

## Biomass Energy Opportunities from Hybrid Poplars In Minnesota



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Making Things Happen!

## Short Rotation Woody Crops for Biomass A “Poplar” topic for Minnesota

Information presented at Woody  
Biomass Harvesting and Utilization  
Workshop presentation in St. Cloud,  
MN on March 21, 2006

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WesMin RC&D Council acknowledges the  
many partners that we work with who  
support and carry out hybrid poplar  
project activities

- MN DNR
- US DOE-Biofuels Feedstock Development Program
- CINRAM
- U of M
- AURI
- NRRI
- U of Nebraska
- National Agro-Forestry Center
- McKnight Foundation
- MN State Legislature
- USDA - Rural Development
- EPS/Beck Power
- International Paper
- SWCD's
- County Commissioners
- RC&D Councils
- US Forest Service
- NRCS
- MN Dept. of Ag
- MN Agro-Forestry Cooperative
- Cooperative Services
- Center for Rural Policy
- Private Landowners
- FSA
- MN State Energy Office
- **CERTS and Renewable nrg**
- **Central MN Comm. Found.**

## Hybrid Poplar Trees

- Short Rotation Woody Crop (SRWC)
- Fast Growing "Cottonwood trees"
- Site preparation
- Plant "sticks"
- Spacing (8'x8' or now 10x10' or variation)
- Maintenance Critical (cultivation and weed control) first 3 years
- Reduced fertilizer and chemicals
- Insect and Disease Control
- Harvest at age 5 years (energy) or age 10-15 years (pulp/paper)
- Uses: Whole Tree Burning, steam and electric energy from heat, windbreaks, pulp for paper, OSB ; wood products (fiber is similar to aspen)
- Future: Ethanol?

## Benefits to Minnesota Citizens and Landowners

- Perennial Crop-doesn't need to be planted every spring (i.e. NW MN)
- Soil and Water Conservation-because of perennial crop, less tillage, less plowing over rotation
- Water Quality- sediment filters, phytoremediation,
- Environmental Protection-less overall use of fertilizer and chemicals
- Alternative Agriculture-new crop for farmers to diversify income
- Produce forest products from crop land
- Locally produced renewable energy (Now 2005 energy crunch-high gas prices, natural gas, etc ) Reduce dependence on fossil fuels and less environmental friendly nonrenewable energy, coal, nuclear power, etc)

## Wood Energy Scale Up Project

- WesMin RC&D Project - Nonprofit Fiscal Agent
- Funded by D.O.E.- Biofuels Feedstock Development Program- Oakridge
- Technical Assistance from DNR Forestry
- Many Partnerships - Stated Earlier
- Collects Hybrid Poplar Costs and Growth/Production
- On Farm Demonstration- Real Life

## Wood Energy Scale Up Project

- 17 Landowners within 50 miles of Alexandria, MN- West Central MN
- 6 Ac. To 300 Ac fields, Approx. 1750 Ac.
- Mostly on CRP (CRP 5 year extensions)
- Wide Variety of Soils, Topography, Management
- More typical of real life farms in MN?

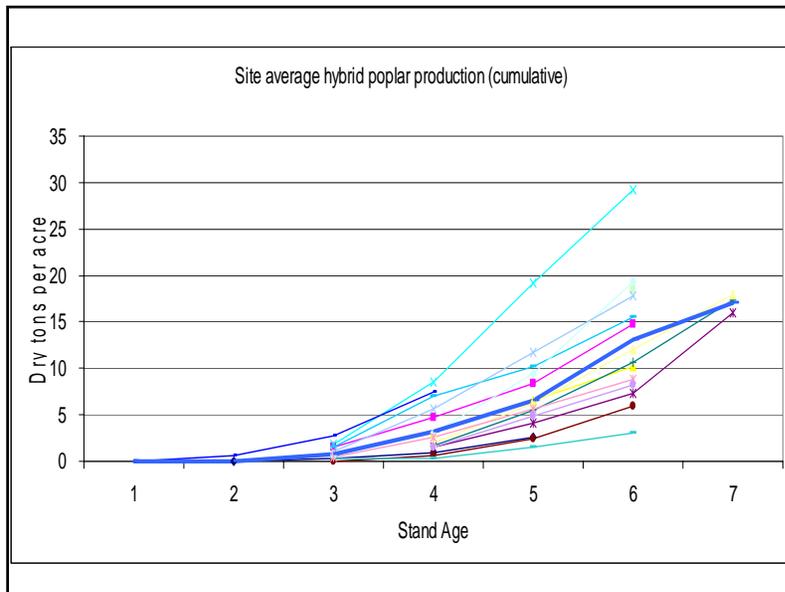
## Wood Energy Scale Up Project (continued)

- Started in 1994, 2006 would be 12th year
- Technical Assistance from DNR- Forestry
- Producers allow access by Project Participants for on farm research, data collection
- Cost Share from DOE with WesMin as Fiscal Agent to encourage best management and data collection from receipts

## Next Slides/Overlays compiled by University of Minnesota

Thanks to Steve Taff and others  
at

U of M for compiling our data so  
it can be shared with the public!!!



## Yield of 1 to 6 dry tons/ac/yr

- Average of 17.11 tons over 6 years
- Approx. 3 tons/ac/yr
- Some better clones and soils and management yielding nearly 6 tons/ac/yr
- Most experts agree 3.0 to 3.5 tons/ac/yr with new clones, improved management and experience from what we have learned from pilot projects
- Lower yields: poorer clones, maintenance not as should be, CRP program cover crop competition, weather, etc

## Acreage, location of hybrid poplar plantations

- 3000 acres in Oklee Tree Project in NW MN
- 1750 acres in WesMin Wood Energy Scale Up Project near Alexandria
- 16,000 owned or rented by International Paper for Sartell Paper Plant (West Central MN, Todd, Douglas Counties)
- 4000-6000 more in other locations, private
- Estimate 25,000 – 30,000 acres (28,000) total growing in MN (DNR and other sources)

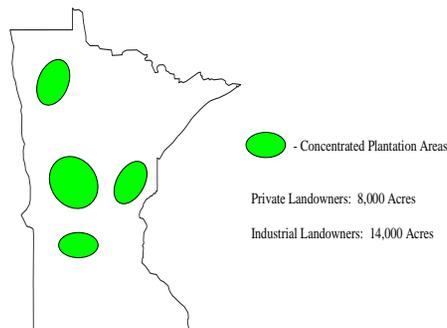
## Minnesota's Forest Resources



Department of Natural Resources  
Division of Forestry  
September 2004  
55155

500 Lafayette Road  
St. Paul, Minnesota

## Hybrid Poplar in Minnesota - 2004



Hybrid Poplar has been found to be an excellent substitute for aspen fiber in papermaking and Oriented Strand Board (OSB) production.

- Hybrid Poplar can reach merchantable size in 7 to 12 years.
- Intensive culture is required for the first 3 years in order to grow hybrid poplar.
- It is commonly grown on marginal agricultural fields.

## Real Data Comparisons from three actual harvests in MN

- Douglas County- west of Alexandria
- Harvest 2003 - 26 acres @27 cords acre = 700 cords
- 15 years old
- \$24/cord = \$648/ac
- Comments: Cherry Picked best trees, excessive wood waste (30% +)
- Site for Timberjack Harvester demo.

## Timberjack Slash Bundler Demo 2003- Douglas County



## Lots of slash and biomass left over



## A method for biomass collection and storage??





## Harvest Site #2

- NW Becker county
- Harvested 2003
- 12 years old – 25 cords per acre
- \$25/cord
- \$625/ac
- Comments: Old clones, poor soils, maintenance not the best



## Harvest Site #3 (2006- Most recent)

- 7.5 Acres
- 15 years old
- 260 cords
- \$11,000 sale price
- \$42.30/cord
- Thinned once- don't know what was removed
- Comments: good maintenance

Some harvest pictures of site 3



## The slash and residue left site 3 in Todd county



## So what's the average yield per acre per year on harvested sites

- Site 1 = 1.8 cords/ac/yr (excess slash)
- Site 2 = 2.1
- Site 3 = 2.3
- This is ONLY the logs or 100" bolts removed for pulp or OSB Board
- We have improved clonal varieties of trees and better management than when we first experimented with Poplar trees.

## Compare to Wood Energy Scale Up Project Predictions

- We had said 3 to 3.5 tons /ac/yr was reasonable
- That was for entire biomass
- If you remove 25% for slash we are close to our predictions
- $(3.0 - .75 \text{ t/a/yr} = 2.25 \text{ tons/ac/yr})$
- We are using cords and dry tons interchangeably as they are approximately the same.

## So what is potential biomass tonnage from HP in MN-"Back of the napkin calculations"

- In my opinion the best use of HP for biomass will be from slash as the trees bring a higher price for pulp than energy.
- Added value energy product or in some cases the stands are not a quality product for paper and pulp (twisted and multiple trunks)
- So for slash or added value figure at present  $28,000 \text{ acres} \times (3.0 \times .25) = 28,000 \times .75 \times 15 \text{ years} = 315,000 \text{ cords or dry tons of wood for the stands if harvested at 15 years of age}$

## Tonnage if all were used for biomass

- $28,000 \times 3.0 \text{ t/ac/yr} \times 15 \text{ years} = 1,260,000$  cords or dry tons of wood.
- Since they are various ages it is not likely all would be harvested in one year, many are nearing 12 to 15 years of age

## Conclusions and estimates of biomass harvest as added value

- Pulp prices bringing \$30 to over \$100/cord stumpage price, offers of \$50 + easily today
- Slash not used for pulp bringing \$0 (give it away for free and I'll take it away off your land) to \$15-25.
- Using 1 cord/acre as slash, that's \$15/yr per acre of added value for energy
- \$60 to \$200 per acre per year for pulp
- Summer wood, easy access, private lands avoids environmental and public concerns

## Other Economic Factors to Consider

- Distance to markets
- Trucking and fuel prices
- Biomass energy prices
- Wood similar to aspen, some industry desires HP wood, some may not be compatible for wood processes
- International Paper highly desires and has planted approx. 16,000 ac
- Ainsworth Engineered for OSB interested
- Pulp market—DNR sales \$20 to \$120 + (aspen)

## My biggest concerns about hybrid poplar slash for biomass

- If not utilized for biomass, it is on field in way of planting so most likely will just be burned on the field
- Wasted biomass and CO<sub>2</sub> in the air
- Added value is nice, any farmer could use more \$ rather than waste it
- There is still a tremendous amount of leaf litter and small twigs, branches so am not concerned about erosion from what I've observed

## Other thoughts about use of Hybrid poplars for biomass

- Many have been planted too close and a thinning operation could be used to improve stand and use thinned trees for biomass. Were 8x8, now most 10x10, some thinking 12x12.
- Coppicing of trees, resprouting from trunks after harvest are many stems, most landowners will not prune out main leaders, extensive hand labor required, multistem bush-like coppicing could be a great way to save root system and not replant and use these for biomass crops, every 4 to 5 years? Great Potential!

## Will farmers/growers get a fair price??

- Are we moving from food production to energy production on midwest farms?
- If so, will farmers get paid for what their biomass is worth to grow or for energy or will they be expected to “give it away for free”???
- Farmers are not getting costs of production for corn, soybeans, wheat, hence LDP's, etc. Will we repeat this cycle for energy crops??? Just a thought for the future.

## Why Minnesota's leading the way for Hybrid Poplar Demonstration Projects, Research, and Programs

- MN Wood Energy Scale-up Project
- Oklee Tree Project-UM Crookston
- MN Agro-Forestry Cooperative
- Information and Educational Activities
  - Tours, handouts, workshops, Farmfest, event booths, newsletters, etc.
- Agro-Forestry Loan and Grant Program from MN State Legislature
- St. Peter CRP Biomass Pilot Project
- Center for Rural Policy and Development (Panel and Paper regarding MN role for SRWC)

## What will drive SRWC in the future? #1 opinion, energy needs

- Federal and State Supported Biomass/ Closed Loop Renewable energy Projects
- Wood Energy (Burning)
- Gasification
- Plasmification
- Ethanol from wood
- Need for locally produced, renewable energy, national and state mandates, energy shortages and prices
- Jobs and local economic development-from energy projects and businesses

## For instance

- Central MN Ethanol Coop. (Little Falls) Biomass Burning addition-\$17 million-Wood Chips, sawdust, gasification to make steam and electricity for plant-Replace natural gas
- Fibrominn -Turkey Litter – Benson -20% wood
- District Energy- St. Paul-Waste wood
- Laurentian Energy Authority- Hibbing and Virginia-closed loop wood
- RECAP- Plasma Torch concept at International Falls (Laurentian RC&D)

## New Projects for environment

- Phytoremediation
  - Wellhead protection (Glenwood)
  - Sanitary landfills (Clay county)
- Watershed protection and buffers
  - Chippewa Watershed
  - Hypoxia in gulf?
  - MN and Mississippi river Basin

## Conclusion about HP in MN

- Alternative agriculture and diversity
- Minnesota's pulp prices and wood industry needs fiber, possibly highest prices for pulp in nation?
- Renewable energy
- Energy conversion specialists vs. Food producers
- "Productive Conservation" vs "Idle Conservation"
  - Environment & Soil and Water Conserv.
  - Water quality protection
  - Perennial cover
  - Phytoremediation
  - Carbon Sequestration
- Programs and challenges
- Minnesota is a leader in SRWC

## Photos by:

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Forester

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- Making things happen!!

