Modeling juvenile aspen-spruce dynamics: Preliminary results from the Dynamic Aspen Density Experiment

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What type of Stand should I regenerate?
Regeneration Decision: Pure Deciduous
Regeneration Decision: Mixed Conifer-Deciduous
Regeneration Decision Considerations

Management objectives

- Fiber requirements
- FMP assumptions
  - Post-harvest transition rules
Regeneration Decision Considerations

Management objectives

Regulatory requirements

- Landbase designations (Con vs Dec)
- Regeneration strata balancing
- Regeneration standards – MAI targets
Regeneration Decision Considerations

Management objectives

Regulatory requirements

Economics

- Commitments to management intensity
- Cost of ‘pushing-the-site’
Regeneration Decision Considerations

Management objectives
Regulatory requirements
Economics

Biological limitations

- Site productivity vs MAI targets
- Site specific regeneration challenges
  - Cold wet soils
  - Moisture deficits
  - Competition potential
Regeneration Decision Considerations

- Management objectives
- Regulatory requirements
- Economics
- Biological limitations

**Operational restrictions**
- Planting stock availability
- Site prep
- Competition control
How can we make the regeneration decision?

We need a quantitative understanding of how juvenile aspen and spruce grow, in mixtures, and in pure stands.
DADE Project Objectives

Identify thresholds in aspen density that determine Stand Condition (symbiotic, commensal, competitive) during each of 2 post-Performance Stand Development Stages.

Determine spruce Survival and Growth in different Stand Conditions during each of 2 post-Performance Stand Development Stages.

Determine opportunity cost to aspen production of optimizing spruce Survival and Growth.
DADE Project Objectives

Provide post-Performance targets to serve as basis for developing silviculture treatment regimes ('Crop Plans') in mixedwoods

Provide credible early rotation data with which to calibrate growth models for mixtures of aspen and spruce
Experimental Design: Sampling Frame

2 Stand Development Stages (Ages)
17 years
22 years

7 stands in each combination
2 × 7 = 14 stands chosen
**Experimental Design: Aspen Target Densities**

<table>
<thead>
<tr>
<th>Years</th>
<th>17 Years</th>
<th>22 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 Aw/ha</td>
<td>0 Aw/ha</td>
</tr>
<tr>
<td></td>
<td>1,000 Aw/ha</td>
<td>1,000 Aw/ha</td>
</tr>
<tr>
<td></td>
<td>2,500 Aw/ha</td>
<td>2,500 Aw/ha</td>
</tr>
<tr>
<td></td>
<td>5,000 Aw/ha</td>
<td>5,000 Aw/ha</td>
</tr>
<tr>
<td></td>
<td>Natural (&gt; 10,000)</td>
<td>Natural (&gt; 10,000)</td>
</tr>
</tbody>
</table>
Experimental Design: Number of PSP’s

Number of Treatment Units

- 5 Treatments Units / Stand
- 7 Stands per Stand Development Stage
- $5 \times 7 \times 2 = 70$ Treatment Units
- 1 PSP per Treatment Unit = 70 PSP’s
DADE Project Methods

Block Layout:

• 50 m X 50 m Treatment Units (5 / block)

• modal sites

• > 10K Aw/ha pre-treatment

• > 1,000 Sw/ha pre-treatment

• 20 m X 20 m PSP in of each Treatment Unit
DADE Project Methods

Block Layout:

- **0 Aw/ha**
  - 50 X 50

- **1000 Aw/ha**

- **2500 Aw/ha**

- **5000 Aw/ha**

- **> 10,000 Aw/ha**
DADE Project Methods

Pre-Treatment Measurements
Thinning Procedures
DADE Project Methods

Progress to Date

4 installations established in 2007, all in Central Mixedwood

- 2 in 17 year-old (Touchwood Lake, Calling Lake)
- 2 in 22 year-old (AlPac 1000 Road, Calling Lake)
DADE Project Methods

Progress to Date

4 installations established in 2007, all in Central Mixedwood
- 2 in 17 year-old (Touchwood Lake, Calling Lake)
- 2 in 22 year-old (AlPac 1000 Road, Calling Lake)

5 installations established in 2008, all in Central Mixedwood
- 2 in 22 year-old (AlPac 1000 Road, Calling Lake)
- 2 in 22 year-old (Peace River, South Harmon Valley)
- 1 in 22 year-old (Peace River, Kimiwan Lake)
Progress to Date

5 installations established in 2009, all in Central Mixedwood
All at Sinkhole Lake, Weyco FMA near Drayton Valley
All in 17 year-old stands
DADE Project Methods

Progress to Date

In 2010, three-year measurements completed for all 2007 installations

3 installations destroyed by herbicide application in 2010 (AlPac 1000 Road, 22-year old)

In 2011, three-year measurements completed for all 2008 installations (Peace River, three 22-year old)
DADE Project Methods

Progress to Date

In 2012, three-year measurements will be completed for all 2009 installations (Sinkhole Lake, five 17-year old)
DADE Project Results

Top Height

![Graphs showing top height over stand age for different treatments and installations.](image_url)
DADE Project Results

Density, Aw > 9,000 / ha
DADE Project Results

Density, Aw < 9,000 / ha
DADE Project Results

Basal Area

![Graphs showing Basal Area over Stand Age](image-url)
DADE Project Results

Volume

INSTALLATION - CM - 17 - 02 TREATMENT - 2500

GYPSY PROJECTION, LOCATION = C Road Mattini

AW (red) - SI_AW = 22, SW (blue) - SI_SW = 20

INSTALLATION - CM - 17 - 02 TREATMENT - 2500

MGM PROJECTION, LOCATION = C Road Mattini

AW (red) - SI_AW = 22, SW (blue) - SI_SW = 20

Volume at Q10 (m³/ha)

Stand Age (years)
DADE Project Results

Aspen Density Effects
Management Implications

Wind Toppling
Management Implications

Operational feasibility

Possible to grow intimate mixedwoods?
Techniques for aspen density control?
Management Implications

Operational feasibility

Costs

$$$$’s – DADE used manual thinning!
Management Implications

Operational feasibility

Costs

Long term impacts of aspen on spruce

Will determine how much aspen is sacrificed to gain spruce volume increases