Seed Conditioning of Understory Forbs in the Longleaf Pine Ecosystem

Jill Barbour, jbarbour@fs.fed.us
Jeff Glitzenstein, jeffglitz@aol.com

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Ground Layer Plants Project

- Partner with US Fish & Wildlife (Jim Bates)
- ground layer plants
- Alabama, Georgia, South Carolina
- Seed collection (2005, 2006)
- Seed cleaning (2006, 2007)
- Laboratory and nursery germination
- Nursery propagation
- Outplanting
26 Genera of Forbs

- Ageratina
- Amsonia
- Aster
- Baptisia
- Chamaecrista
- Chrysopsis
- Coreopsis
- Desmodium
- Erythrina
- Eupatorium
- Galactia
- Helianthus
- Heliopsis
- Lespedeza
- Liatris
- Manfreda
- Melanthera
- Mimosa
- Pityopsis
- Polygononella
- Silphium
- Solidago
- Tephrosia
- Tetragonotheca
- Vernonia
- Uniola
Flow chart of seed conditioning

First step
- Remove seed from in fluorescent with brush machine

Second step
- Aspirate
- Or
- Use blowers

Third step
- Remove sticks with screens or indent cylinder

Fourth step
- Remove lighter weight material with blowers or specific gravity table

Fifth step
- Hand pick out debris for small lots

Sixth step
- Prepare sample for seed testing and storage
Brush machine to extract seed from fruits
Conditioning Equipment

Brush machine  Screens  Aspirator

Indent cylinder  Scarifier  Stultz  General Blower
Coreopsis major, tickseed

Seed coming out chute

Gravity table   Germination

Upper                32%
Lower                12%
After cleaning    27%

Aspirating seed
**Eupatorium album**, white thoroughwort

<table>
<thead>
<tr>
<th>Treatment</th>
<th>(Echaw Rd.)</th>
<th>% Germ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom, bottom Stultz</td>
<td></td>
<td>16.0</td>
</tr>
<tr>
<td>Chute, top Stultz</td>
<td></td>
<td>24.0</td>
</tr>
<tr>
<td>Chute, indent 12/64”</td>
<td></td>
<td>23.0</td>
</tr>
<tr>
<td>Hand clean</td>
<td></td>
<td>33.0</td>
</tr>
</tbody>
</table>

21 day count on machine cleaning
Helianthus atrorubens, purpledisk sunflower

No clean: 7.0%
Chute end: 17.0%
Bottom: 48.0%

16 day count on machine cleaning
**Polygonella americana**, southern jointweed

- **Tetrazolium**: 55.0%
- **Germination**: 2.0%
- **Nursery**: 0.0%
**Vernonia angustifolia, tall ironweed**

<table>
<thead>
<tr>
<th>Location</th>
<th>unstrat</th>
<th>strat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Echaw</td>
<td>1.5%</td>
<td>20.5%</td>
</tr>
<tr>
<td>FMNF 11/1/06</td>
<td>9.0%</td>
<td>29.5%</td>
</tr>
<tr>
<td>FMNF 11/29/06</td>
<td>15.0%</td>
<td>26.0%</td>
</tr>
<tr>
<td>FMNF (Brush, Stultz)</td>
<td></td>
<td>78.5%</td>
</tr>
</tbody>
</table>
Erythrina herbacea, coral bean

Forsberg 100%
Forsberg (clip) 93%
Brush 1st run 78%
Brush 2nd (unnicked) 96%
Brush 2nd (nicked) 97%
Lespedeza capitata

<table>
<thead>
<tr>
<th>Type</th>
<th>% Dormant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covered</td>
<td>14%</td>
</tr>
<tr>
<td>Green</td>
<td>44%</td>
</tr>
<tr>
<td>Brown</td>
<td>32%</td>
</tr>
</tbody>
</table>
**Lespedeza hirta**, hairy lespedeza

<table>
<thead>
<tr>
<th>Type</th>
<th>%</th>
<th>Dormant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown, sunk</td>
<td>39</td>
<td>60</td>
</tr>
<tr>
<td>Brown, float</td>
<td>26</td>
<td>19</td>
</tr>
<tr>
<td>Green, sunk</td>
<td>20</td>
<td>32</td>
</tr>
<tr>
<td>Green, float</td>
<td>33</td>
<td>0</td>
</tr>
</tbody>
</table>
Tephrosia virginiana, Goat’s Rue

Hand cleaned     54%
Forsberg         55%
Brush machine    65%
Tetragonotheca helianthoides

Tetrazolium: 88.0%
Germination:
- Unstratified: 0.0%
- Stratified: 0.0%
Nursery: 0.0%
### Uniola paniculata, sea oats

<table>
<thead>
<tr>
<th>Mantle</th>
<th>Brushes</th>
<th>% Germination</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 square wire</td>
<td>medium</td>
<td>1.27</td>
</tr>
<tr>
<td>16 square wire</td>
<td>soft</td>
<td>19.0</td>
</tr>
<tr>
<td>16 light wire</td>
<td>medium</td>
<td>17.0 bottom</td>
</tr>
<tr>
<td>16 light wire</td>
<td>medium</td>
<td>32.0 chute end</td>
</tr>
</tbody>
</table>
Ground layer plant nursery germination
## Nursery and Laboratory Germination Results

<table>
<thead>
<tr>
<th>Species</th>
<th>Nursery % germ</th>
<th>Lab % germ</th>
<th>Comments</th>
<th>Comments 2005 seed collections</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Aster linariifolius</em></td>
<td>41</td>
<td>30</td>
<td>2007</td>
<td></td>
</tr>
<tr>
<td><em>Baptisia lanceolata</em></td>
<td>2</td>
<td>6</td>
<td>Brown Green</td>
<td>61% dormant 73% dormant</td>
</tr>
<tr>
<td><em>Chrysopsis gossypina</em></td>
<td>1</td>
<td>23</td>
<td>40% after cleaning</td>
<td></td>
</tr>
<tr>
<td><em>Chrysopsis mariana</em></td>
<td>74</td>
<td>59</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Coreopsis major</em></td>
<td>9</td>
<td>32 upper</td>
<td>12% lower 27% after cleaning</td>
<td></td>
</tr>
<tr>
<td><em>Desmodium spp.</em></td>
<td>12</td>
<td>33</td>
<td>Brown Green</td>
<td></td>
</tr>
<tr>
<td><em>Eupatorium album Echaw Rd.</em></td>
<td>0</td>
<td>4</td>
<td>40% dormant 19% cleaned</td>
<td>18 day count</td>
</tr>
<tr>
<td><em>Helianthus atrobuens</em></td>
<td>32</td>
<td>7</td>
<td>2007</td>
<td></td>
</tr>
<tr>
<td><em>Liatris graminifolia</em></td>
<td>14</td>
<td>54</td>
<td>2007</td>
<td></td>
</tr>
<tr>
<td><em>Liatris secunda</em></td>
<td>3</td>
<td>62</td>
<td>Before cleaning 17% after cleaning</td>
<td></td>
</tr>
<tr>
<td><em>Mimosa quadrivalvis</em></td>
<td>23</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Tephrosia virginiana</em></td>
<td>28</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Vernonia angustifolia</em></td>
<td>2</td>
<td>4</td>
<td>After cleaning</td>
<td></td>
</tr>
</tbody>
</table>
Lab and Nursery Germination 2006

As Baptisia Chrysopsis Coreopsis Desmodium Eupatorium Helianthus Liatris before Liatris after Mimosa Pityopsis Tephrosia Vernonia

% Germination

Nursery germ
Lab germ
Percentage of Filled Cells in Nursery (2007 seed)

Species

- Agerteria
- Aster concolor
- A. linariifolius
- A. tortifolius
- Chrysopsis
- Coreopsis
- Eupatorium
- Helianthus
- Heliopsis
- Liatris elegans
- L. graminifolia
- L. squarrosa
- Pityopsis
- Solidago
- Vermonia

Percentage of Filled Cells:

- 89
- 91.1
- 99
- 95
- 24.7
- 99
- 99
- 29.3
- 49.3
- 8.4
- 2.2
- 10.2
- 95
- 90
- 99
- 99
- 95
- 30
Conclusions

- Use a softer mantle in brush machine for *Liatris* and other species
- *Asteraceae* family difficult to clean - brush machine creates much debris
- Legumes clean easily in brush machine and Forsberg scarifier
- *Vernonia angustifolia* seed benefits from prechilling
- Insect predation detrimental to germination (2007 seed better than 2006)
- Expensive to obtain purity over 90%
- Grasses easy to clean with brush machine
Future of project

- Collect more seed but from fewer plants
- Fine tune the conditioning process
- Determine prechilling and germination temperatures
- Need storage information
- Monitor nursery propagation
- Monitor seedlings in the field
- Create seed production areas
- Publish results, create seed cleaning manual