Hurricane impacts on the herbaceous and woody ground layer vegetation in a mature coastal plain forest

College of William and Mary REU Summer 2004
Jennifer Toy (Whitman College, Walla Walla, Washington)
Mentor: Dr. Stewart Ware
Hurricane Isabel
- category 2
- hit September 18, 2003
- heavy rains and high winds

College Woods
- previously undisturbed
- 150 years old
- prime example of post-cultivation succession
Microburst:

Highly Damaged Area

A small downburst of wind that spins off from a hurricane at speeds of 150 knots or 172.6 mph
Purposes

- To investigate what happens to the ground layer vegetation in a mature coastal plain forest after a hurricane creates openings in the canopy.
- To determine how different any changes are in herbaceous and woody ground layer vegetation in two areas with different degrees of hurricane damage.
- To establish permanent sampling sites in the College Woods for future herbaceous vegetation research.
• 40 sites, 5 east-west transects
  - 20 sites in microburst area
  - 20 sites in less disturbed
Methods:

The Breakdown

- 40 sites, 5 E-W transects
- each **site** has three **plots**
- each **plot** is 1 $m^2$
Methods: Sampling Technique

For each species present:

• Number
• Percent Cover
• Re-growth
• (Deer damage)
*Comparison of Microburst and Less Disturbed Plots*

<table>
<thead>
<tr>
<th></th>
<th>Microburst Plots</th>
<th>Less Disturbed Plots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Individuals</td>
<td>3424</td>
<td>927</td>
</tr>
<tr>
<td>Total Number of Species</td>
<td>53</td>
<td>37</td>
</tr>
</tbody>
</table>

**53 – 37 = potentially 16 ‘invasive’ species**
Number of Individuals in Microburst vs. Number of Individuals in the Less Disturbed Area (Informative Species)

- **Erechtites hieracifolia**: 129 in Microburst, 4 in Less Disturbed
- **Erigeron canadensis**: 53 in Microburst, 16 in Less Disturbed
- **Eupatorium capillifolium**: 27 in Microburst, 4 in Less Disturbed
- **Galium**: 16 in Microburst, 10 in Less Disturbed
- **Gnaphalium**: 68 in Microburst, 4 in Less Disturbed
- **Pau locals tomentosa**: 10 in Microburst, 4 in Less Disturbed
- **Phytolacca americana**: 10 in Microburst, 4 in Less Disturbed
- **Rhus glabra**: 4 in Microburst, 4 in Less Disturbed
2,592 tulip trees later...

Liriodendron tulipifera

- # in microburst: 2,285
- # in less disturbed: 307
- # in sites 23, 24: 179
- # in less disturbed minus # in sites 23, 24: 128
Erechtites and pokeweed

Number of Erechtites and Pokeweed in Microburst vs. in Less Disturbed Area

- **Erechtites hieracifolia (fireweed)**: 129 individuals in Microburst, 0 in Less Disturbed.
- **Phytolacca americana (pokeweed)**: 68 individuals in Microburst, 0 in Less Disturbed.

Species Name

- Erechtites hieracifolia (fireweed)
- Phytolacca americana (pokeweed)
Regrowth in Quercus alba

- Total individuals in microburst: 123
- Total individuals experiencing regrowth in microburst: 71
- Total individuals in less disturbed: 86
- Total individuals experiencing regrowth in less disturbed: 0
In summary...

- In response to openings in the canopy:

  1. Potentially 16 species are ‘invaders’
     - changes in composition may lead to different rates and patterns of succession

  2. Established species continue to grow
     - i.e. *Q. alba*

  3. No signs of mortality yet
Additional Thoughts and Questions

- Different rates and patterns of succession may lead to changes in forest structure.
- How will deer damage affect competition between and among ground layer vegetation species?
- Would a mature coastal plain forest respond to a clear cut or man made disturbance in similar ways?
- How will hurricane damage to vegetation affect soil minerals, runoff, and water quality of Lake Matoaka?
Thank you…

...to my mentor, Dr. Ware, for sharing his vast knowledge of forest ecology and amazing enthusiasm for plants and trees.

...to Dr. Chambers for his pep talks.

...Tim Russell for his GIS expertise.

...to Team Plant members Jeremy Wacksman and Kristin Pederson for their help in the field and moral support.