Influence of weed composition, abundance, and spatial relations on hybrid poplar trees within plantations

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Role of plantations:

- Provides a source of high quality, environmental sustainable fiber near the processing site
- Increase fiber supply
- Reduce dependence on native forested lands
- Provide long-term income at minimal risk for private landowners

Sources:
- http://www.forestnet.com
- http://www.pbase.com
- http://www.ghumakkar.com
Silviculture in plantations

Business-as-usual practices:

• Row planting
• Fallowing of row interspaces
• Herbicide application to control competing vegetation

Source: http://www.biomasswithplants.com

Source: http://www.independent.ie
Management challenges

- Input costs high – especially around early establishment period
- Young trees susceptible to weedy competition [1,2,3,4,5,6]
Management challenges

Lack of information concerning quantitative guidelines surround impacts of weed abundance, composition, and spatial relationships to nearby poplar trees.

![Graph showing Hybrid Poplar Growth](image)

- **Optimal Conditions**
- **Weedy Conditions**
Opportunities

• Integrated weed management plan can decrease plantation costs while increasing tree size = greater profitability

• Accomplished by:
  – Determining which weeds are the most competitive
  – Where weeds cause the most damage

Source: http://www.alpac.ca/
Opportunities

Further environmental benefits: reductions in...

- Carbon loss
- Soil erosion
- Herbicide accumulation

Sources:
- http://ecopreservationsociety.wordpress.com
- http://extension.psu.edu
Research objectives:

- Quantify reductions in tree growth due to neighboring vegetation
- Identifying tree growth losses due to the identity of different weed species
- Determine spatial relationships between weeds and poplar
- Assess alternative establishment methods for poplar
Tree yield loss
Methods

- Business-as-usual (tillage + alley herbicide)
- Tillage + complete weed removal (hand-herbicide)
- Tillage only
Methods

- Tree growth (height and diameter)
- Neighboring vegetation biomass and composition (cover)
Methods

- Four sites
- 140 trees per site
- 35 trees per treatment
Yield loss results – year one
Tree spatial competition
Methods

• Removal of above-ground competition at:
  – 0 to 1.4 m from bole
  – 0 to 0.5 m from bole
  – 0.5 to 1.4 m from bole

• Removal of above + below-ground competition at:
  – 0.5 to 1.4 m from bole
  – 0 to 0.5 m from bole
Methods
Methods

- Three sites, six blocks per block
- Each block 50 trees with half of Walker and half of Okanese clonal stock
- In each half block, select the six most uniform in the center nine trees for treatment

Experimental treatments

- 'Above; 1m'
- 'Nowhere'
- 'Above-near'
- 'Above+below: near'
- 'Above - far'
- 'Above+below: far'

Buffer rows
Alternative establishment systems

Cover cropping

No-till

Fallowing of fields year prior to planting
Methods

- 15 blocks
- Each block split into four plots to be assigned to treatment
- Each plot to be of a split-design with 20 trees each of Walker and Okanese
- Center six of each half plot to be used for experimental treatment
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References


