Enhancing Establishment of White Oak and American Hazelnut Enrichment Plants in a Mesic Forest Using Understory Removal and Group Selection

Kurt Dreisilker
Mesophication

Late 1920s 2010
Fire importance

Pre-1900
Fire suppression; canopy closure; increased shade

Mid-1900s
Dramatic increase of shade-tolerant, mesophytic trees

Early 2000s
Decreased flammability due to mesophytic litter and cool, humid microclimate

Foreseeable future

Mesophication

Nowacki and Abrams 2008
American hazelnut (*Corylus americana*)

- Once the most common understory shrub in northeastern Illinois → savanna, prairie, woodlands, forest openings
- Fire suppression → canopy closure → decreased light → loss of hazelnut
- Undergone population reduction by over 80% in late 20th century

Bowles & Spravka 1994
Management with Fire

Burned annually

Unburned
Management with Canopy Reductions

• Potential Silvicultural Methods:
  • Clearcutting
  • Shelterwood
  • Group selection
  • Single Tree Selection
Objective:
To determine the effects of various treatment factors on the survival and growth of underplanted white oak and American hazelnut transplants.
Mechanical removals:

- Understory Tree Removal (U)
- Group Selection (G)
- Group Selection + Understory Removal (G+U)
- Control (C)
Mechanical removals:

- Understory Tree Removal (U)
- **Group Selection (G)**
- Group Selection + Understory Removal (G+U)
- Control (C)
Mechanical removals:

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Mechanical removals:

- Understory Tree Removal (U)
- Group Selection (G)
- Group Selection + Understory Removal (G+U)
- Control (C)
Enrichment Planting
Questions:

• How well do transplanted white oaks and hazelnut shrubs respond, as indicated by mean annual twig elongation, to various factor combinations?

• What are the interactions among the factors that influence the growth of transplanted trees and shrubs?
Results
## Oak Twig Elongation Results

**Type 3 Tests of Fixed Effects for oak twig growth.**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Num</th>
<th>Den</th>
<th>F Value</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
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<td>11.9</td>
<td>1.64</td>
<td>0.2355</td>
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<tr>
<td>Location</td>
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<td>Treatment*Location</td>
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<td>Caged</td>
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<td>27.5</td>
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<td>Treatment*Caged</td>
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<td>27.5</td>
<td>1.21</td>
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</table>
# Oak Twig Elongation Results

<table>
<thead>
<tr>
<th>Contrast</th>
<th>Estimate</th>
<th>St. Error</th>
<th>P-value</th>
<th>Bonferroni-Adjusted P-Value</th>
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<tbody>
<tr>
<td>U+G vs U</td>
<td>5.4272</td>
<td>2.4557</td>
<td>0.0374</td>
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<tr>
<td>G vs U+G</td>
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Oak mean annual twig growth "In" and "Out" of treatments.
## Hazelnut Twig Elongation Results

### Type 3 ANOVA tests of fixed effects for hazelnut growth.

<table>
<thead>
<tr>
<th>Effect</th>
<th>DF</th>
<th>DF</th>
<th>F Value</th>
<th>Pr &gt; F</th>
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</thead>
<tbody>
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### Multiple Contrasts Comparing Treatments to Each Other and their Respective Controls

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Difference</th>
<th>Standard Error</th>
<th>P-Value</th>
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</table>

Multiple Contrasts Comparing Treatments to Each Other and their Respective Controls
Hazelnut mean annual twig growth of "In" and "Out" of treatments.
Implications for Practice

- Successful oak establishment and growth may be possible with intensive management in forest preserves being overtaken by understory-tolerant trees while minimizing negative visual impact.
Implications for Practice

- Oak and hazelnut regeneration can be enhanced in oak forests by using small, 250 m², group-selection openings together with understory removal and the use of planting stock ≥1.5 m in height or 2.5 cm caliper for oak and 18.9L container hazelnuts.
Implications for Practice

- Beyond the scope of this study, successful regeneration would require greater planting density and diversity together with countermeasures against transplant shock, deer damage, competition, insects and diseases.
Implications for Practice

• Controlled burns together with mechanical and chemical control of small diameter woody species, especially invasive plant species, are recommended prior to planting trees and shrubs in openings and after planted trees and shrubs are sufficiently grown to tolerate measures such as prescribed burns.
Implications for Practice

- The need for thinning to release planted trees and shrubs should be assessed beginning at least 10-years after enrichment planting.
Acknowledgments

• University of Illinois @ Urbana-Champaign
  – Jeffrey Dawson, PhD; Anton Endress, PhD; Donald Briskin, PhD
  – Andrew Koeser
  – Karen Claus, Piper Hodson, Renee Gracon

• The Morton Arboretum
  – Kris Bachtell, Vice President of Collections & Facilities
  – Research staff, especially Marlin Bowles, Bryant Scharenbroch, & Bob Fahey
  – Natural Resources staff - Matt Laizure, Tim Ross, Mark Hochsprung, Ted Mrozek
  – Arborist staff - Brian Malatia, Terry Guiney, and Ben Mills
  – Arboretum Horticulturists and Lawn Crew staff
  – Arboretum Volunteers

• The Grand Victoria Foundation