Factors affecting health, reproduction and distribution of the endangered *Magnolia macrophylla var. ashei*
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Thanks to Short-term Employees & Volunteers for help with field work!
M. macrophylla distribution in SE USA

Scattered disjunct populations in Florida are var. ashei

Var. dealbata is in México

Courtesy of Richard Figlar
Distribution of Section Macrophylla: Macrophylla = light brown; Ashei = green; Nuevoleonensis = yellow; Rzedowskiana = light grey; Vovidesii = blue; Dealbata = red  (Courtesy José Antonio Vázquez-Garcia)
Magnoliaceae: Section Macrophylla includes varieties (syn. Species) *macrophylla, ashei* and *dealbata*

<table>
<thead>
<tr>
<th><strong>M. macrophylla</strong></th>
<th><strong>M. macrophylla var. ashei</strong></th>
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<tbody>
<tr>
<td>Mesic woods of the southeastern USA</td>
<td>Restricted to ravines and slopes in the coastal plain of north Florida, USA</td>
</tr>
<tr>
<td>Typically one trunk up to 20 m</td>
<td>One to several stems up to 12 m</td>
</tr>
<tr>
<td>Fruits 5-10 cm</td>
<td>Fruits 2.5-5 cm</td>
</tr>
<tr>
<td>Co-dominant in forest canopy</td>
<td>Understory plant</td>
</tr>
<tr>
<td>Flowers at 15 years</td>
<td>Flowers as early as 3-5 years</td>
</tr>
<tr>
<td></td>
<td>Generally all plant parts are smaller in size</td>
</tr>
</tbody>
</table>
Magnoliaceae: Section Macrophylla

M. macrophylla

M. macrophylla var. ashei
Macrophylla
Leaves 25-100 cm

Ashei
Leaves 25-60 cm

Courtesy of Richard Figlar
Magnolia macrophylla var. ashei

**Status:**
- Florida: Endangered
- USA: Management Concern
- NatureServe: G2 (imperiled due to rarity)
- Red List: Vulnerable (IUCN 3.1)

**Threats:**
- Limited range/habitat
- Habitat loss due to human disturbance and erosion
- Reports of low seedling recruitment
Factors affecting health, reproduction and distribution of the endangered *Magnolia macrophylla var. ashei*

- Few or inefficient pollinators
- Excessive fruit/seed damage from insect pests
- Inadequate seed dispersal mechanisms
- Excessive plant injury from white-tailed deer (*Odocoileus virginianus*) followed by opportunistic pathogens
Pine plantings on higher elevations outline ravines.
Ravines 10 – 100 m deep
Sites of Research: Two Ravines

= 2015 census

*M. macrophylla*
var. *ashei* plants

in 2 ravines

176 trees

594 trees
Reproductive Studies

- Flower phenology
  - Time-lapse camera
- Census of flowering trees, flowers and fruits
- Pollinator ID
  - False tepal traps
- Effects of seed predation
  - Screen exclusion cages
Reproductive Studies: Census of flowering and fruiting

- 112 trees with flower buds were identified at two sites
  - Number of stems
  - Height
  - Stem diameter
  - Number of flowers
○ = Subsample of trees with flower buds
○ = Trees not used
Reproductive Studies: Census of flowering and fruiting

Trees with Flower Buds (n=112)

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Number of stems per tree</td>
<td>3.68</td>
</tr>
<tr>
<td>Height (m)</td>
<td>4.50</td>
</tr>
<tr>
<td>Basal stem diameter (cm)</td>
<td>5.06</td>
</tr>
</tbody>
</table>
Reproductive Studies: Census of flowering and fruiting

<table>
<thead>
<tr>
<th>Trees with Flower Buds (n=112)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of flowers</td>
</tr>
<tr>
<td>Flowers per tree</td>
</tr>
<tr>
<td>Trees that produced fruit (number (%))</td>
</tr>
<tr>
<td>Total fruits</td>
</tr>
<tr>
<td>Fruits per tree</td>
</tr>
<tr>
<td>Fruits per flower</td>
</tr>
</tbody>
</table>
Reproductive Studies: False tepal traps

- White Coroplast™, 2 mm × 3 cm × 15 cm
- Painted with tangle-trap sticky coating
- One trap consisted of three wired to stem below
  - Floral shoot
  - Vegetative shoot
- Insects lured to false tepal will be trapped
Vegetative bud/shoot
Reproductive Studies: False tepal traps

- 112 false tepal traps placed on 21 trees over 6 weeks
  - 56 on floral shoots
  - 56 on vegetative shoots
- Each trap left on shoot for one week then collected and stored
  - Tepal traps replaced each week until flowering ceased
- 1 April – 10 May 2016
- Insect counting and identification on-going
COLLECTED 4/6 - 4/12/16

T1F1  T2V3  T2F3  2V3  2F3
T1F2  T3V1  T3F1  3V1  3F1
T1F3  1V1   1F1   3V2  3F2
120   2V1  2F1   3V3  3F3
COLLECTION #4  4/19 → 4/26/16

T1F1
T1F2
T1V1
T1V2
T3
T3V2
F2
### Reproductive Studies: False tepal trap results (Nov. 2016)

<table>
<thead>
<tr>
<th>Insects Captured</th>
<th>Traps on Floral Shoots (#)</th>
<th>Traps on Vegetative Shoots (#)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total insects</td>
<td>4266</td>
<td>3243</td>
</tr>
<tr>
<td>Tumbling flower beetles (<em>Mordella melauna</em>)</td>
<td>763</td>
<td>121</td>
</tr>
<tr>
<td>Bees</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Cerambicids, scarabs and Lampyridae</td>
<td>13</td>
<td>3</td>
</tr>
</tbody>
</table>
Total number of insects captured on traps

1 Apr             6 Apr            12 Apr           19 Apr          26 Apr           3 May

Distribution of Capture

<table>
<thead>
<tr>
<th>F</th>
<th>16.31</th>
</tr>
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<tr>
<td>Prob &gt; F</td>
<td>&lt;.0001</td>
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Flowering

0 50 100 150 200 250

Total number of insects captured on traps

1 Apr  6 Apr  12 Apr  19 Apr  26 Apr  3 May

Flowering
Distribution of Mordellidae (Tumbling Flower Beetle)

Total number of Mordellidae captured on all traps

Flowering

1 Apr            6 Apr           12 Apr          19 Apr         26 Apr          3 May
Reproductive Studies: Effects of seed predation

- Leaf-footed bug, *Leptoglossus fulvicornis* (Coreidae)
- Native
- Often observed feeding on developing and mature fruits and seeds
- Enhances fruit abortion and believed to damage seed viability
- An exclusion cage was developed to prevent or reduce insect access
Reproductive Studies: Effects of seed predation

- Leaf-footed bug, *Leptoglossus fulvicornis* (Coreidae)
- 31 exclusion cages were installed over fruits about 1 month after fruit development was observed
- August: 31 Caged fruits were harvested along with 30 uncaged fruits paired on the same trees
## Reproductive Studies:
### Insect exclusion cage (Nov. 2016)

<table>
<thead>
<tr>
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<th>Caged fruits</th>
<th>Uncaged fruits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of seeds</td>
<td>950</td>
<td>661</td>
</tr>
<tr>
<td>Number of seeds per fruit</td>
<td>30.2</td>
<td>22.7</td>
</tr>
<tr>
<td>Seeds per fruit (g)</td>
<td>4.93</td>
<td>3.14</td>
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*Germination studies begin January 2017*
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