


Minnesota Statewide Conservation and Preservation Plan
Energy Production & Use/ Mercury Team
 7/17/08

INSTITUTE ON THE ENVIRONMENT

UNIVERSITY OF MINNESOTA

Planning Bonestroo

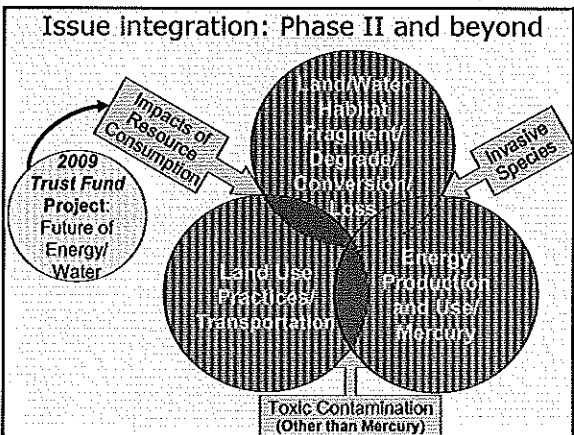
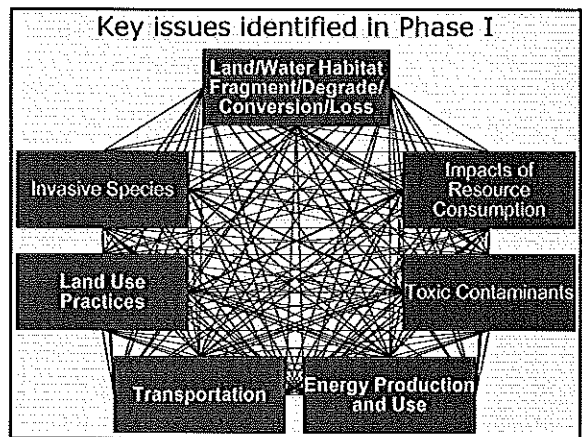


Presenters/Team Members

- Deb Swackhamer, Univ. of Minnesota
- Dave Mulla, Univ. of Minnesota
- Bill Berguson, Univ. of Minnesota, NRRI
- Laura Schmitt Olabisi, Univ. of Minnesota

Goals of the Project

- Comprehensive inventory and assessment of Minnesota's environment and natural resources
- Review, analyze, integrate, & build upon existing information and plans pertaining to Minnesota's environment and natural resources
- Identify & prioritize important issues and trends affecting MN's environment and natural resources
- Develop and prioritize recommendations for strategies to best address issues and trends



Interconnections

	Habitat	Land Use	Energy	Consumption	Toxics	Transportation	Invasives
Air		✓	✓	✓	✓		
Water	✓	✓	✓	✓	✓	✓	✓
Land	✓	✓	✓	✓	✓		✓
Fish	✓	✓	✓	✓	✓	✓	✓
Wildlife	✓	✓	✓	✓	✓	✓	✓
Recreation	✓	✓	✓	✓	✓	✓	✓

Phase II Products

- Priority area mapping
- Recommended conservation strategies
- Trend analysis supporting recommendations
- Evaluating conservation strategies

Phase II Project Organization

Project Coordinators

Core Management Team

Research Teams			
	Land & Aquatic Habitat Conservation	Land Use Practices/ Transportation	Energy Production and Use/Mercury
Team members			
Partners/ Advisors			

Information, Data, Geographic Information Systems

Outreach

Cost Benefit Analysis

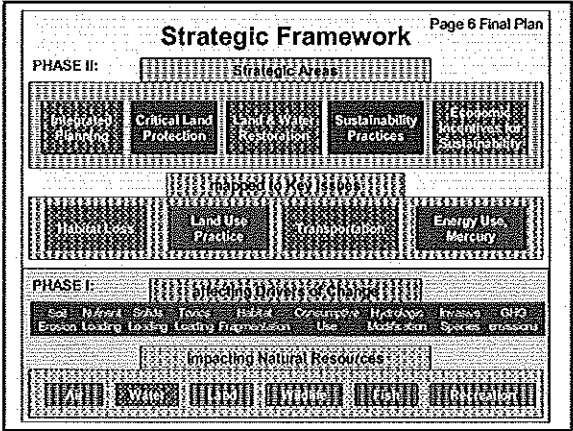
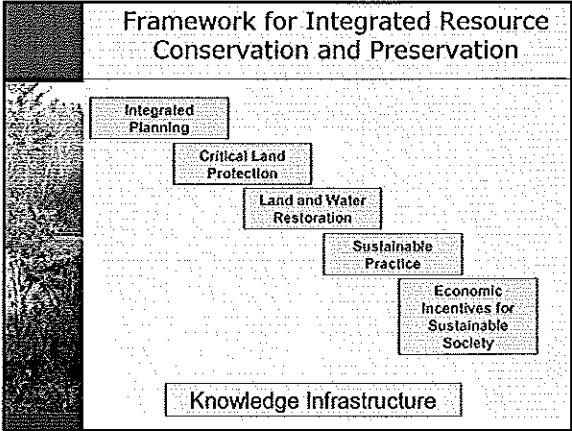
Phase I & II team members and project advisors

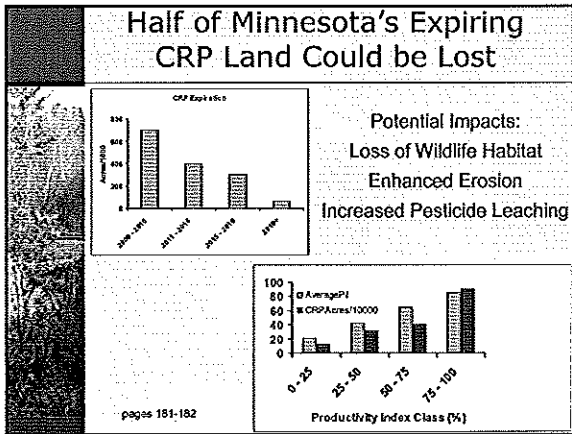
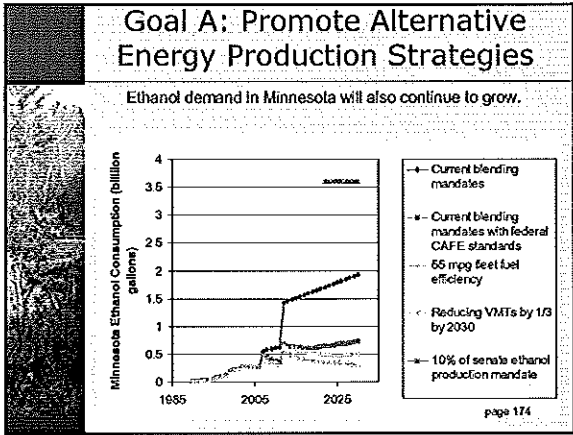
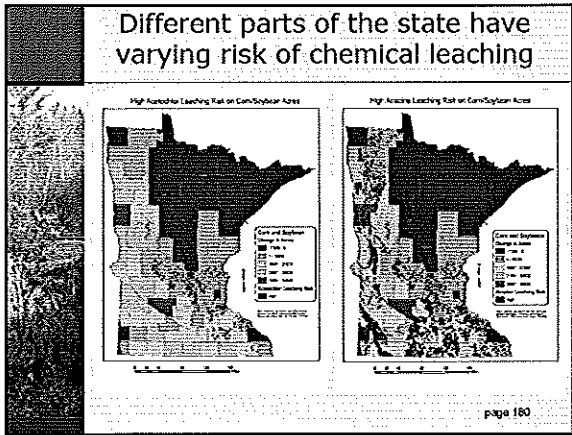
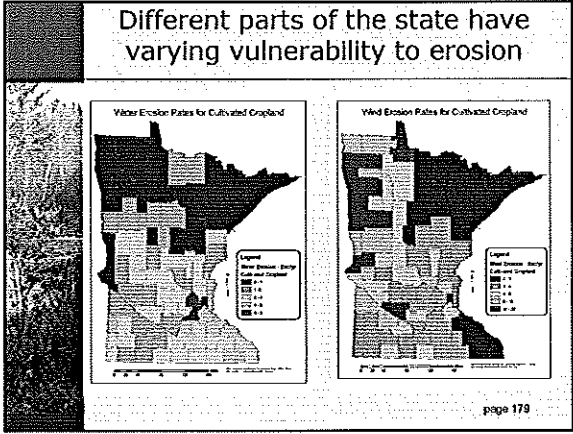
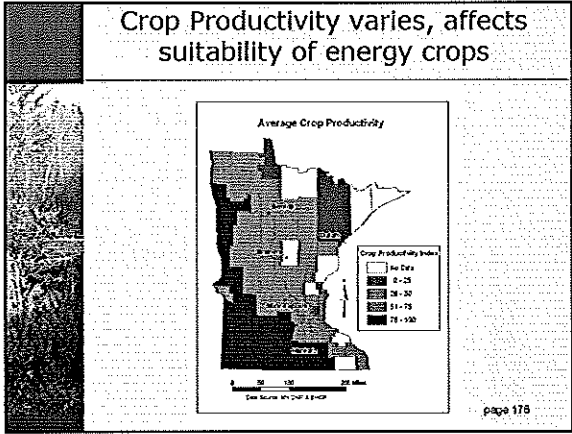
Over 100 scientists, professionals, agency staff, and citizen groups involved from the beginning of the project

	Land & Aquatic Habitat Conservation	Land Use Practices/ Transportation	Energy Production and Use/Mercury	Cost Benefit Analysis	GIS and Data Support
University of MN	25	15	15	5	15
Bonestroof/ CR Planning	5	3			4
Citizen groups	7	11	4		
Agency staff	7	5	3		

Complementary efforts

- There are many complementary efforts such as:
 - Clean Water Council
 - Great Outdoors Minnesota/ Campaign for Conservation
 - MN Climate Change Advisory Group
 - Lake Pepin TMDL process
 - Regional Council of Mayors sustainability initiative
- Multiple State agency efforts
- We have reviewed and learned from their efforts





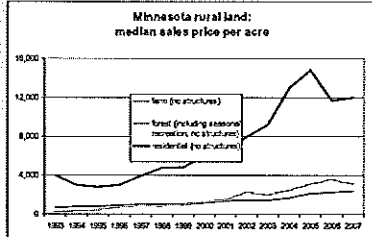
Goal A: Promote Alternative Energy Production Strategies

Energy 1 (p. 184): Develop coordinated laws, policies, and procedures for governmental entities to assess renewable energy production impacts on the environment

- Biennial report to legislature
- Ensure that efforts to achieve state goals align & allow policymakers to choose strategies that address multiple goals (e.g. GHG reduction, wildlife habitat provision)
- Legislative Electric Energy Task Force recommendation for better coordination on energy issues

Goal A: Promote Alternative Energy Production Strategies

Energy 2 (p. 185): Invest in farm and forest preservation efforts to prevent fragmentation due to development, guided by productivity and environmental vulnerability research (Similar to Land Use Forestry Rec. #1)



Land prices are major driver of fragmentation

Minnesota Forest Resources Council currently studying issue

Source: Mines of a Land Economics

Goal A: Promote Alternative Energy Production Strategies

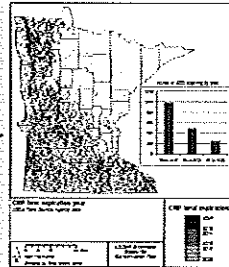
Energy 3 (p. 186): Invest in perennial biofuel and energy crop research and demonstration projects on a landscape scale

- Improve yields
- Develop BMP's for perennial crops
- Figure out 'what to plant where'
- Identify economic costs, benefits & barriers
- Evaluate biomass availability & sustainable production rates by eco-region *while considering potential climate change*

Goal A: Promote Alternative Energy Production Strategies

Energy 4 (p. 188): Develop policies and incentives to encourage perennial crop production for biofuels in critical environmental areas (such as expiring CRP lands)

CRP land in Minnesota by year of expiration



Goal A: Promote Alternative Energy Production Strategies

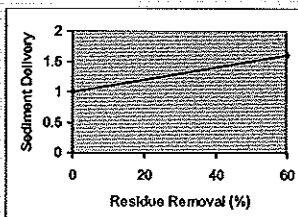
Energy 5 (p. 189): Invest in data collection to monitor/assess the cumulative impact of energy production on the environment (similar to Land Use Community Rec. #2; Habitat Rec. #9; Energy Rec. #9)

We need information on:

- water quality
- water resource sustainability
- wildlife habitat & biodiversity (in perennial landscapes, for example)
- Invasive species
- land use change
- soil quality changes under perennials
- infrastructure & storage needs for alternative fuels
- greenhouse gas emissions

Goal A: Promote Alternative Energy Production Strategies

Energy 6 (p. 190): Invest in research to determine sustainable removal rates of corn stover and to establish incentives and BMPs



Amount of corn stover removed affects erosion and soil carbon content

Goal A: Promote Alternative Energy Production Strategies

Energy 7 (p. 191): Invest in research to review thermal flow maps and determine potential for geothermal power in Minnesota

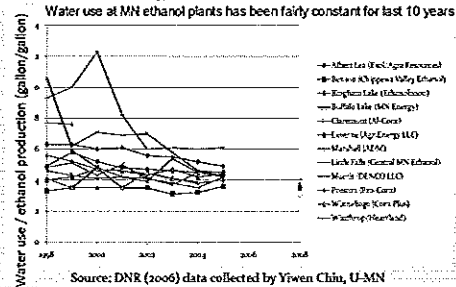
Current maps may underestimate heat flow due to sampling techniques; should be evaluated by MGS, NRRI.



From U.S. DOE

Goal A: Promote Alternative Energy Production Strategies

Energy 8 (p. 192): Invest in applied research to reduce energy and water consumption and greenhouse gas emissions in ethanol plants, and encourage implementation of these conservation technologies



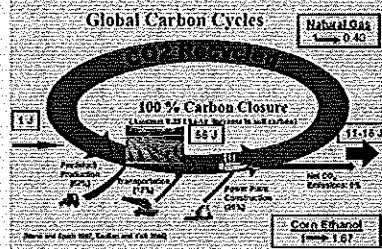
Goal A: Promote Alternative Energy Production Strategies

Energy 9 (p. 193): Invest in research to determine the life cycle impacts of renewable energy production systems

- on the economy
- on GHG emissions
- water consumption
- water quality
- carbon sequestration
- gene flow risks
- wildlife populations

Goal A: Promote Alternative Energy Production Strategies

Energy 10 (p. 194): Invest in research and demonstration projects to develop, and incentives to promote, combined wind power/biomass, wind power/natural gas, and biomass/coal co-firing electricity projects



Goal A: Promote Alternative Energy Production Strategies

Energy 11 (p. 195): Invest in research and enact policies to protect existing native prairies from genetic contamination by buffering them with neighboring plantings of perennial energy crops

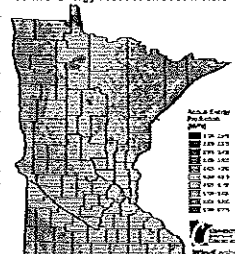
- Some energy crops have characteristics of invasive species
- We don't know yet how introduced species will behave in Minnesota

Energy 12 (p. 196): Invest in efforts to develop sufficient seed or seedling stocks for large-scale plantings of native prairie grasses and other perennial crops

Goal B: Promote a Healthy Economy

Community-owned wind power is posited to have a greater beneficial impact on the economy compared with corporate-owned wind power

Minnesota's Wind Resource by Estimated Annual Energy Production at 80 Meters



Goal B: Promote a Healthy Economy

Energy 13 (p. 196): Invest in research and policies on implementation strategies and optimal pricing schemes for 'green payments.' These 'green payments' may be applied to perennial energy crop production.

- Implemented on expiring CRP land, impaired watersheds, DNR working lands, environmentally sensitive or low productivity areas
- Multiple tiered payments for
 - water quality
 - carbon sequestration
 - wildlife habitat
 - fuel production

Goal B: Promote a Healthy Economy

Energy 14 (p. 197): Investigate opportunities to provide tax incentives for individual investors in renewable energy (e.g. for individuals who wish to install solar panels).

- Example: Massachusetts tax rebate program allows homeowners to pay off costs of solar panels within 5-8 years; also earmarks funds for installation in government buildings
- Minnesota C-BED program encouraging community wind power
- Could stimulate job creation and economic output in Minnesota

Goal B: Promote a Healthy Economy

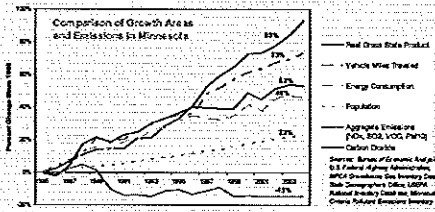
Energy 15 (p. 198): Invest in efforts to develop, and research to support, community-based energy platforms for producing electricity, transportation fuels, fertilizer, etc. that are locally/ cooperatively owned.

Example: U of M Morris



Goal C: Promote Energy Conservation Efforts

Energy consumption and CO₂ emissions are growing faster than population in Minnesota



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Goal C: Promote Energy Conservation Efforts

Energy 16 (p. 199): Provide incentives to transition a portion of Minnesota's vehicle fleet to electrical power, while simultaneously increasing renewable electricity production for transportation

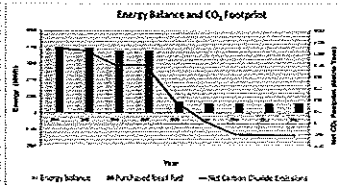
Would provide multiple benefits:

- Help Minnesota meet its GHG reduction goals
- Improve human & ecosystem health through reduction of particulates, ozone
- Stimulate economy by providing jobs, economic output in renewable electricity & vehicle maintenance
- In combination with other strategies, could help to stabilize commodity prices & relieve pressure on the landscape

Goal C: Promote Energy Conservation Efforts

Energy 17 (p. 200): Promote policies and incentives that encourage carbon-neutral businesses, homes, communities

Ex: U of M Morris combining wind power w/biomass gasification

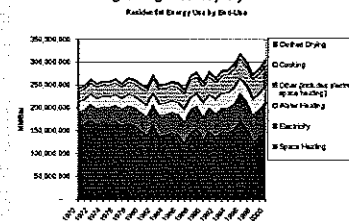


J. Tafakian & L. Resmussen, "Integrating Wind and Biomass to Manage Carbon Emissions"

Goal C: Promote Energy Conservation Efforts

Energy 18 (p. 201): Implement policies and incentives to lower energy use of housing stock

In Minnesota, most home energy use is for heating, but electricity use is growing most rapidly



Goal C: Promote Energy Conservation Efforts

Energy 19 (p. 202): Promote policies and strategies to implement smart meter and smart grid technology

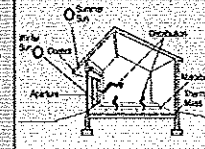
- Example: Xcel Energy is working with partners to make Boulder, CO a 'smart grid' city
 - new infrastructure allowing two-way communication through the grid
 - controlled power usage helps to eliminate 'peaker' plants
 - consumers may install devices to monitor and fully automate home energy use
 - good for accommodating distributed generation
 - would support plug-in vehicles

Goal C: Promote Energy Conservation Efforts

Energy 20 (p. 202): Develop incentives to encourage widespread adoption of passive solar and shallow geothermal systems in new buildings

Shallow Geothermal Energy for heat and cold

Other building in Munich, DE



Feeding and cooling 28 beds each 41 m², operational since 2003

Feeding capacity 58 MW
Cool for cooling in summer 2003 (c. 280 t/0.12 €/t)

European Geothermal Energy Council

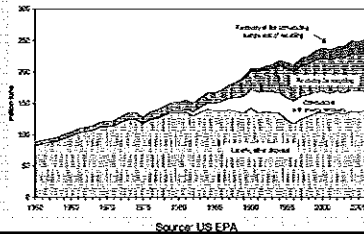
Elements of passive solar design, shown in a direct gain application (from DOE Distributed Energy Program)

Goal C: Promote Energy Conservation Efforts

Energy 21 (p. 203): Develop standards and incentives for energy capture from municipal solid and sanitary waste, and minimize landfill options for MSW.

National recycling and waste combustion efforts have increased dramatically since the 1980s, but so has our waste generation—we could do a lot more!

Figure 26. Municipal solid waste management, 1960 to 2006



Goal C: Promote Energy Conservation Efforts

Energy 22 (p. 204): Invest in public education to promote energy conservation efforts by individuals, businesses

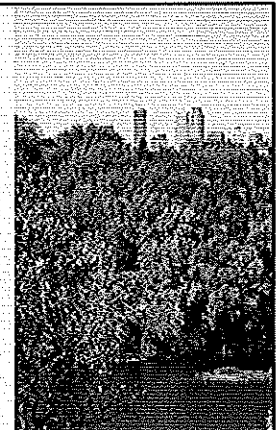
- MIT study: about half of our carbon emissions in the U.S. due to system infrastructure; half due to individual choices
- The 'big three' carbon generating activities: transportation, housing, food
- Avoiding the 'rebound effect'

Energy Team Conclusions

- The recommendations made are a start for the state -- other actions likely will be important as we move into the future
- Many alternative energy scenarios exist -- Biofuel energy production alone is not sufficient
- Policy changes are needed to ensure that perennial biofuels can be grown for renewable energy and environmental benefits, while maintaining production of other annual crops for food, feed and fiber

Project Goal

To achieve a better future for Minnesota's natural resources




Thank You!

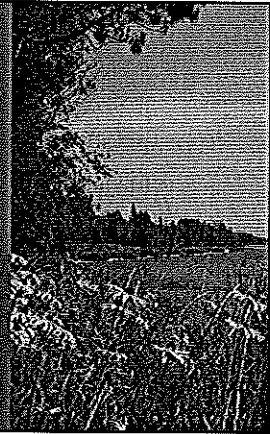
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CR Planning
Consistency
Recovery

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