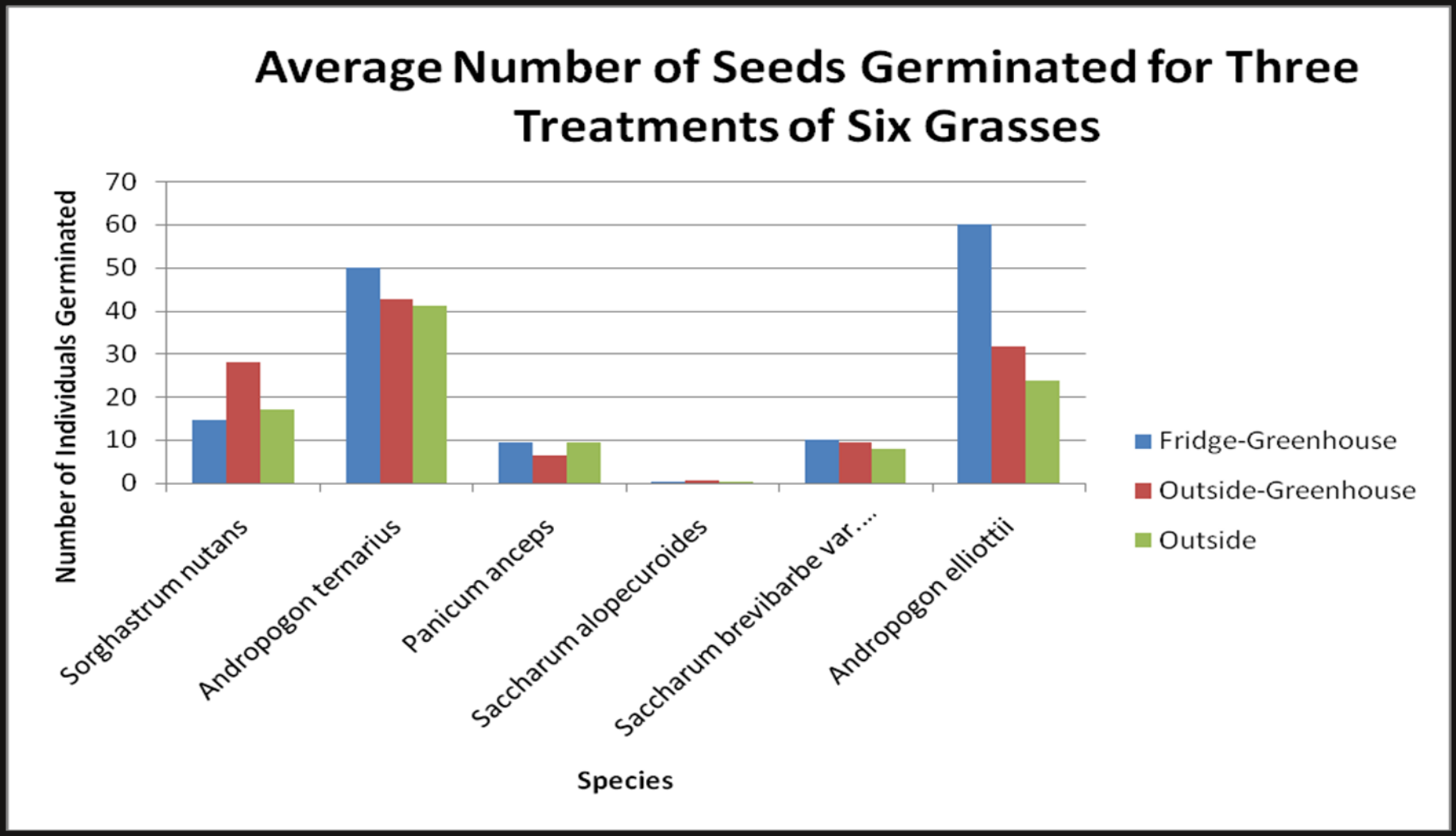
  - higher percent germination in more controlled environment

- Germination experiment
  - Treatment 1: artificial stratification →Greenhouse
  - Treatment 2: natural stratification→Greenhouse
  - Treatment 3: natural stratification and left outside

5 seeds per plug, 38 plugs per tray, four trays per treatment

Results

- Germination Treatments: no statistical significance among treatments



Plot Sampling

- Three transects, 10 plots each
  - Evenly spaced transects along length of field
  - Randomly selected plots based on distance from road
- Recorded presence/absence of all species found in the plots
- Monitoring (2003 and 2009)

Plot sampling - 2003

Results

- Percent of Plots Occupied by Species (only those occurring in >10%)

2003

Species	Percent
Festuca arundinacea	100
Lespedeza cuneata	73
Rubus flagellaris	40
Dichanthelium scoparium	37
Oxalis dillenii	37
Veronica arvensis	37
Lonicera japonica	30
Toxicodendron radicans	30
Cerastium glomeratum	27
Allium vineale	20
Krigia dandelion	20
Plantago virginica	20
Apocynum cannabinum	17
Geranium carolinianum	17
Dichanthelium sp.	13

2009

Species	Percent
Dichanthelium scoparium	93
Short Juncus	50
Barbarea verna	33
Onion	33
Plantago virginica	33
Pseudognaphalium obtusifolium	33
Festuca arundinacea	30
Houstonia pusilla	27
Oenothera sp.	20
Oxalis dillenii	20
Skinny white mustard	20
Fine grass	17
Cerastium	17
Geranium	17
Panicum dichotomiflorum	17
Ranunculus parviflorus	13
Shiny rhizomatous	13

Spring, 2009

Spring, 2009

June, 2009

July, 2009

The Myths of Restoration Ecology

Hilderbrand, Watts, and Randle 2005 **Ecology and Society** 10(1)

- Field of Dreams – Sole focus on physico-chemical conditions
- Fast Forward – Succession and ecosystem development can be accelerated
- Carbon Copy – Community assembly predictable; a single endpoint exists
- Command and Control – Nature is controllable; Treating symptoms will fix the problem
- Cookbook – Methodology overused and not sufficiently validated (e.g., it worked there – it should work here….)

Conclusions

- Immediate Changes:
  - Significant reduction in coverage of Fescue and Lespedeza
  - Significant increase in coverage of *Dichanthelium scoparium*
  - Increase in winter annuals, disturbance related species
  - Some invasive plants that came up last summer and disappeared – *Cyperus iria* and *Microstegium viminium*

Conclusions, cont.

- Things to look forward to:
  - More plantings – e.g. *Lobelia, Vernonia, Asclepias, Liatris, Oenothera, et al.*
  - Field monitoring over time (transect data)
  - Plot monitoring (survivorship data)
  - Fire management
  - Wildlife inventory

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