Perennialization of Agricultural Landscapes

Principal Partners: Iowa State University, University of New Hampshire, US Forest Service- Northern Research Station, Leopold Center for Sustainable Agriculture, Neal Smith National Wildlife Refuge, USDA Agricultural Research Service, National Laboratory for Agriculture and the Environment

"Center for Research on Ecosystem Change "

A research work unit of the USDA Forest Service Northern Research Station

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Issue At Hand

There is a growing recognition that intensive row crop agriculture as currently practiced in the Upper Midwest lacks both ecological resilience and socioeconomic sustainability.

A major constraint to diversifying agricultural systems is the perception that food production and environmental conservation are incompatible goals.

All photos courtesy of USDA NRCS.

The Potential of Perennials

Integrating perennial vegetation into agriculturally dominated landscapes has the potential to improve:

- Water quality and natural flood abatement,
- Natural regulation of insect pests and weeds,
- Nutrient cycling and soil quality,
- Societal health and well-being, and
- Economic opportunities.

Although benefits provided by perennials are known to be significant, information on the type, quantity, and spatial arrangement of perennials is insufficient at present to recommend optimal landscape designs.

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What We Aim To Do

We are an interdisciplinary group of scientists, with expertise ranging from ecology and hydrology to sociology and economics. We aim to provide the scientific foundation for integrating perennials into agricultural landscapes to achieve greater sustainability. Our research spans field, watershed and landscape scales within the Upper Mississippi River Basin. We expect to inform community-led initiatives on how to enhance environmental quality and socioeconomic vitality by integrating perennial vegetation within agricultural landscapes.

Summary of Perennialization Project Components

Currently, our efforts are focused on seven components that contribute to the project's long-term vision of aiding communities to transform strategic portions of the landscape to perennial plant communities and, thereby, enhance their environmental quality and socioeconomic vitality.

- Developing and testing a **watershed-scale computer simulation model** (SWAT: Soil and Water Assessment Tool) to simulate effects of perennial cover in agricultural landscapes on water quality and quantity.
- Implementing a replicated **watershed-scale field experiment** at Neal Smith National Wildlife Refuge, Prairie City, Iowa to assess the level of ecosystem services associated with perennial vegetation integrated into watersheds dominated by annual rowcrops.
- Conducting a **landscape analysis** of baseline biophysical and land use conditions with partners in the Squaw Creek and Clear Creek watersheds as a basis for developing a joint participatory research project.
- Creating **dynamic decision support tools and partnerships** to bridge the gaps among science, people, and policy in the midst of changing rural demographic and landscape patterns.
- Identifying appropriate measures of **urban stream health** focusing on riparian zone functions and water quality.
- Assessing stakeholder perceptions of alternative landscapes and implications for enhancing **economic benefits** through increasing perennial cover.

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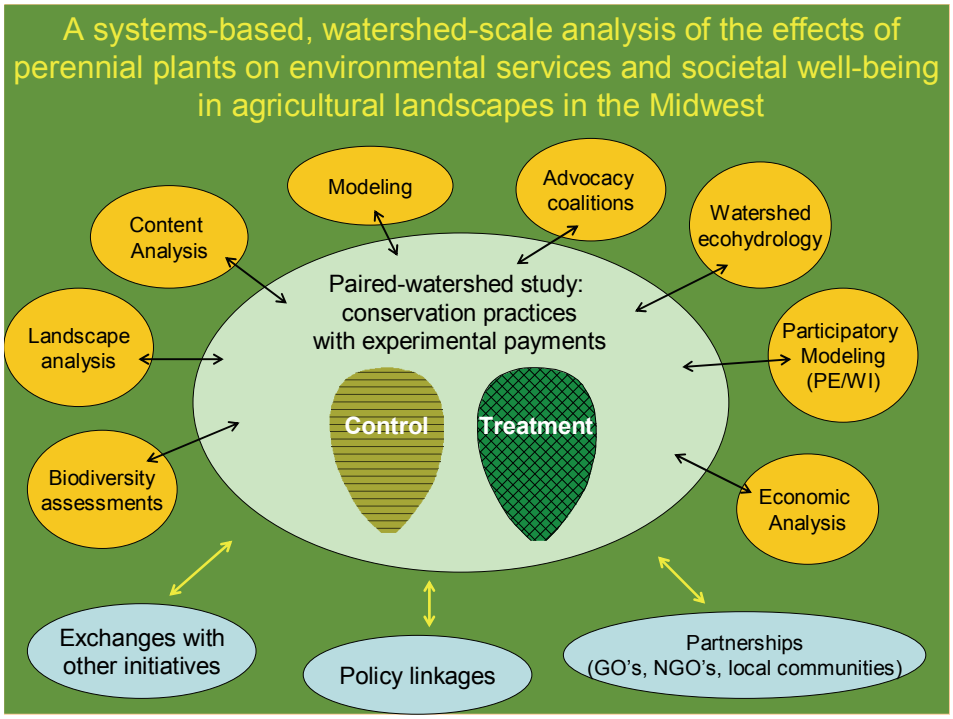
Future Directions of the Perennialization Project

Research conducted within each of these components is continually shared to inform and guide the overall project. The integration of knowledge, methods, and partnerships is providing a foundation for the development of an interdisciplinary paired watershed experiment (see figure below). Experimental watersheds for this future study will be located within the Upper Mississippi River Basin and will be selected based on priority sites identified in the regional water quality modeling (Study 1 on previous page). Priority sites are expected to benefit maximally from the conversion of strategic portions of the watershed to perennial cover.



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