**Introduction**

Acorns are a staple of winter diets of many wildlife species. Acorn crop influences wildlife populations:
- white-tailed deer
- black bear
- ruffed grouse
- gray squirrels

Oaks are economically and ecologically important:
- 7th largest standing timber volume (3.2% of all volume)
- 10th most abundant tree species (1.9% of all trees)

Oak masting is variable:
- Among species (Erythrobalanus vs. Leucobalanus)
- Year to year (masting cycles and weather)
- Site to site (topography and stand conditions)
- Tree to tree (genetics, size, and age)
Introduction
Previous literature has focused on red oaks
Thinning may increase mast production in red oaks
Fertilizing oaks is often suggested in popular literature, but has not been tested
White oaks are the most common oak in the eastern US
Commonly believed that white oak acorns are preferred by some species of wildlife

Objectives
Determine baseline acorn production potential of individual white oaks
Determine the effects of fertilization and thinning on white oak acorn production

Study site
Chuck Swan SF and WMA
30 km N of Knoxville
Elevation: 310 – 520 m
24,444 acres; 92% forested
Mixed hardwoods
130 cm annual rainfall
Well drained, acidic soils
Data collection

120 white oaks
• dominant / codominant
• DBH 12.7 – 32.2 inches

Three, 1 m² baskets per tree
Acorns collected biweekly
• Sept – Nov
DBH and crowns measured

Data collection

Acorn soundness estimated by float-testing
Marked acorns returned to monitor depredation in baskets
Up to 50 acorns from each tree dried and weighed to estimate biomass in 2008

Data analysis

Production classes (modified from Healy et al. 1999)
Based on mean acorn production / m²
• Excellent: ≥ 2x the mean acorns / m²
• Good: < 2x but > mean acorns / m²
• Moderate: < mean but ≥60% mean acorns / m²
• Poor: < 60% mean acorns / m²
Annual variability

White oak mast crop variability, Chuck Swan SF, 2006-2010

Production classes

Proportion of white oaks by production class, Chuck Swan SF, 2006-2010

Production classes

Proportion of white oaks by production class, Chuck Swan SF, 2006-2010
**Production classes**

Proportion of acorns produced by production class, Chuck Swan SF, 2006-2010

- Excellent: 35%
- Good: 40%
- Moderate: 14%
- Poor: 11%

Production classes

Production Characteristics, Chuck Swan SF, 2006 – 2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Poor Trees</th>
<th>Poor Trees: % of acorns</th>
<th>Excellent Trees</th>
<th>Excellent Trees: % of acorns</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>78%</td>
<td>20%</td>
<td>11%</td>
<td>62%</td>
</tr>
<tr>
<td>2007</td>
<td>69%</td>
<td>6%</td>
<td>13%</td>
<td>81%</td>
</tr>
<tr>
<td>2008</td>
<td>50%</td>
<td>18%</td>
<td>14%</td>
<td>36%</td>
</tr>
<tr>
<td>2009</td>
<td>67%</td>
<td>17%</td>
<td>14%</td>
<td>53%</td>
</tr>
<tr>
<td>2010</td>
<td>47%</td>
<td>11%</td>
<td>18%</td>
<td>55%</td>
</tr>
</tbody>
</table>

**Identifying strong producers**

Relationship between DBH and Acorns / m², Chuck Swan SF, 2008 & 2010

- DBH (cm): 10, 15, 20, 25, 30, 35
- Acorns: 0, 50, 100, 150, 200, 250, 300, 350, 400

R² = 0.018115
Identifying strong producers

<table>
<thead>
<tr>
<th>Trees per production class</th>
<th>% Correct strong years</th>
<th>% Correct poor years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>14</td>
<td>75%</td>
</tr>
<tr>
<td>Good</td>
<td>35</td>
<td>36%</td>
</tr>
<tr>
<td>Moderate</td>
<td>22</td>
<td>50%</td>
</tr>
<tr>
<td>Poor</td>
<td>49</td>
<td>87%</td>
</tr>
<tr>
<td>Overall</td>
<td>64%</td>
<td>32%</td>
</tr>
</tbody>
</table>

*7 out of 14 excellent producers misidentified as poor producers

Discussion

Acorn production is highly variable
In good years, more trees set acorns, and more acorns are produced
Annual crop is influenced by external factors, but production potential is inherent
Physical traits are poor predictors of masting potential

Discussion

Few trees produce most of the acorns
Poor producers may constitute most of a stand
In order to identify strong producers, mast production should be monitored during good mast years
Management Implications
To increase mast production monitor individuals first

When thinning for wildlife:
- remove spp. with low wildlife value first
- then poor producers

Retain strong producers and a diversity of spp.

Management Implications
Monitoring Options:
- fall surveys for acorns
- spring surveys for seedlings

Acknowledgements
Project Team: Dr. Craig Harper, Michael McCord, Seth Basinger, Ashley Unger
Logistics: Neal White, Brook Smith, Theresa Harper
Our many wonderful volunteers!
References


Questions?