

*New Opportunities for the Nation's Oldest
Renewable Resource*

The Role of Bioenergy

Lew McCreery

lmccreery@fs.fed.us



WOOD EDUCATION
AND RESOURCE CENTER



Today's Presentation

- The Wood Education and Resource Center
- History of Woody Biomass Use
- Biomass Future and Change Agents
- Biomass Utilization in Wisconsin
- Glimpse of the Future

Wood Education and Resource Center

Main Office Building



WOOD EDUCATION
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The WERC Mission

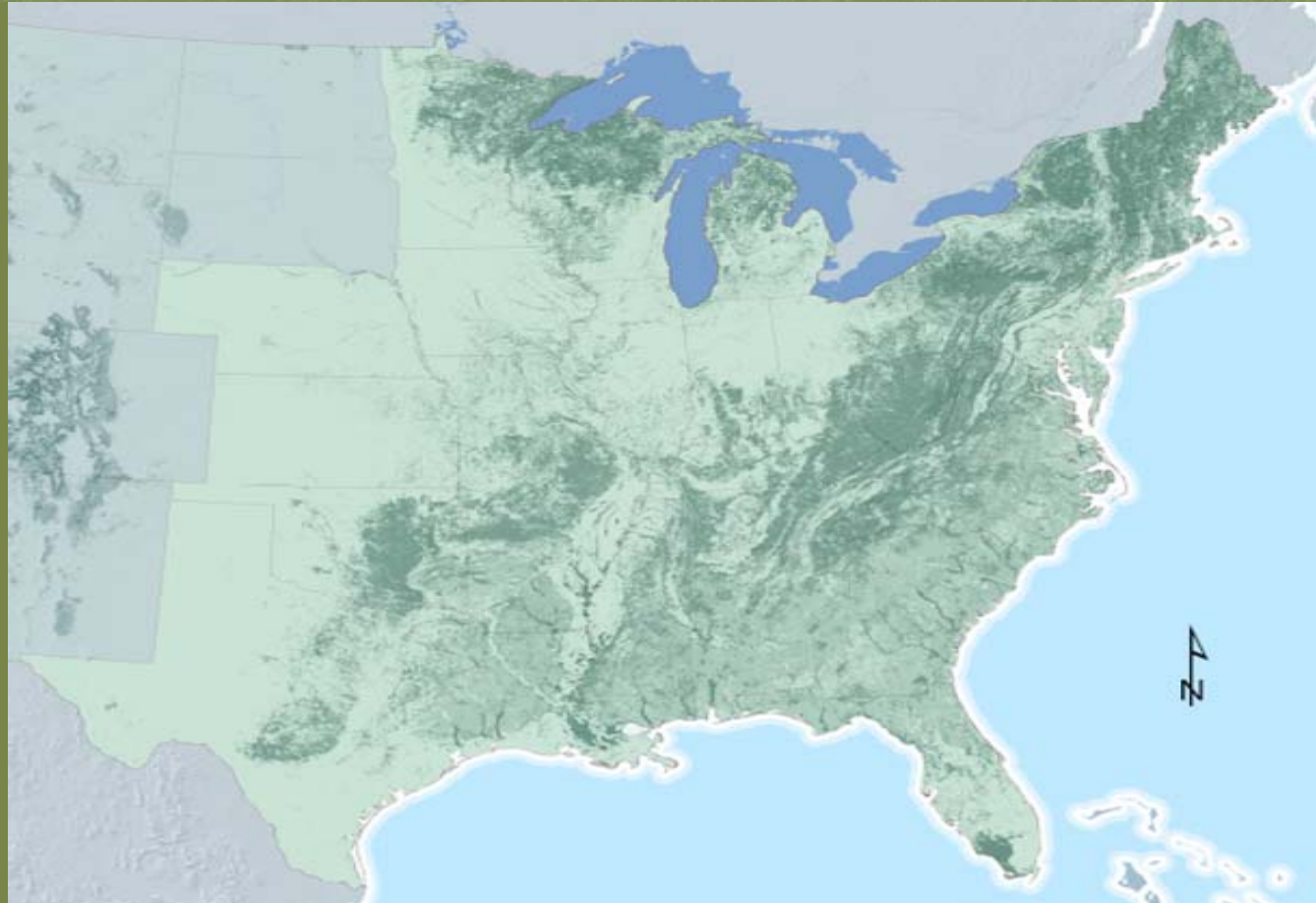
Foster interaction and information exchange with the forest products industry to enhance opportunities for sustained forest products production in the eastern hardwood region of the United States.

WERC States - Eastern Hardwoods

Eastern
Hardwood
Forest

162 Million
Acres

35 States



93% total Eastern forest = private + other public
83% total Eastern forest = private only

Why WERC?

■ Industry Challenges

Job Losses - 5 years

Wood Products: 20,000

Paper: approx. 100,000



WERC Cluster

Public / Private
Partnerships

Facilities –
offices, training,
manufacturing

Work force - labor

Forest Resources

Infrastructure

Training

Research

Technology
Transfer

Investment Capital



Connections to the Past

American's and Their Forests...A
*Historical Geography by Michael
Williams*



The Forest Bio-Refinery – 1700's

■ **Chemicals**

- *From 1768-1772 10,600 tons of pot and pearl ash were exported from ports north of Philadelphia.*
- *Farmers were paid from 6-12 cents/bushel for potash depending on purity.*

■ **Fuel**

- *In colonial America, wood use - 4.5 cords/capita*
- *Hauling distances were limited from 25-35 miles by cart*
- *From 1760 until 1810 about 1.08 billion cords*

Biomass Future

- **Expanded use is coming**
 - Energy, climate, farm and forest policy push
- **Using biomass makes economic, climate and energy sense.**
- **Biomass offers opportunities to:**
 - Reduce energy costs
 - Support energy independence
 - Mitigate climate change
 - Support sustainable forest management

Increased Use Requires Planning

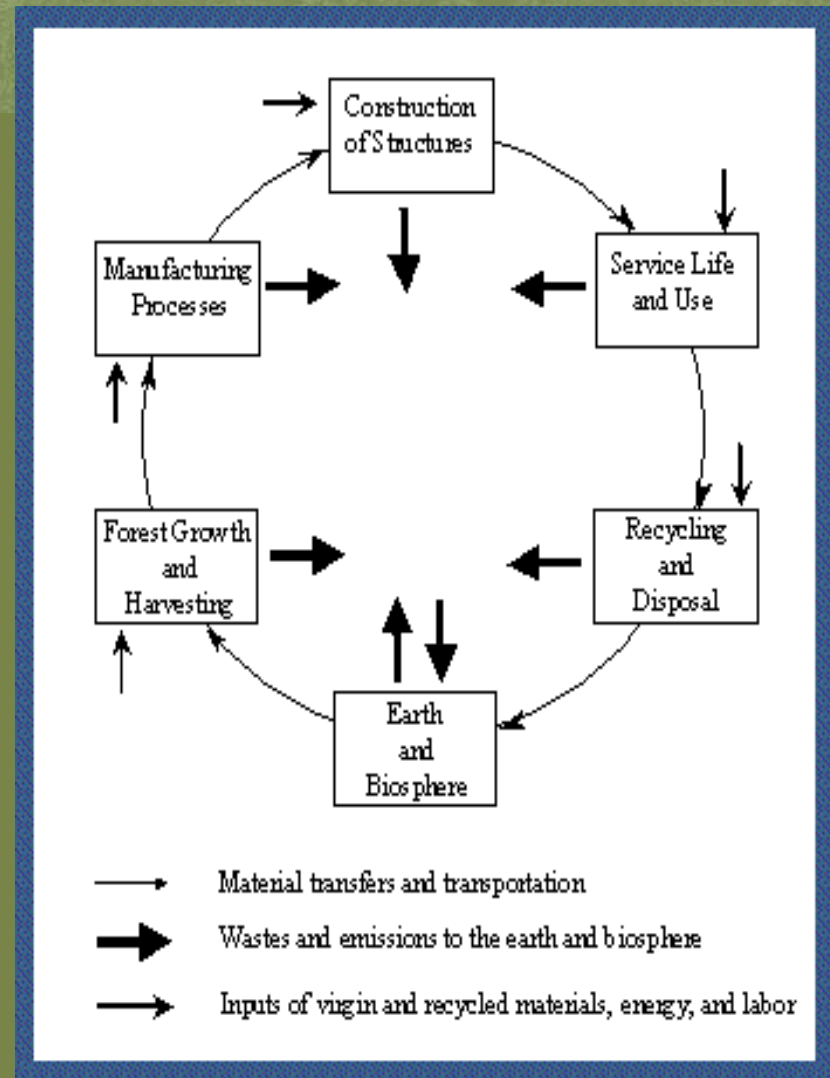
- **Address sustainability issues**
 - Wildlife
 - Nutrients
 - Water & Air quality
- **Impacts on existing industry**
 - Value added industries must be maintained
 - Focus on highest value utilization
 - Maintain management capability
- **Public perception and support**

Change Agents

- Renewable materials - CORRIM
- Renewable Portfolio Standards
- 25 x '25 Initiative & other efforts
- IPCC Reports on Climate
- Business Investments
- E.O. 13423 - Greening Government
- Fire, Disasters, Invasives, Forest Health
- Domestic Energy Prices

CORRIM

- Consortium for Research on Renewable Industrial Materials
- A scientific base of information relating to the environmental performance of wood based building products



Renewable Portfolio Standards

- Policy that ensures the public benefits of wind, solar, biomass, and geothermal energy are recognized within electricity markets
- A Renewable Energy Credit (REC) is a tradable certificate of proof that one kWh of electricity was generated by a renewable-fueled source.
- Renewable goals, eligible technologies, and financial support vary among states.
- MA RPS has had major impacts on the renewable energy market in the Northeast.

Intergovernmental Panel on Climate Change (IPCC)

- Working Group I Report “The Physical Science Basis” – 2/2/07
- Working Group II Report “Impacts, Adaptation and Vulnerability” – 4/6/07
- Working Group III Report “Mitigation of Climate Change” – 4/7/07
- An up-to-date assessment of the current state of knowledge on climate change

Business Investments

- PepsiCo announces purchase of 1 billion kWh of “green power” annually to offset their US electricity use – equals use by 90,000 homes/year
- Vinod Kholsa, Silicon Valley venture capitalist, invests \$100 million to create a cellulosic ethanol plant in GA.
- Chevron and Weyerhaeuser create a bio-fuel alliance

E.O. 13423 – Greening Government

- **Strengthening Federal environmental, energy, and transportation management**
- **President directs federal agencies to:**
 - Improve energy efficiency and reduce greenhouse gas emissions;
 - Use renewable energy;
 - Acquire green products and services; and
 - Increase diversion of solid waste

Fire, Invasives, Disaster, Forest Health

- Fuel load reduction, fire risk reduction, air quality issues
- Emerald Ash Borer, Sirex wood wasp
- Disasters like Katrina...is the East Coast next?
- Southern Pine Beetle, Mtn. Pine Beetle

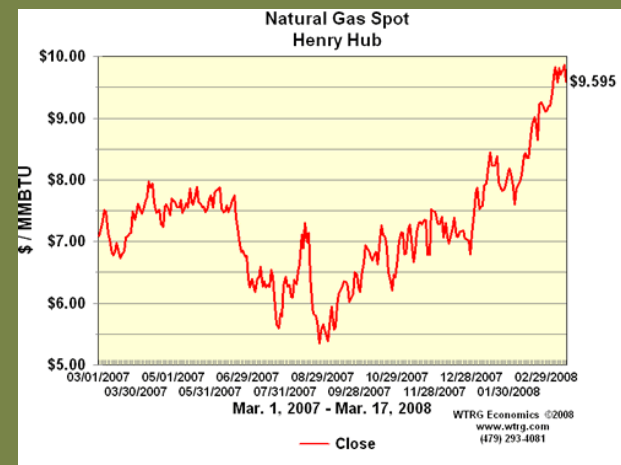
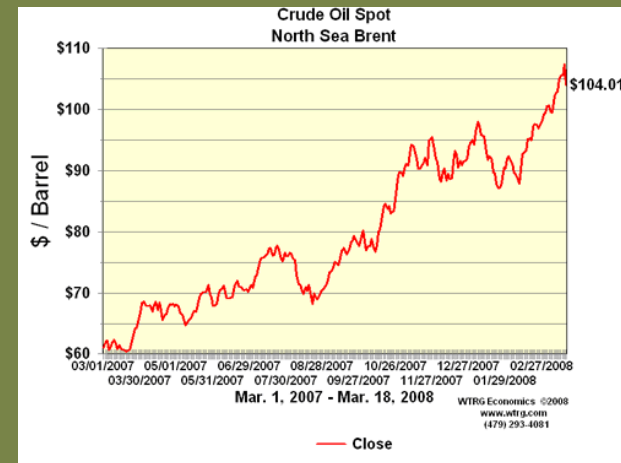
Domestic Energy Prices

■ Crude Oil

- 3/01/2007: \$60/barrel
- 2/27/2008: \$104/brl
- 173% increase

■ Natural Gas

- 3/1/07: \$7.00/mmbtu
- 3/2/08: \$9.60/mmbtu
- 137% increase



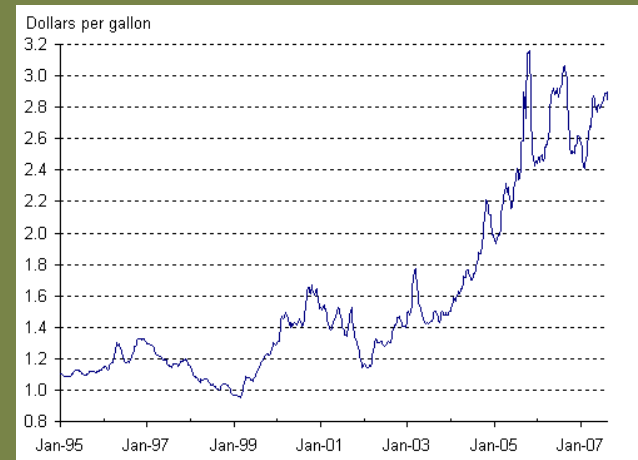
Heating Oil and Diesel Fuel

■ Heating Oil

- 3/19/03: \$1.25/gal
- 3/19/08: \$3.26/gal
- 266% increase

■ Diesel Fuel

- 01/03: \$1.40/gal
- 03/08: \$3.00/gal
- 272% increase



Domestic Energy Prices

■ Heating Oil

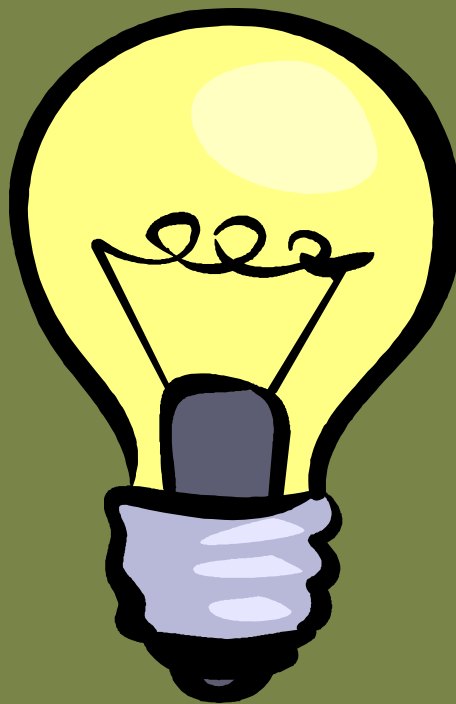
- 2001 - NE Household spent \$775 on 630 gal.
- 2008 - NE household spent \$2053 on 630 gal

■ Natural Gas

- 2001 – Household spent \$698 on 70 MCF
- 2007 – Household spent \$900 on 70 MCF

2025

25x25

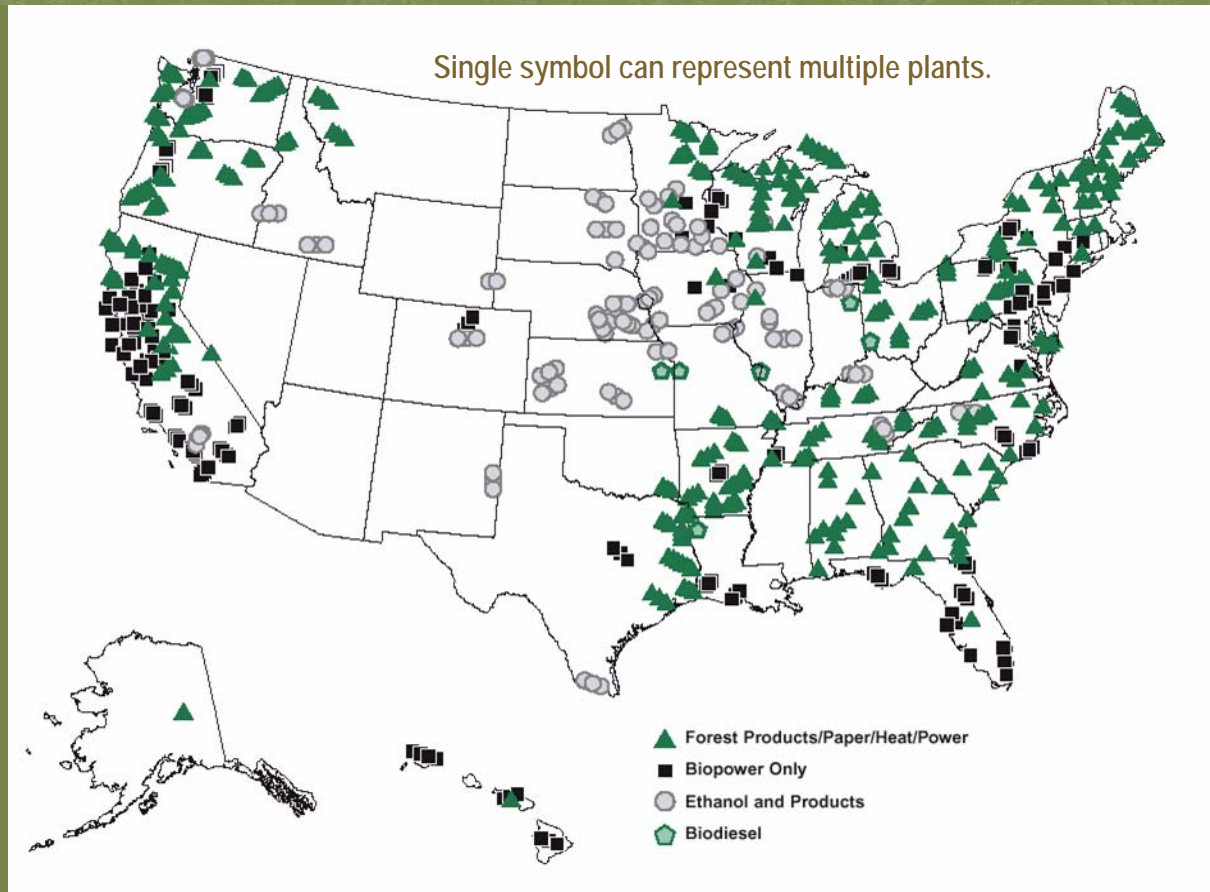


25x25



25x25

U.S. Biomass Facilities



Heat, Power, Ethanol, and Biodiesel Products

Infrastructure...Forest Workers



Infrastructure...Manufacturing Sites



Utilization Options for Emerald Ash Borer-Killed Ash

- Goal is to minimize removal and disposal costs of EAB-infected ash trees
- Turning wood waste into usable products
- Training urban foresters and tree care workers on proper log manufacturing



Fire Hazard Reduction in Minnesota



Biomass 101

Woody Biomass Sources

- Small-diameter trees
- Forest Residues
- Clearings and timberland conversions
- Residues
 - Processing
 - Construction/demolition
 - Yard trimmings
- Production
 - Conventional harvests
 - Short-rotation woody crops
 - Land use change

Woody Biomass Uses

- Power (any scale)
 - Electricity
 - Heat and cooling
 - Process Energy
- Fuels
 - Ethanol
 - Bio-diesel
 - Jet fuels
 - Methanol/bio-butanol, etc
- Bio-products (offset fossil energy)
 - Building materials
 - Chemicals
 - Medicines

More Biomass 101

■ Wood Biomass Technologies

- Direct Combustion – chips, pellets, bricks, w/coal
- Fermentation – converting sugars to ethanol
- Gasification – heating biomass in a reduced oxygen environment to produce synthetic gas (syngas)
- Pyrolysis – heating biomass without oxygen and cooling gases to create pyrolysis oils
- Fractionation – reducing biomass to cellulose, hemicellulose and lignin and processing these components

■ Bio-refineries - Integration of above processes with existing industries

Wisconsin's Energy Needs

- In 2005 WI consumed 1,785 trillion Btu's of energy for transportation, heating/cooling, industry, agriculture, and electric power.
- If the total amount of woody biomass on one forested acre **was converted to energy** (no reduction for efficiency) that acre would produce 601 million Btu's.

Wisconsin's Energy Needs

- WI would need to annually harvest approximately 3 million acres of forestland to meet current annual energy needs.
- WI forests would supply energy for 6 years.
- Utilizing all annual growth in WI would supply 8.7% of existing energy needs.
- Fully utilizing annual logging residues would supply 2% of existing annual needs.

Woody Biomass Utilization in WI

- Woody biomass is part of the solution but can not be the whole solution to energy independence.

Biomass Harvesting Costs - WI

- Production costs for whole tree chips delivered to a facility within 35 miles of the logging site range from \$14 - \$21 per green ton.
- A cost of \$14 is the sum of additional cost of chipping, transportation, and stumpage related to only the *biomass* portion of a sale.
- Production costs for a dedicated whole tree chipping on a sub-merchantable aspen site are \$21/green ton.
 - Source: The Real Cost of Extracting logging Residue Study, 2005, Don Peters

Biomass Markets in Wisconsin

- Energy utilities will pay \$18 to \$25 per green ton and want long term contracts
- Ethanol production facilities - \$15/green ton.
- Pellets \$20 - \$30/green ton
- Industrial fuel \$18 to \$30/green ton
- Schools \$25 to \$35/green ton

These are rough price estimates from conversations.

Biomass Markets in Wisconsin

- In the DNR air quality data base there is approximately 2024 boilers of those boilers there are:
 - 1500 natural gas boilers
 - 120 coal fired boilers
 - 294 diesel fired boilers
 - 104 biomass fired boilers

VT North Country Hospital Powers with Wood



Keys to our Bio-energy Future

■ Sustainability

- Part of production and management system
- How much, where, managed impacts

■ Cost Competitiveness

- Creditable financial analysis
- Documentable cost data

■ Investment in infrastructure

Potential Opportunities Exist in the Use of Woody Biomass

- Improved forest management
- Reduced fire danger
- Move toward energy independence
- Reduced competition with food crops
- GHG reductions and carbon offsets
- New revenue streams for landowners and existing forest industries
- Support to *Keep Forests as Forests!*

For more information

<http://www.na.fs.fed.us/ea/werc/werc.shtm/>



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