

# **Ensuring Forest Sustainability in the Development of Wood Biofuels and Bioenergy in the Great Lakes States**

## **Panel 3**

**Options for build-out of a sustainable bioenergy/biofuels industry in the Great Lakes**

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# Near-Term Options for Developing Wood Bioenergy/Biofuels Industry

## *A Michigan Perspective*

- Diversification initiatives
- Value added opportunities
- Build on assets
- Target under-utilized resources
- Technology development stage
- Venture capital initiatives
- Builds on company goals and initiatives
- State and federal funding opportunities
- Local, state, and federal development incentives

**Create and maintain jobs/economy**

**15%**

## Michigan Key Assets

- Key anchor companies
- Presence of original equipment manufacturers (OEMs)
- Top manufacturing workforce
- Top wood fiber resource
- Top universities in key fields
- Sense of urgency
- 21<sup>st</sup> Century Jobs Fund
- International relationships
- Existing relationship with key cleantech venture capital firms
- Fresh water
- Outstanding geological formations for CO<sub>2</sub> sequestration

## **MEDC Response – Cluster Based New Market Economic Development**

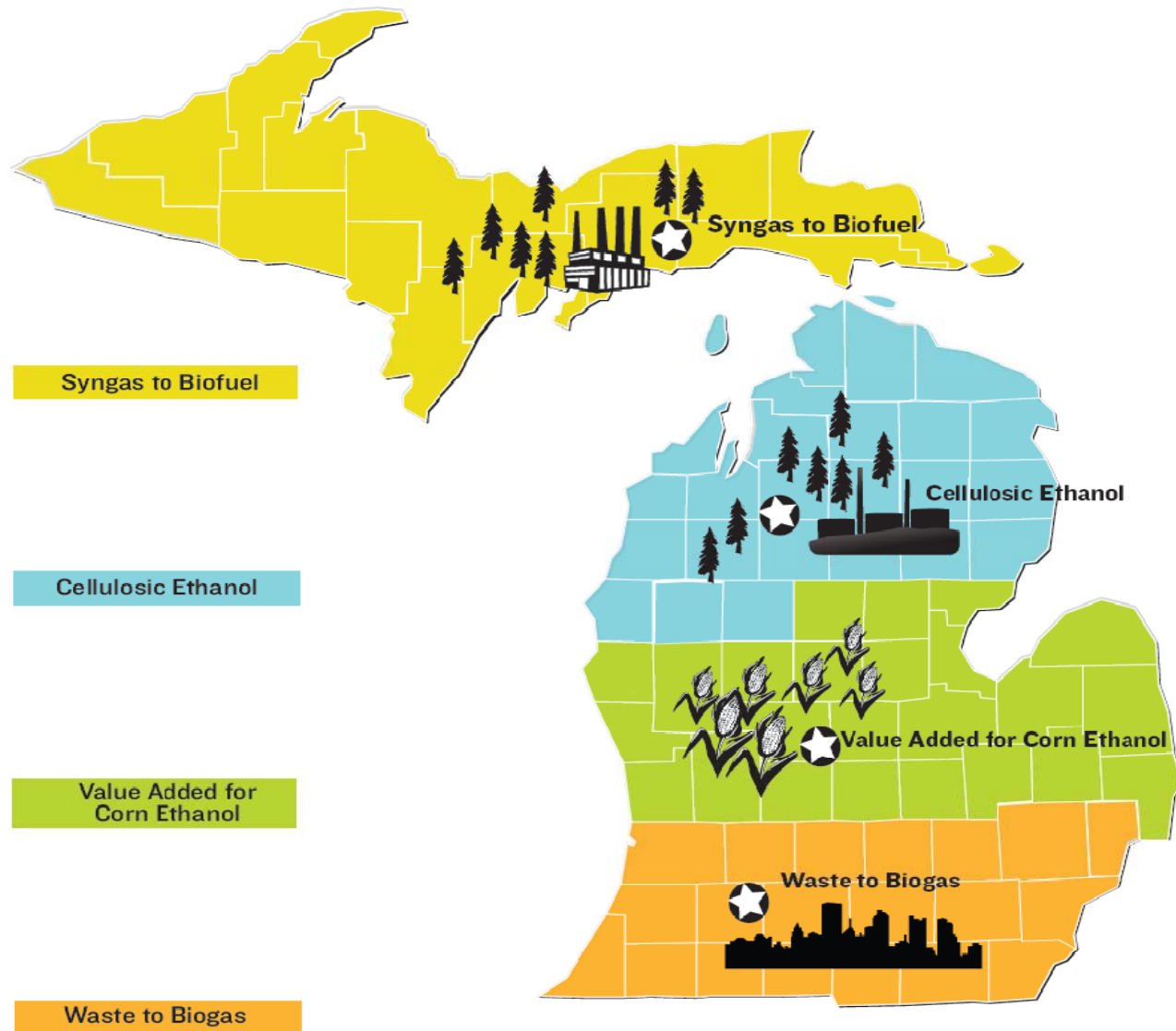
- **Targeted industries**
- **Potential for significant growth**
- **Leverage state strengths**
- **Generally not mature**
- **Gap exists – requires economic assistance**

1. **Wind Turbine Mfg.**
2. **Bioenergy/Fuels**
3. **Advanced Energy Storage**
4. **Solar/Photovoltaic**
5. **Water Technology**
6. **CO<sub>2</sub> Capture, Reuse & Sequestration**

# Cellulosic Biofuels

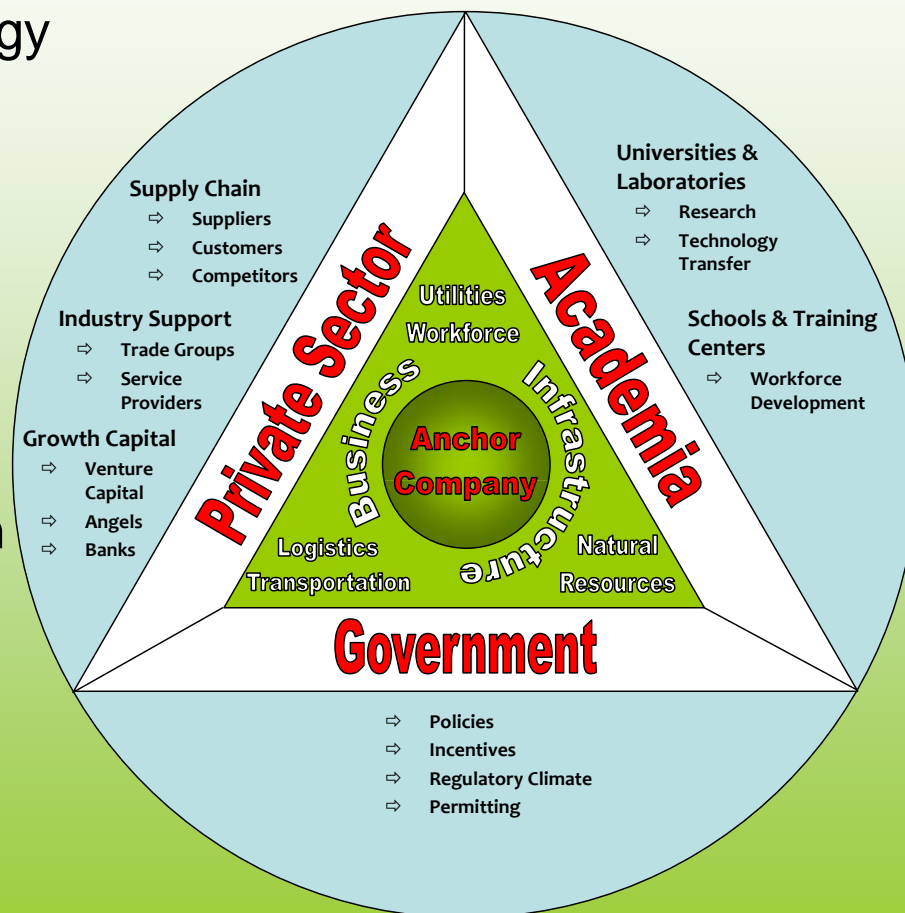
- **Target Focus:** Bio-fuel production using cellulosic biomass as feedstock (e.g., forest-based, wood waste, energy crops, agriculture stover)
- **Data-Driven Research**
  - Michigan competitive advantages (forest products)
  - Related commercial/industrial expertise - pulp/paper mill industry
  - Relevant workforce in place
  - World class universities
- **Cluster Team** – Formed in 2007. Actively participated in the creation and implementation of a strategy.
  - **Potential focus areas across multiple technologies and regions.**
    - Gasification of cellulosic biomass to motor fuels
    - Biochemical conversion of cellulosic biomass
    - Value-added products for corn ethanol producers
    - Municipal waste to biogas/motor fuels

# Biofuel Focus Areas



# Centers of Energy Excellence

- Combination of private sector, university research, and public sector support to accelerate creation of advanced energy industry clusters where MI has an advantage in;
  - Workforce
  - Intellectual Property
  - Natural Resources
- Resources assigned to areas where there are technical or supply chain issues that prevent commercialization
- Focused on areas which have impact on Michigan's;
  - Energy security
  - Environmental profile
- Have potential for significant economic impact



# Michigan Biomass Based Centers of Energy Excellence



**Product:** Cellulosic Ethanol

**Feedstock:** Forest-based biomass

**Investment:** COEE \$20 million leveraging a \$26 million Mascoma DOE Grant, and a \$1.427 million federal appropriation. \$2 million of the COEE grant is dedicated to feedstock supply chain R&D

**Description:** A commercial-scale cellulosic ethanol facility (40 million gal/yr) in the Upper Peninsula, Chippewa County

**Partners:** Mascoma/JM Longyear joint venture (Frontier Renewable Resources, LLC), Michigan State University, and Michigan Tech

**Other Stakeholders:** Marathon, GM



**Product:** Biogas

**Feedstock:** Municipal Waste Water Sludge

**Investment:** COEE \$4 million leveraging \$3 million from Swedish Government and \$ 951,500 federal appropriation

**Description:** Anaerobic digestion of waste water sludge at the City of Flint's wastewater treatment plant.

**Partners:** Swedish Biogas International, the City of Flint, Kettering University, the Swedish Energy Agency, Vinnova, and Linköping University (Sweden)



# Michigan Biomass Based Centers of Energy Excellence



**Product:** Cellulosic Ethanol, sodium acetate and potassium acetate

**Feedstock:** Waste water stream from Decorative Panels International (hardboard mill) process containing C5 and C6 sugars

**Investment:** COEE \$4 million

**Description:** A pilot scale biorefinery in Alpena, utilizing fermentation with genetically modified micro-organisms. Potential for replication across the state in other biorefineries, pulp and paper mills, and food and agricultural processing plants.

**Partners:** American Process Inc., Valero Energy Corporation, Decorative Panels International and Michigan Tech



**Product:** High-value specialty and fine biochemicals and biofuels (e.g. biobutanol)

**Feedstock:** Variety of natural feedstocks

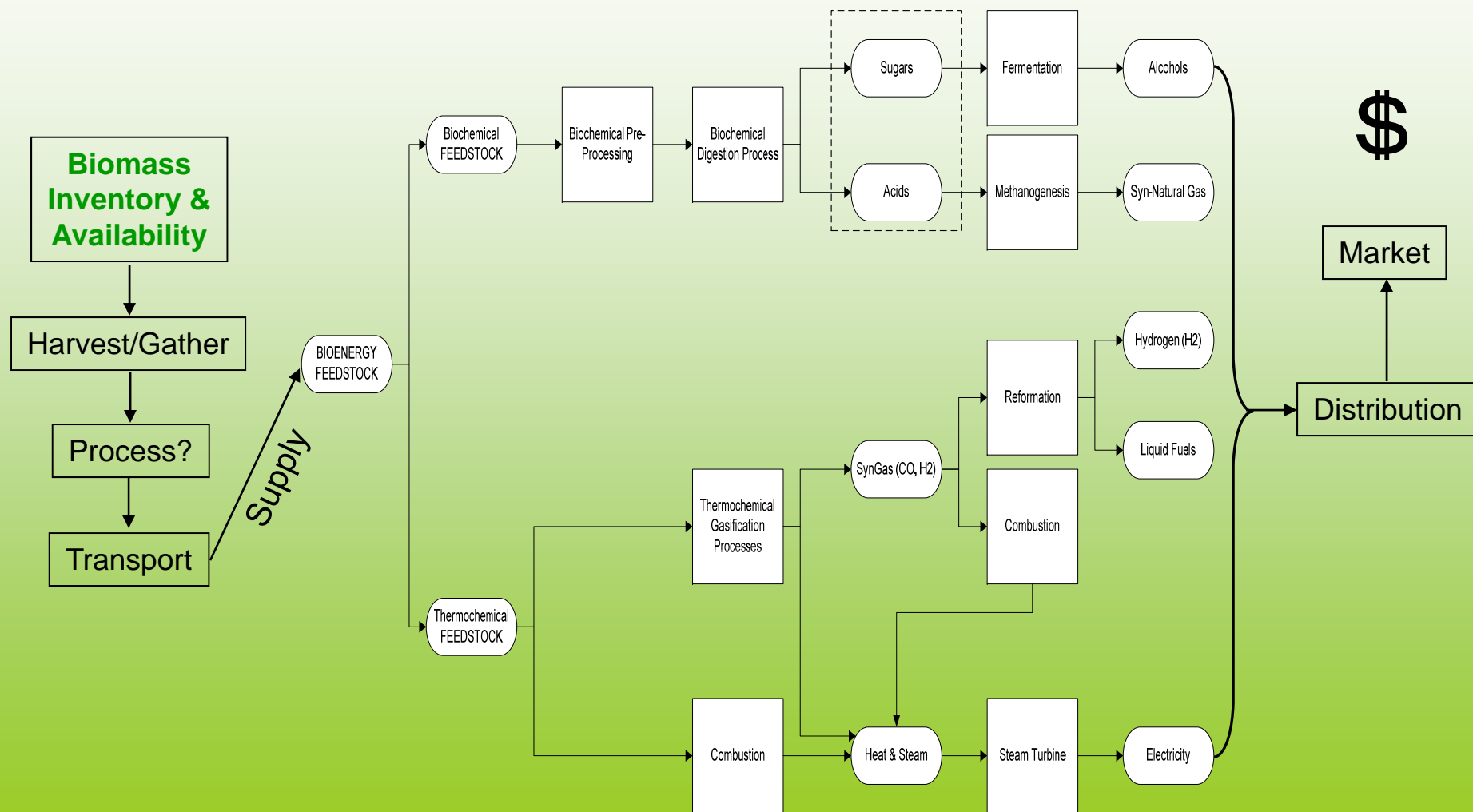
**Investment:** COEE \$2 million

**Description:** Biorefinery in East Lansing utilizing fermentation with a variety of micro-organisms. Technology can be applied to existing biomaterial processing facilities such as corn ethanol plants, beet sugar refineries, and pulp mills to produce new, higher margin products.

**Partners:** Working Bugs and Michigan Tech

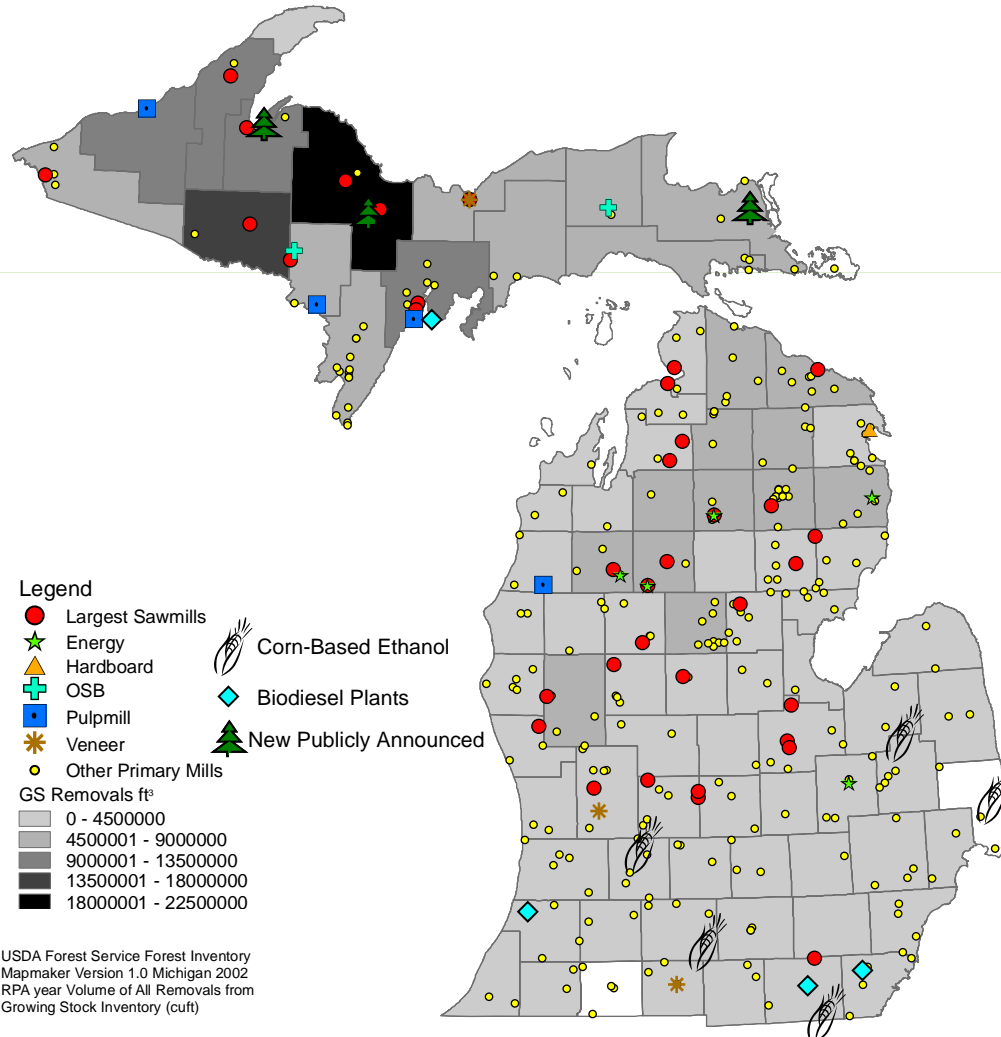
# Value Chain

## INFRASTRUCTURE



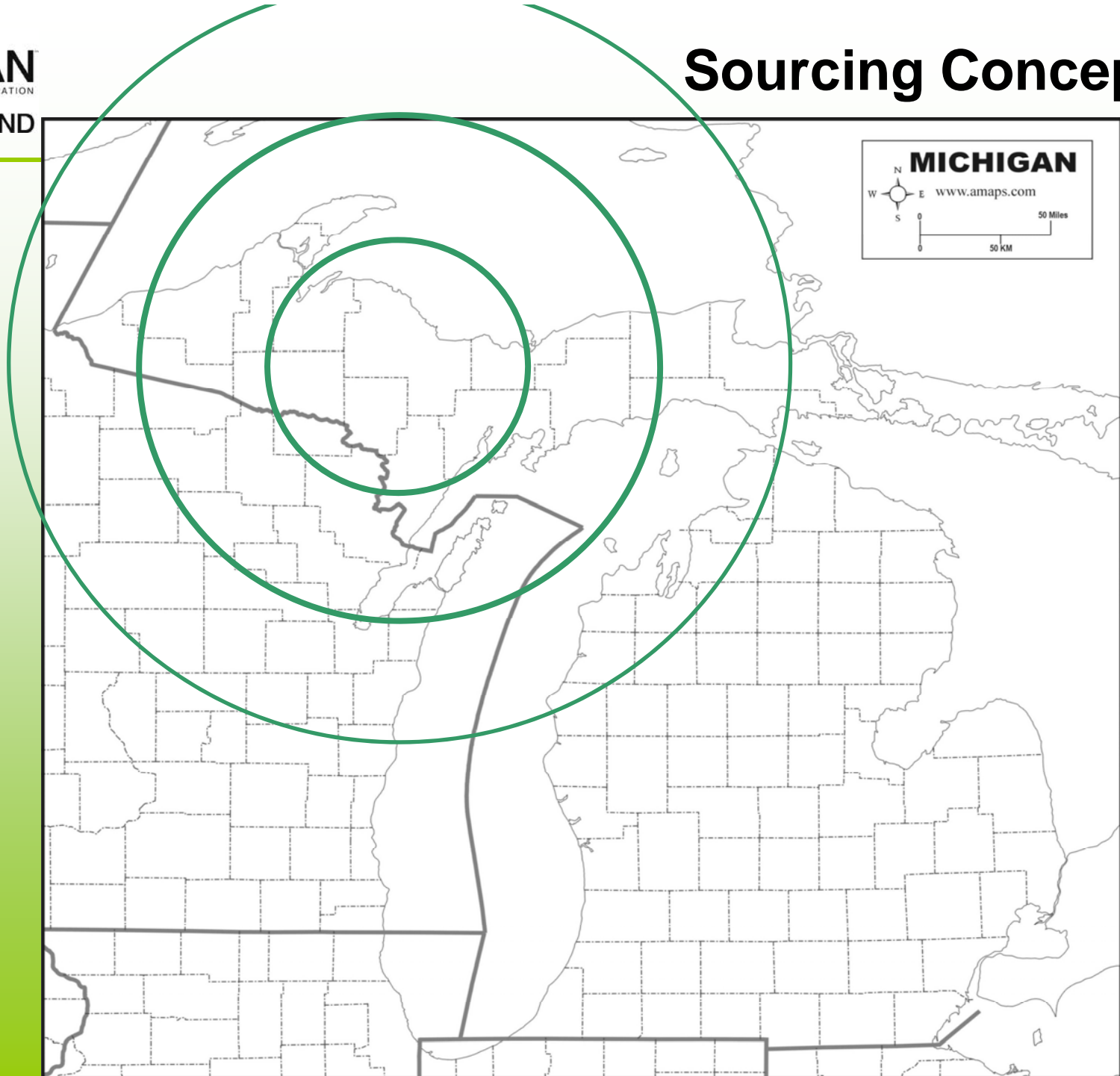
# Forest Product Primary Mills and Growing Stock Removals

With addition of operational corn-based ethanol plants, biodiesel plants  
and new publicly announced renewable energy projects



Base map produced by the Michigan Department of Natural Resources

# Sourcing Concept



# **Decisions Impact Other Decisions**

## Discussion Starters: Regional Bioenergy Strategy

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- Knowledge publicly announced project biomass needs
- Legal requirements
- Common policy issues (e.g. definition of renewable biomass)
- Energy crops
- ?
- ?
- ?