

The Center for Integrated Natural Resources and
Agricultural Management

Restoring Hydrologic Stability and Meeting TMDLs in the Minnesota River:

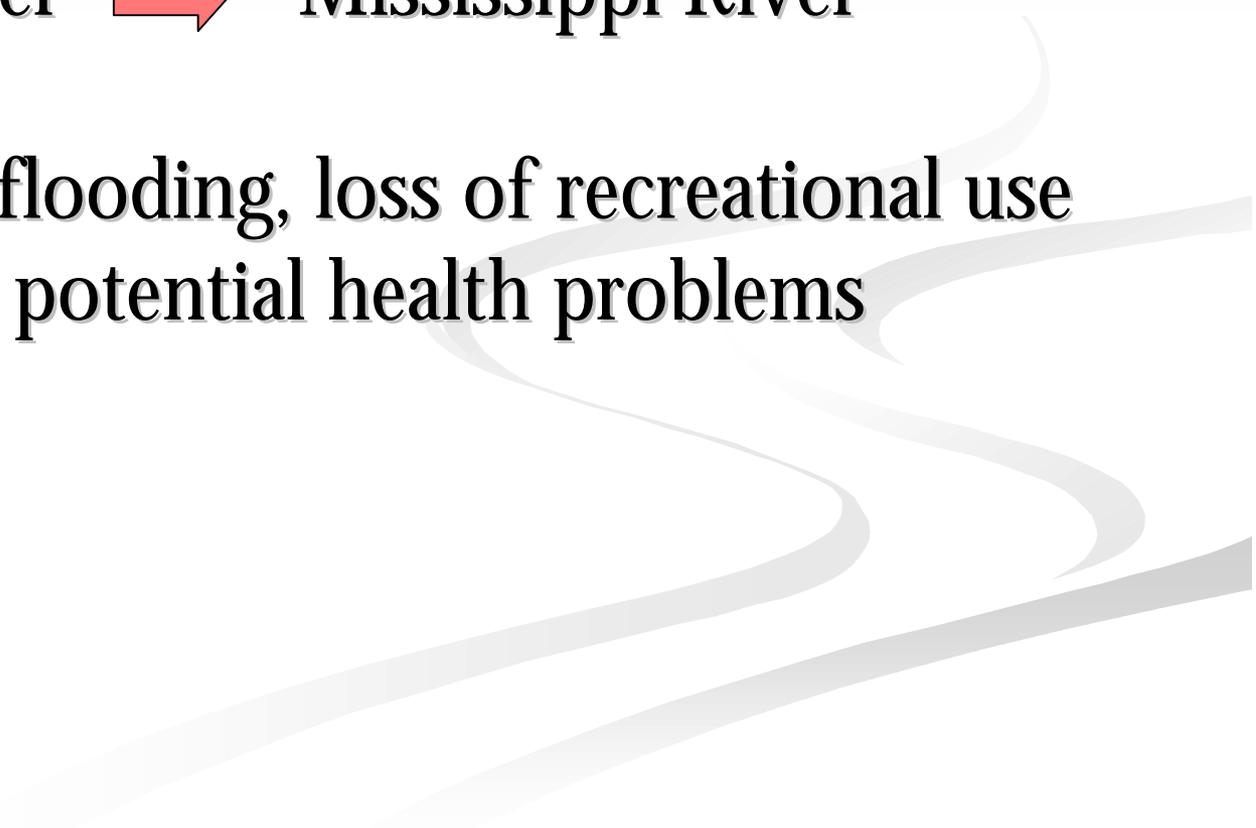
Can Perennial Crops Provide an Economically Viable Solution?



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Problems

- High levels of nutrients and chemicals in the Minnesota River → Mississippi River
 - Water quality, flooding, loss of recreational use and actual and potential health problems
- 

Roots of the problem

Changing landscapes

Dependence on two annual crop system

Widespread agricultural drainage

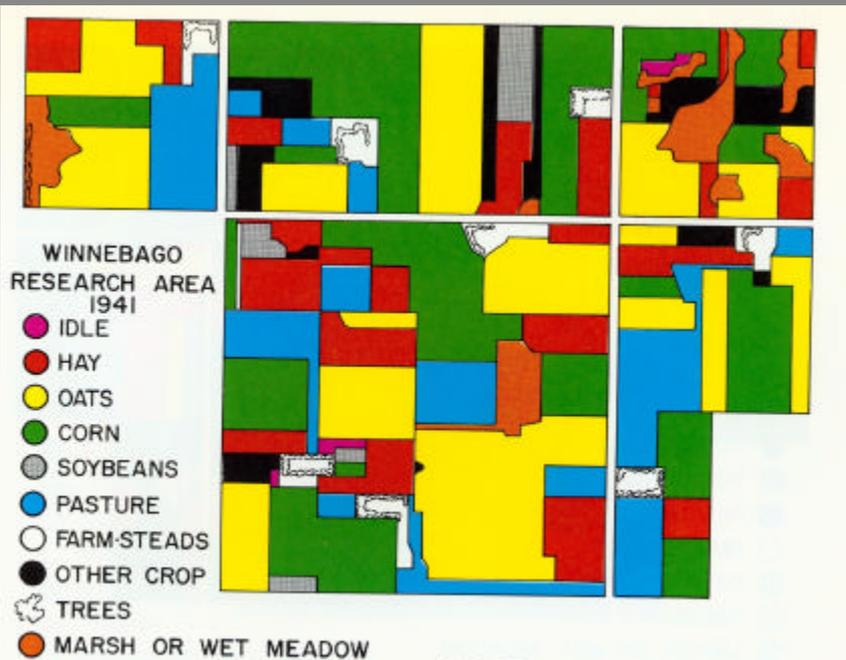


Figure 19. Cover map of the Winnebago pheasant study area, 1941.

1941

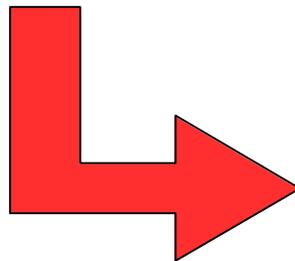
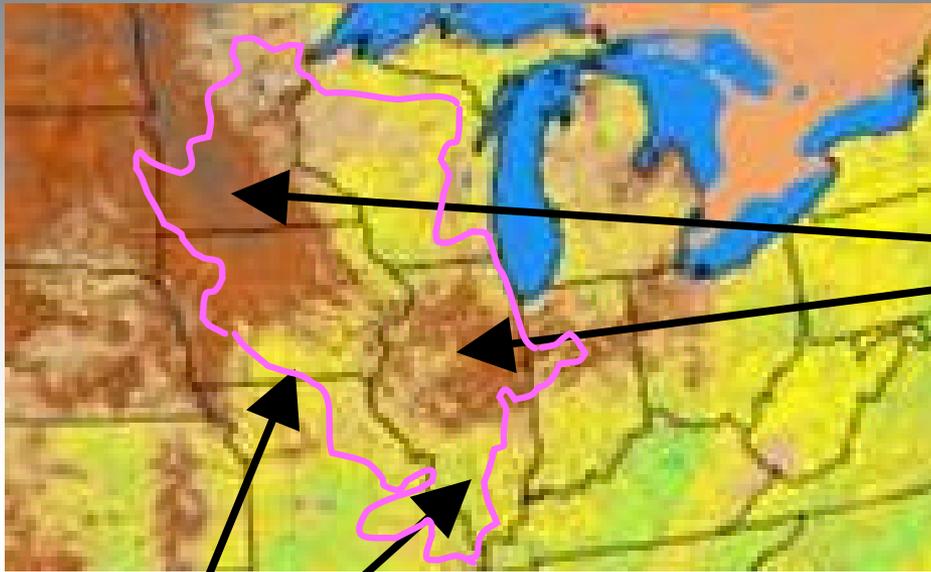


Figure 23. Cover map of the Winnebago pheasant study area, 1976.

1976

Why perennials?

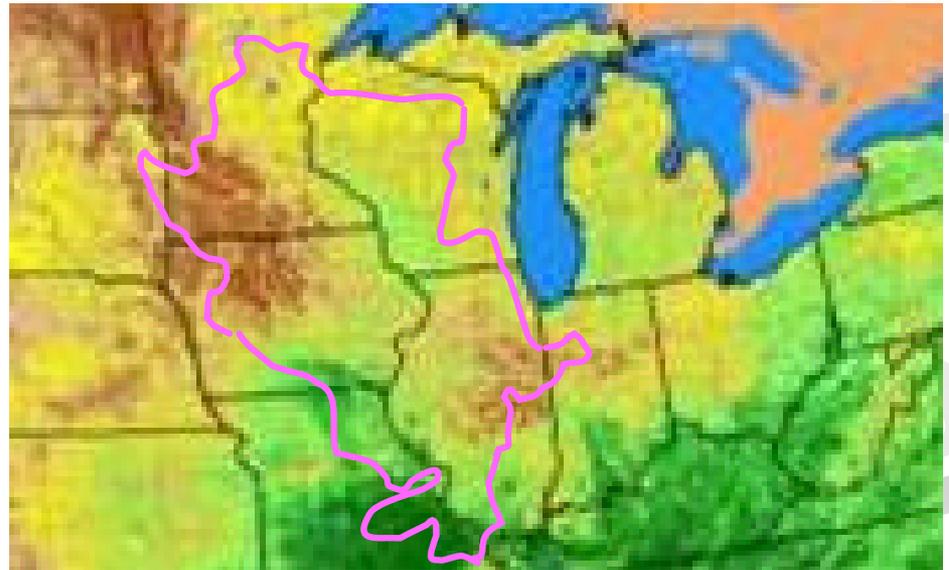
The background features several light gray, wavy, horizontal lines that flow from the right side towards the left, creating a sense of movement and depth.



**Areas of annual
Row cropping**

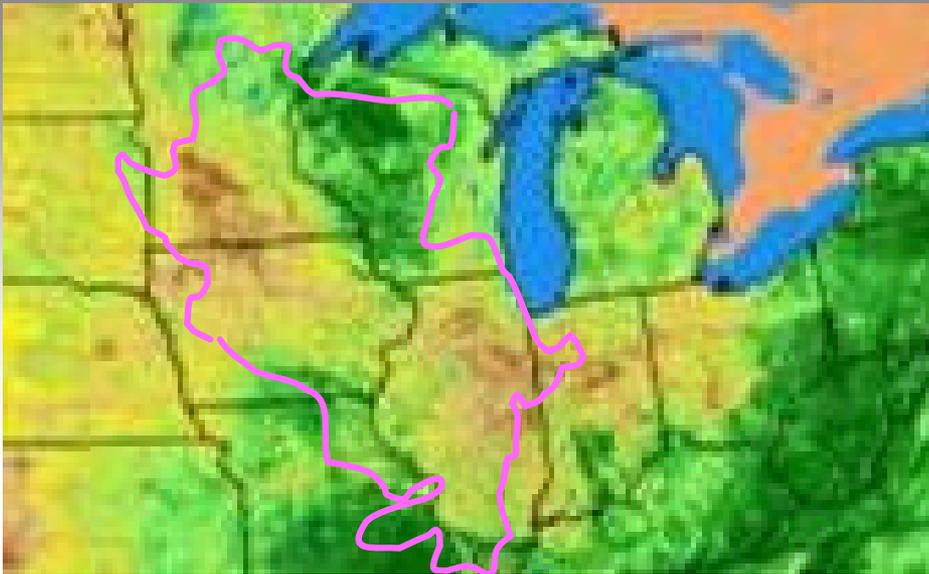
April 5 - 18

**Areas of perennial
vegetation**

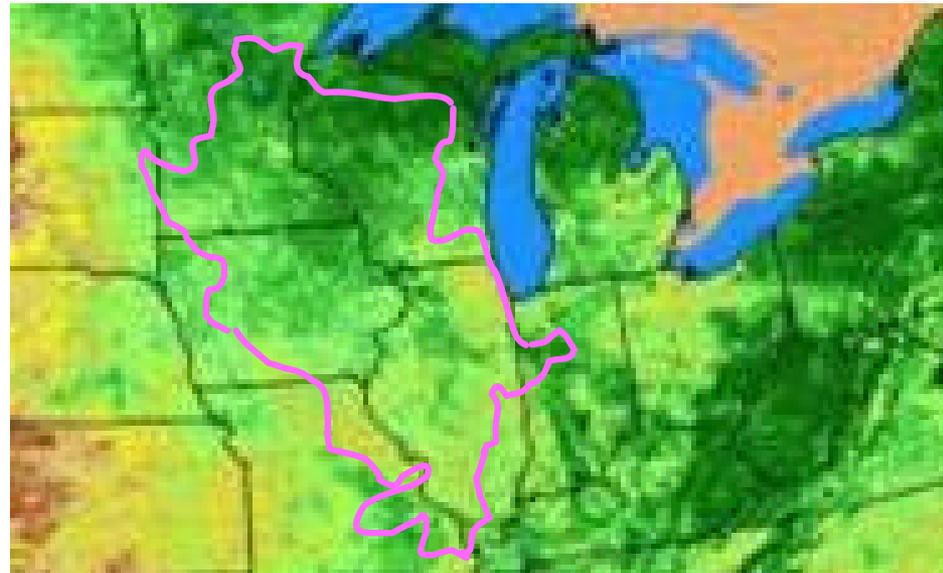


May 3 - 16

2002 Growing Season

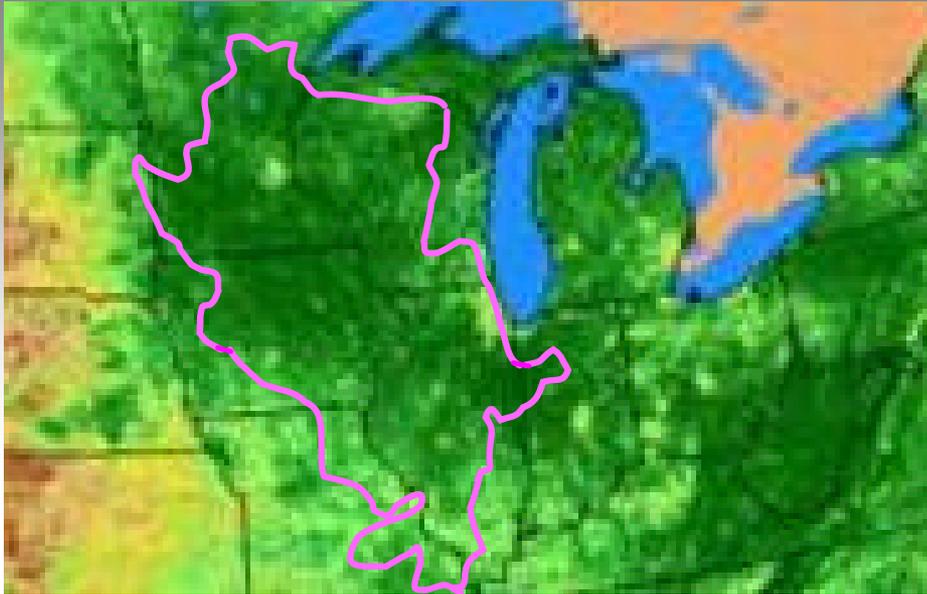


May 31 – June 13

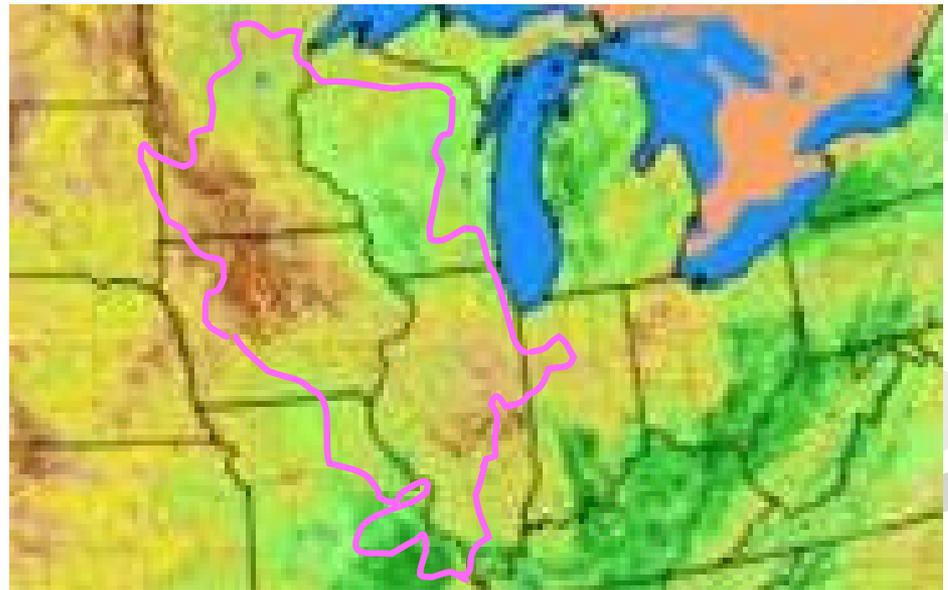


June 28 – July 11

2002 Growing Season



July 26 – August 8



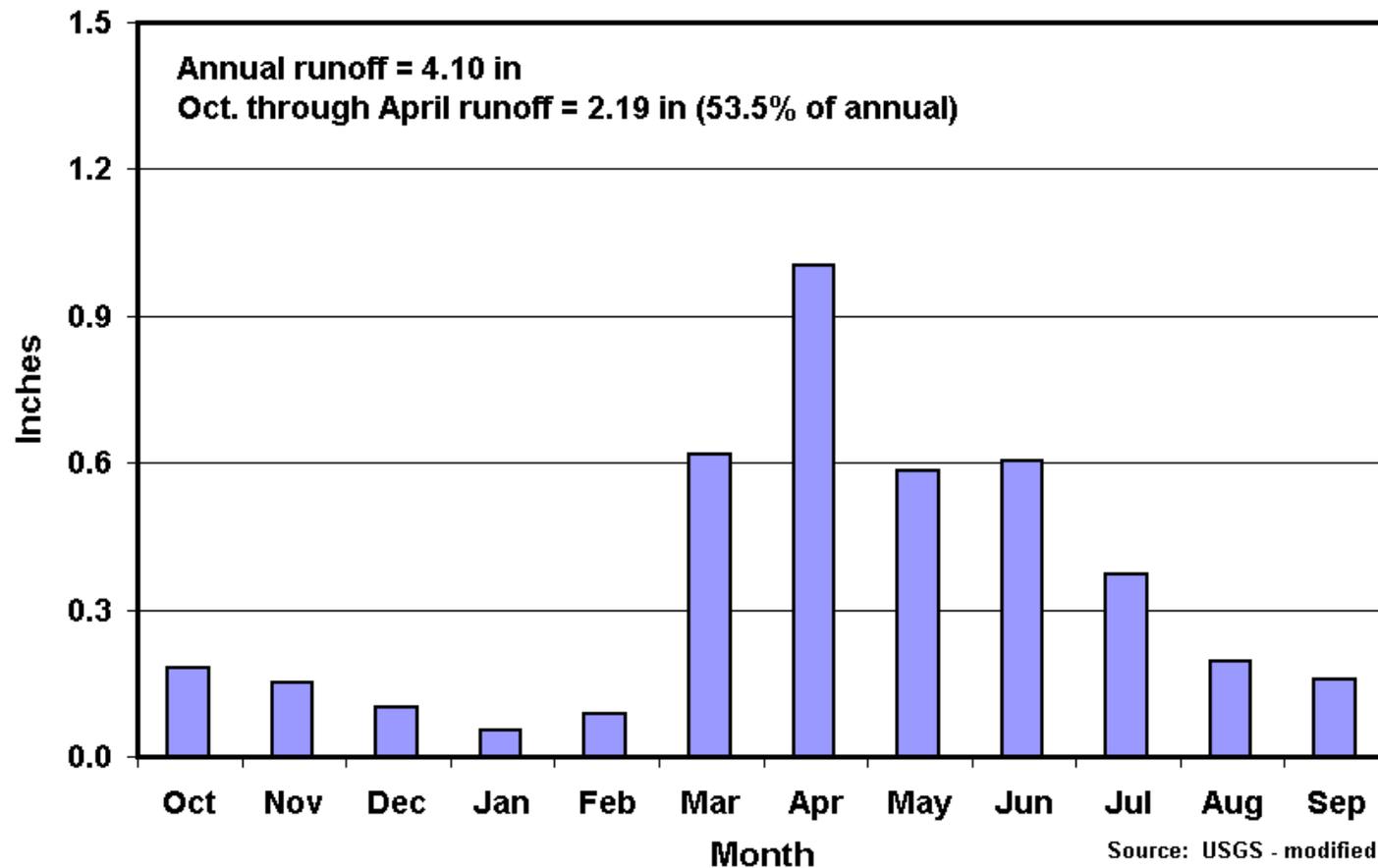
October 4 - 17

2002 Growing Season

Cottonwood River Watershed Runoff

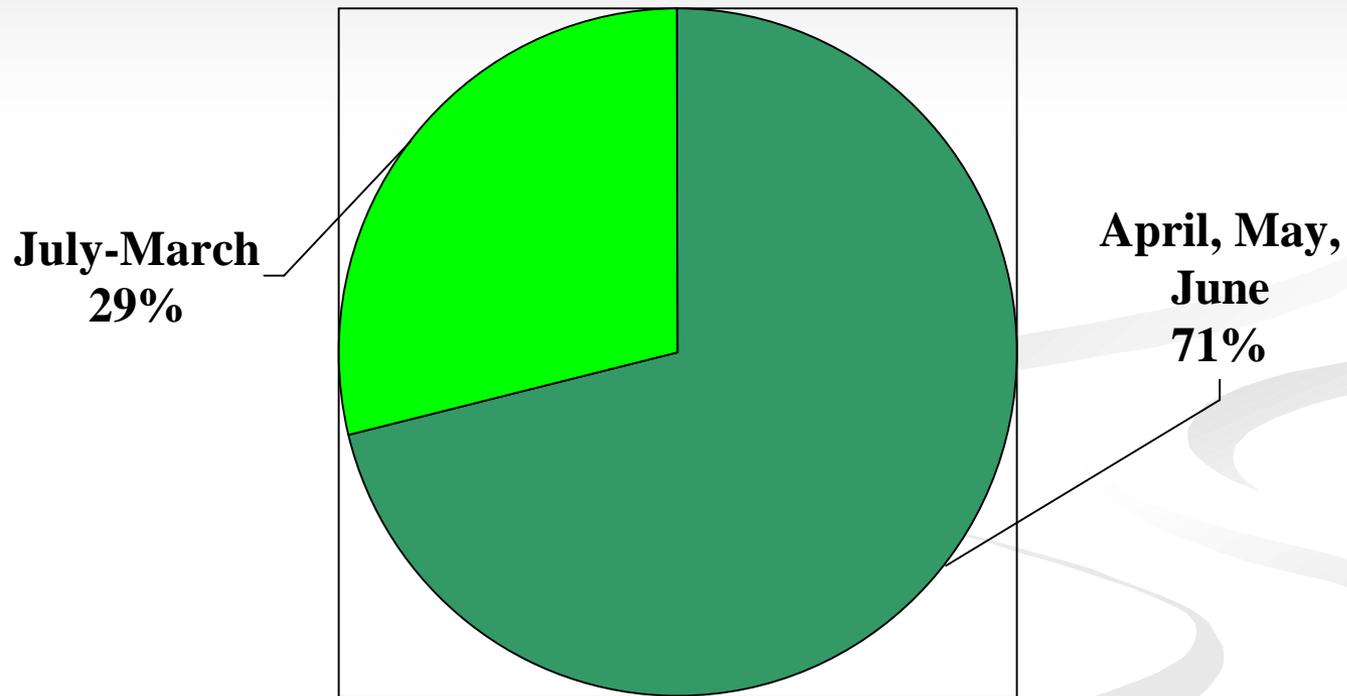
Monthly Runoff in the Cottonwood River Watershed

1939-1998



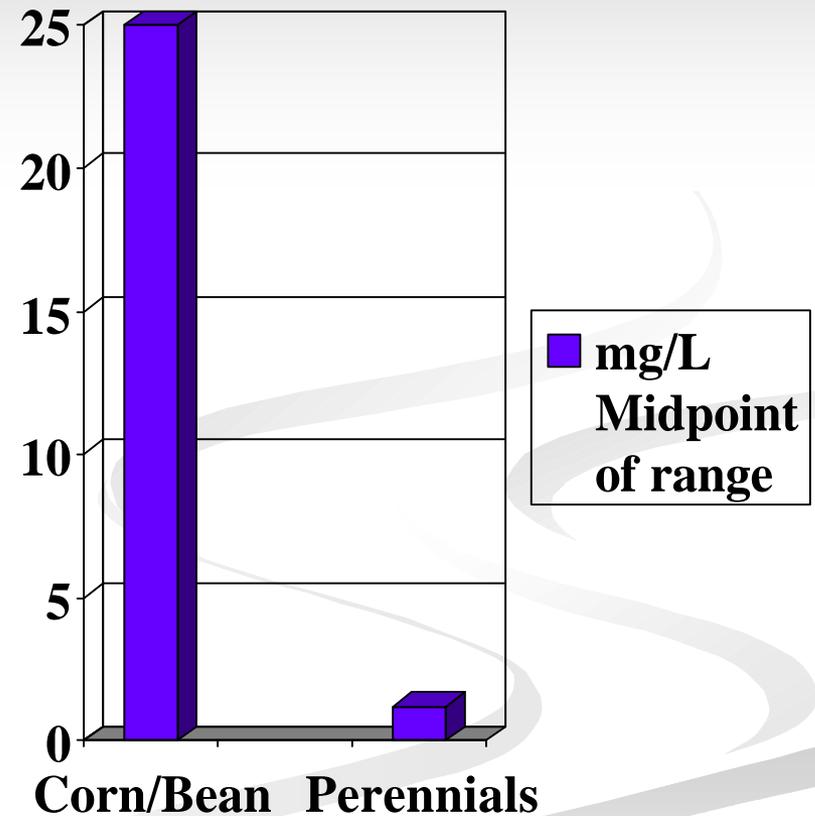
Annual Tile Drainage Loss in Corn-Soybean Rotation

Waseca, 1987-2001



Corn and Soybean Nitrate-N Loss Concentrations

- Tile drainage system
- U of MN - Lamberton



Potential Solutions

- BMP's part of the solution but not sufficient
 - Since 1993, BERBI has implemented approximately \$7,000,000 in traditional BMP's
 - Resulting in a pollution loading **reduction of an estimated 8%** from the Blue Earth River, but...
 - To meet local, state and federal water quality goals we need to reduce the loading by about 40%¹, **so..**
- **Introduce perennial crops in targeted areas of the watershed – Landscape change**

¹ **Source:** Linda Meschke, Executive Director – BERBI and Rural Advantage

CSREES Integrated Watershed Management Project

- “Improving Water Quality and Enhancing Hydrologic Stability of the Minnesota River through Agroforestry and Other Perennial Cropping Systems”
- Initiated in September of 2002
- Research, Outreach and Extension
- Interdisciplinary UMN team working closely with out state partners

Research/Outreach

- Hydrology – Modeling impact of perennial crops on water quality and storage
- Agronomy – Production of perennial crops
- Economics
 - Financial costs and benefits of perennial crops
 - Economic impacts of crops and potential for PES
 - Enterprise development
- Outreach/social
 - Learning groups/adoption
 - Policy options

Leveraging research support

- Green Lands, Blue Waters Initiative
- USDA/UMN/XCEL – Biomass energy options
- MN-LCMR – Trial plantings and monitoring
- MN-PCA – TMDL development and monitoring of trial plantings
- SARE – Support to learning groups
- MN-DA – Trial woody biomass plantings

Preliminary results

Hydrologic and economic research and
outreach through learning groups

Benefit estimates

Benefit category	Unit	Low	Best	High
Flood control	\$/acre	11.66	35.06	100.36
Income generation (net)	\$/acre	<0.00	--	587.56
Savings in dredging costs	\$/CY	--	6.50	--
Savings in ditch cleaning	\$/foot	--	--	65.00
Recreational benefits	\$/h'hold	--	11.80	59.87
Cost savings TMDL	\$/kg.	<0.00	--	7.89

Analysis on Cottonwood W'shed

Scenario (damages calculated on 50-50 corn bean rotation)	Ag. damage /acre (US\$)	Expected annual area flooded (acre)	Expected annual damage reduction (US\$)
Existing condition	151	66	--
86% drained corn	151	65	100
11% hybrid poplar	140	64	1,087
59% hybrid poplar	82	60	5,116
86% hybrid poplar	51	59	7,043

Learning Groups - Approach

- Linking the expertise of UMN with the experience and insights of partners leading to:
 - More diversified agricultural and natural resource production base
 - Increased profitability for landowners
 - Enhanced environment/ecosystem
 - Strengthened rural communities
- Contribute to the design and promotion of feasible, profitable cropping options

Learning groups

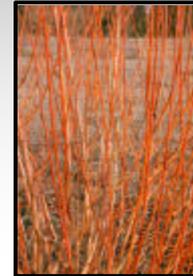
- Four groups focused on locally identified interests;
 - **hazelnut** and **native seed production** in the Greater Blue Earth watershed (BERBI)
 - **decorative woody florals** and **healthy meats/rotational grazing** in the Chippewa River watershed (LSP)
- Members of the groups
 - Interested farmers
 - Agency personnel (SWCD, NRCS, MPCA, DOT and DNR)
 - UMN extension and research personnel,
 - NGO's concerned with water quality and diversified cropping systems such as BERBI, IATP and LSP.
 - Health practitioners from government, schools

Hazelnut working group

- Hazelnuts are a promising option
 - Good potential market and the ongoing efforts of Badgersett Research Farm
- Activities of group
 - Bring together interested parties
 - Identify issues that need to be addressed
 - Move forward addressing those issues (research, policy issues, propagation, information exchange)
 - Defining the research agenda
 - Proposal development
 - Enterprise development – cracking facility
 - Partners taking on leadership

Options for different landowners

- Decorative woody florals



- Hazelnuts

- Willow and hybrid poplar/cottonwood plantings for pulp, wood products and energy



Other options

- Bioenergy
 - Rahr malting
 - Virginia Hibbing (municipal power) conversion to biomass energy
- Work with Aveda Corporation
 - Antioxidants
 - Lilac



Questions?



Integrated approach (CSREES)

