Planting and Seeding
Artificial Regeneration

Sources of Reproduction

• Natural
  1. Seed
  2. Sprouts (stump and root)
  3. Advance Reproduction

• Artificial
  1. Planting
  2. Direct Seeding

Components of a Planting Program

• Species vs. Site Selection
  Matching the Species to the Site

Factors
  Costs of establishment (site prep)
  Losses to Insects & Disease
  Rate of growth (seedling spacing?)
  Usefulness & Value of the product
Components of a Planting Program

- Do we replant with same species?
- Exotic Species? Natural Range? Adapted?
- Genetics
  Phenotype vs Genotype
  Elite Trees vs Plus Trees
  Dr. Schlarbaum

**General Rule:** Use species that are already common to the site

Seeds --- Material Covered in Another Course

- Seed Source
- Seed Collection
- Seed Extraction
- Seed Storage
- Seed Germination and Dormancy
- Seed Testing
- Nursery Operations
- Treatment and care after lifting and during planting

PLANTING

- Why Plant?

  **Factors**
  a. Age and size (headstart)
  b. Influence spacing
  c. Influence species composition
Spacing Considerations

- Product Desired
- Site Productivity
- Cultural Operations
- Species Characteristics
- Other Factors
  - Insects and Disease
    - Timing
    - Income vs Costs

Spacing Study
Loblolly Pine — Switzer — Age 19 — SI = 90

<table>
<thead>
<tr>
<th>Spacing (ft)</th>
<th>Total Volume $ft^3/A$</th>
<th>Avg. Ht. (ft)</th>
<th>Avg. DBH (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 x 5</td>
<td>4750</td>
<td>59</td>
<td>6.4</td>
</tr>
<tr>
<td>6 x 6</td>
<td>4830</td>
<td>60</td>
<td>7.0</td>
</tr>
<tr>
<td>7 x 8</td>
<td>4830</td>
<td>62</td>
<td>7.8</td>
</tr>
<tr>
<td>9 x 10</td>
<td>4460</td>
<td>63</td>
<td>9.2</td>
</tr>
</tbody>
</table>

Spacing Study
Loblolly Pine — Switzer — Age 15 — SI = 75

Merchantable Volume

<table>
<thead>
<tr>
<th>Spacing (ft)</th>
<th>Total Volume $ft^3/A$</th>
<th>Merch. Volume $ft^3/A$</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 x 6</td>
<td>2940</td>
<td>2484 (84%)</td>
</tr>
<tr>
<td>8 x 8</td>
<td>2971</td>
<td>2767 (93%)</td>
</tr>
<tr>
<td>10 x 10</td>
<td>2584</td>
<td>2392 (92%)</td>
</tr>
<tr>
<td>12 x 12</td>
<td>2325</td>
<td>2110 (91%)</td>
</tr>
</tbody>
</table>
Spacing Comments

• **Product Objectives** ---- closer vs wider spacing ---- tree form
• **Utilization of the site**
• **Maximum volume vs economic returns**
• **Cost of planting**
• **Wider spacing and merchantability**

• **Economic Yield vs. Density vs. Total Yield vs. Return** - Ultimately goes back to Landowner Objectives, Products Desired and Rate of Return

Spacing Comments

• **Role of Thinnings**
  
  Crown Closure ---- growth & timing
  
  Carrying Capacity of Site

Thus choice of **spacing** is difficult, especially considering we do not know markets 20+ years in advance

Considerations with Planting

• **Season of Planting**
• **Site Prep**
• **Methods of Planting**
• **Survival and Early Growth**
• **Protection of New Plantations**
  
  fire, rodents, deer, insects

  ---- questionable to interplant after initial planting
Considerations with Planting

- **Planting Priority** --- different sites/stands/conditions
- **Use of Container Stock**
  - Advantages
  - Disadvantages
- **Planting Hardwoods**
  - More Site Specific & Site Demanding
  - Not Plastic like Pine
  - Lack of Uniformity, wide genetic variation

---

**Planting**

**Advantages**

- Control of Composition and Genetic Makeup
- Control over Stand Density and Arrangement
- Shorter Establishment Period
- Reduce Risk in losing Seed Trees & other larger material

---

**Planting**

**Advantages**

- Avoids Danger and Risk in using Seed
- Fewer Restrictions on Harvesting Techniques
- Fewer Restrictions on Methods for Site Prep
- Better Access for fire equipment and other operations
- Large potential gains and volume increases
Planting

Disadvantages

- High Cost of Establishment
- Danger of Planting Wrong Species or Strain for the Site
- Poorer Root Systems – Did not develop on site
- High Visual Impact
- Intensive Site Prep – Influence on Soil Properties & Site Productivity – Be Careful

Direct Seeding

Artificial Regeneration Technique

Cost of establishment is less than a planted seedling, however likelihood of success is also less

WHY?

Advantages

- Less Costly than Seedlings
- Less Labor & Equipment
- Large Areas can be Regenerated Faster
- Can be Done on more Adverse Sites
- Conducted over Longer Time Periods
- More Flexibility
- More Natural Root System
Direct Seeding
Artificial Regeneration Technique

Disadvantages

• More Risk of Failure
• Less Control over Spacing and Density
  Overstocking and Understocking
• Wasteful use of Improved Seed
• Usually Longer Rotations
• Harsh Environmental Conditions

Direct Seeding

• Site Suitability
• Species Used
• Seed Characteristics
  Dormancy and Stratification
  Seed Repellents
• Site Prep Required ——— Fire
• Sowing Rate ——— depends on
  Seed Viability
  Germination Rate
  Projected Survival

Direct Seeding

• Methods of Sowing
  Ground ——— Cyclone seeder
  Tractor-Mounted Broadcast
  Helicopter or fixed wing aircraft
  Spot & Row Seeding from the ground

• Rate of Sowing
  Loblolly Pine ——— 0.5 to 1.0 lb of seed is about 15,000 seed/acre and under average conditions will result in 2000 to 5000 seedlings/acre
Direct Seeding

• Rate of Sowing
  Seeding oak acorns using a planter ---- 3000 acorns/acre ---- sown 3 x 10 with 2 acorns/spot, expecting 800 or so seedlings/acre

Question about oak development in pure stands vs. mixed stands ---- stratified species development

Direct Seeding

• Summary
  1. Assess Risk
  2. Lower cost, but unknown results
  3. Use of Improved Seed? Geographic source of seed?
  4. Usually to revegetate sites that cannot be planted
  5. Success rate is not high, but can revegetate large disturbances quickly
  6. Best for inaccessible areas (steep slopes)