Timber Assessment for an Eastern UP Cellulosic Ethanol Facility

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EUP Cellulosic Ethanol Facility

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Mascoma + Longyear =
Frontier Renewable Resources

MICHIGAN Economic Development Corporation

COEE and FBSCC Research Scope

Project 1: Feedstock Supply Chain Model

Project 2: Increasing Sustainable Feedstock Availability

Project 3: Improving Forest Feedstock Harvesting, Processing and Hauling Efficiencies

Project 4: Outreach, Extension and Technology Transfer

COEE = Center of Energy Excellence
FBSCC = Forestry Biofuel Statewide Collaboration Center

http://www.michiganforestbiofuels.org/

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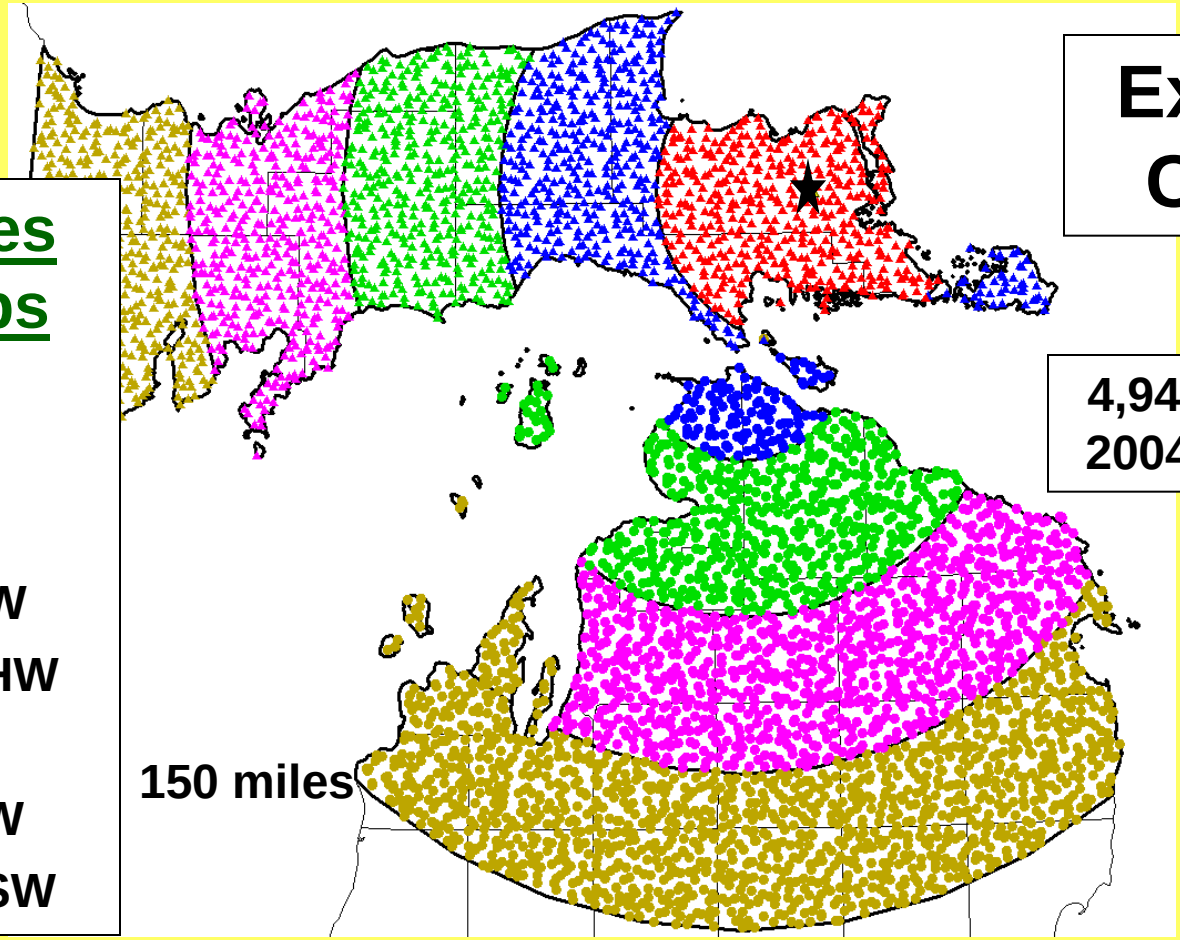
Study Objectives

- Evaluate inventory, growth and removals
- Assess amount of biomass growth beyond current uses
- Describe past timber sales and price trends, and
- Identify factors affecting timber availability and sustainability

Study Area & Methods

Species Groups

- Aspen
- Maple
- Oak
- Upland HW
- Lowland HW
- Pine
- Upland SW
- Lowland SW



Excludes Canada

4,945 FIA plots 2004-2008 data

Forest Inventory Plots Used for Analysis, by Nine Supply Zones

Context for Kinross Facility

- ✓ **Wood requirement = 1 million green tons/year or ~470,000 cords/year at full capacity**
- ✓ **Closed plants (G-P, Sappi, and Smurfit-Stone) used ~1.2 million cords/year**
- ✓ **Statewide pulpwood production in 2007 is ~1.1 mil. cords/year less than in 1997**
- ✓ **Net annual growth in excess of removals is 3.1 million green tons in region ~1.6 million cords; ~845,000 hardwood cords/year)**

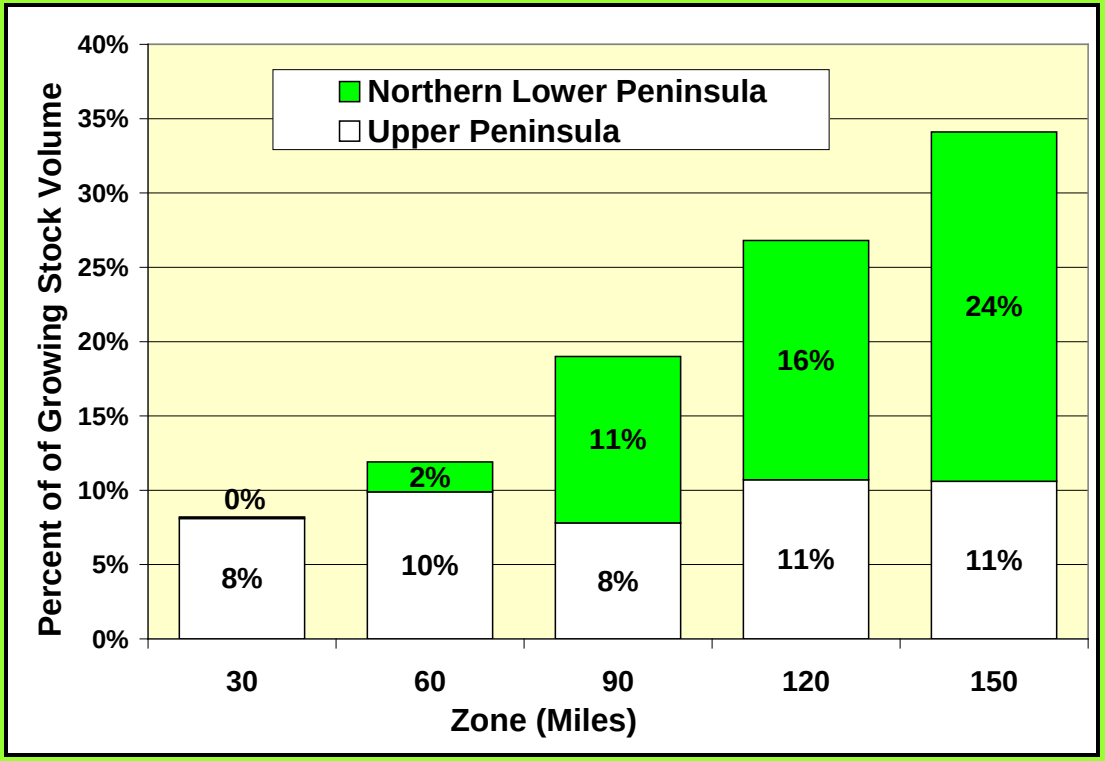
Context for Kinross Facility

- ✓ **Investment – 21st Century Jobs Fund (MEDC): $20 mil.**
- ✓ **Investment – USDOE: $26 mil. (Mascoma)**
- ✓ **Investment – PRIVATE: up to $50 mil. by Valero Energy Corp.**
- ✓ **Working pilot facility in Rome, NY: 200,000 gpy**
- ✓ **COEE researchers @ MTU/MSU = 36**


FIA provides a sample
not a census.

Growing Stock Volume and Weight

- 11.4 billion cubic feet of GSV (merchantable)
- 274.2 million green tons
- 155.1 million ODT = 144 million cords



8.3 million acres of timberland

Percentage of growing stock volume by peninsula and zone.

Sawtimber Volume

- **32.1 billion bdft or 5.1 billion cuft of sawlog GSV**
- **Approx. half HW & SW**

- **Only 26.6% of hardwoods are tree grade 1 or 2 (0.7 billion cu ft)**

International ¼-inch rule from FIA

Net Annual Growth & Removals

- Total annual growth less mortality is 279 million cuft or 6.7 million green tons
  - 63% hardwood and 37% softwood (wt.)
- Removals are 144 million cuft or 3.6 million green tons
  - Slightly higher % hardwood than NAG
- NAG and removals are not uniformly distributed throughout the region

Hardwood Volume, Growth, and Removals -- UP

Upper Peninsula	Volume	Net Growth	Removals	Excess
Species Groups	Thousand green tons			
Aspen	8,906	208	223	-14
Maple	41,814	872	559	314
Oak	1,555	41	22	19
Upland HW	14,856	65	320	-255
Lowland HW	3,530	38	49	-12
UP Total	70,660	1,224	1,172	52

Net annual growth of hardwoods in excess of removals is 1.8 million green tons for Entire Supply Area (~845 thousand cords)

Please Note

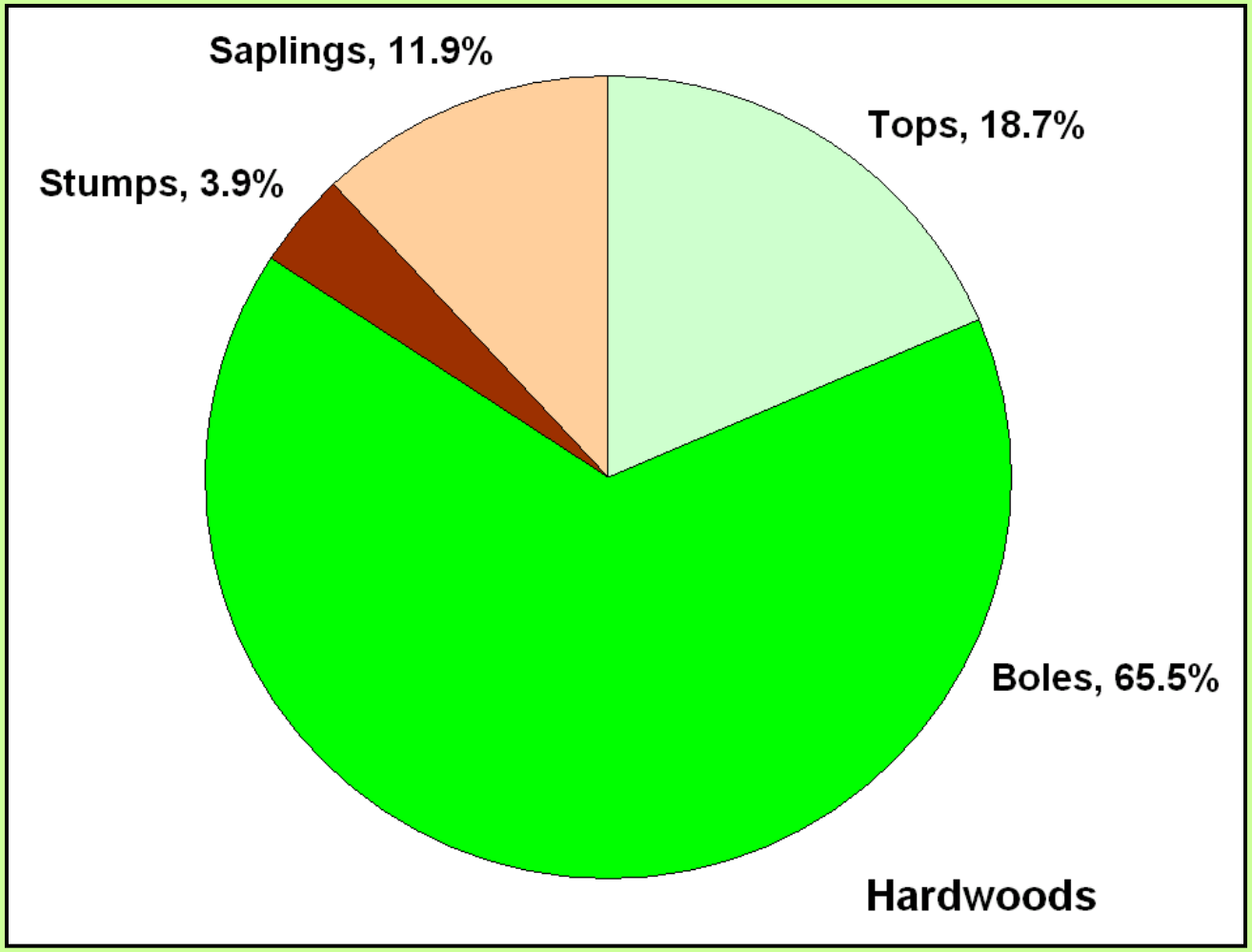
- **Negatives worry foresters**
- **Western zones are more negative**
- **This is a snapshot for 2004-2008**
- **Includes some triple-density data from 2004**
- **And then there is the NLP…**

Hardwood Volume, Growth, and Removals -- NLP

Northern Lower Peninsula	Volume	Net Growth	Removals	Excess
Species Groups	Thousand green tons			
Aspen	21,294	840	382	458
Maple	41,028	1,170	457	713
Oak	22,607	628	181	447
Upland HW	16,470	217	191	27
Lowland HW	4,389	108	8	100
NLP Total	105,789	2,964	1,219	1,744

Net annual growth of hardwoods in excess of removals is 1.8 million green tons for Entire Supply Area (~845 thousand cords)

Woody Biomass Components



Percentage of total woody biomass by component.

The bole portion in NAG covers only two-thirds of the woody biomass contained in hardwood trees.

Factors Affecting Timber Availability and Sustainability

- Historic pulpwood production is down
  - ~1.10 million cords in MI from ’97 to ’07
  - ~0.37 million cords in region from ’97 to ’07
- Competing/complementary wood users
- Timberland ownership
  - State (33.6%), federal (14.2%), Commercial Forest Program (14.3%), and other private (37.8%)
- Sustainability standards-SFI/FSC/NFMA
- Accessibility and site conditions-BSAs, etc.

Future Considerations

- **This study includes MI wood only—the role of Canada is important, too.**
- **Technological change will occur. Feedstock requirements will likely change.**
- **Short-rotation stands may be part of the future supply chain.**
- **There may be attractive (non-forest) sources of cellulose in the future.**
- **Stumpage prices/competition will affect competing and complementary wood users.**

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