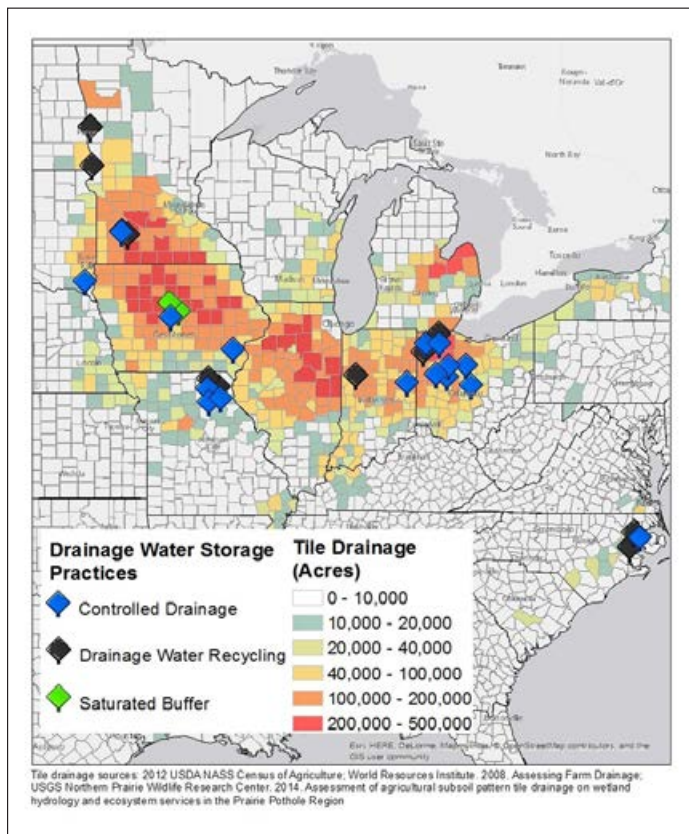# Managing Water for Increased Resiliency of Drained Agricultural Landscapes

sometimes TOO MUCH ...sometimes NOT ENOUGH

About 25% of US cropland is drained, and it's some of the most productive land in the world. But in any given year, such land is still at risk to both water excess and water deficit. Limited crop productivity and water quality concerns are among the consequences. Future climate change is expected to bring more intense rainfall and prolonged summer droughts, making problems worse. Storing drained water within the landscape could increase the sustainability of water for agriculture, producing positive impacts for crop production as well as the environment.

Drainage Water Storage Practices

◆ Controlled Drainage
◆ Drainage Water Recycling
◆ Saturated Buffer

Tile Drainage (Acres)
- 0 - 10,000
- 10,000 - 20,000
- 20,000 - 40,000
- 40,000 - 100,000
- 100,000 - 200,000
- 200,000 - 500,000

Tile drainage sources: 2012 USDA NASS Census of Agriculture; World Resources Institute. 2008. Assessing Farm Drainage; USGS Northern Prairie Wildlife Research Center. 2014. Assessment of agricultural subsoil pattern tile drainage on wetland hydrology and ecosystem services in the Prairie Pothole Region

The project

Who, what: A 5-year, 8-state project led by a core group of 15 leading agricultural engineers, soil scientists, agronomists, economists, social scientists, and database and GIS specialists with a common vision — to transform the way drainage is implemented across the agricultural landscape.
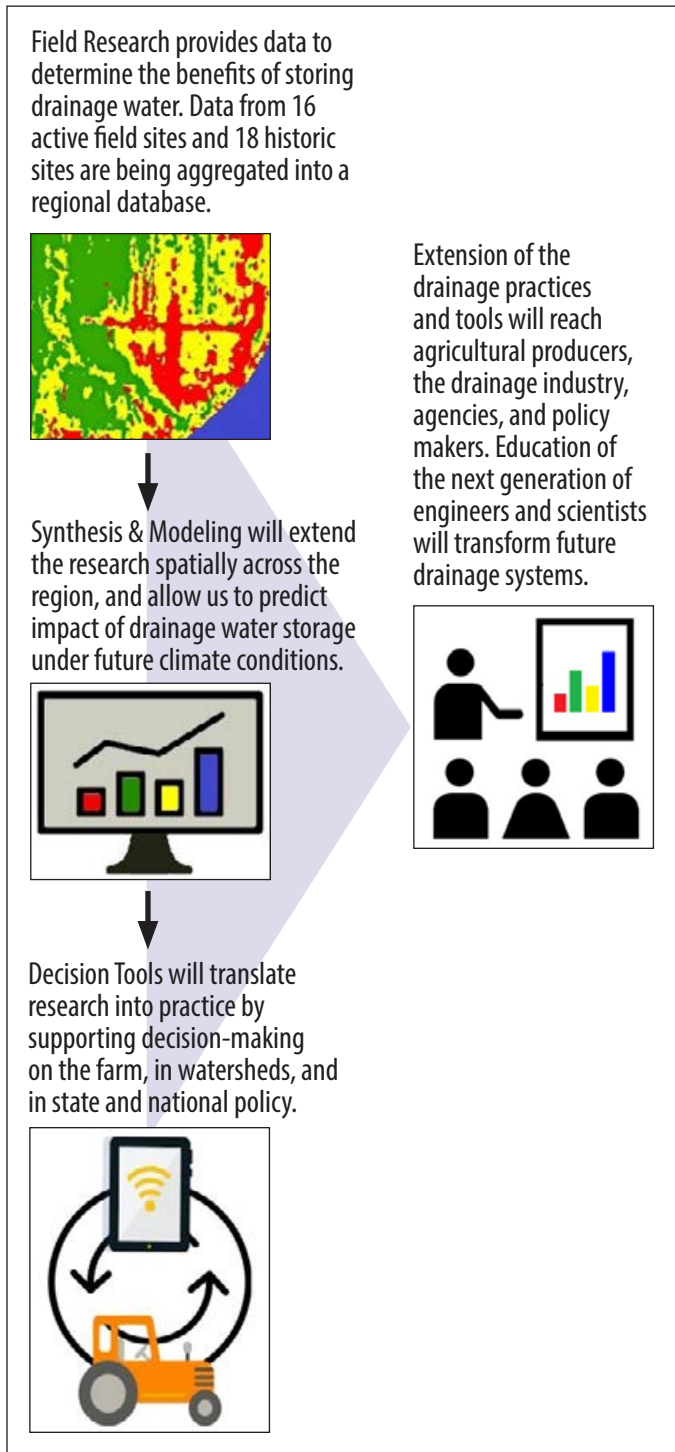
What we hope to see:

- Drainage system engineers and designers consider storage of water in the landscape for each design.

- On-farm ponds able to capture drainage water and provide supplemental irrigation (aka drainage water recycling) will be found throughout the drained landscape.

- By adopting water storage practices, farmers will be more resilient to climate change, and agriculture will be more sustainable.

The approach

Transforming Drainage is a collaborative field research and synthesis effort that brings together historic and current agronomic, hydrologic, and climate data from across the Corn Belt. This multi-state database will provide the foundation for new decision support tools to guide the implementation of drainage water storage practices. It also will fuel Extension and educational efforts that will bring about greater awareness and understanding among drainage professionals, agricultural engineers, and producers of agricultural water sustainability.

Field Research provides data to determine the benefits of storing drainage water. Data from 16 active field sites and 18 historic sites are being aggregated into a regional database.

Synthesis & Modeling will extend the research spatially across the region, and allow us to predict impact of drainage water storage under future climate conditions.

Decision Tools will translate research into practice by supporting decision-making on the farm, in watersheds, and in state and national policy.

Extension of the drainage practices and tools will reach agricultural producers, the drainage industry, agencies, and policy makers. Education of the next generation of engineers and scientists will transform future drainage systems.

The Team

Project Director: Jane Frankenberger, Agricultural Engineer, Purdue University

Project Manager: Ben Reinhart, Purdue University

Iowa State: Matt Helmers, Agricultural Engineer; Lori Abendroth, Agronomist

North Carolina State: Mohamed Youssef, Agricultural Engineer

North Dakota State: Xinhua Jia, Agricultural Engineer

Ohio State: Larry Brown, Agricultural Engineer; Brent Sohngen, Agricultural Economist

Purdue: Eileen Kladivko, Soil Physicist; Laura Bowling, Hydrologist; Bernie Engel, Agricultural Engineer; Linda Prokopy, Social Scientist

South Dakota State: Laurent Ahiablame, Hydrologist

University of Minnesota: Jeff Strock, Soil Physicist

University of Missouri: Kelly Nelson, Agronomist

USDA-ARS: Dan Jaynes, Soil Physicist
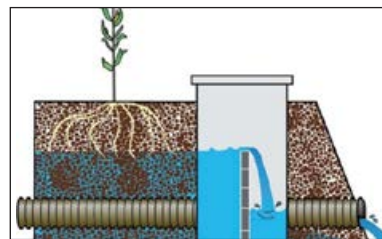
Controlled drainage retains water in the soil above the drainage, holding water in the field during periods when drainage is not needed.
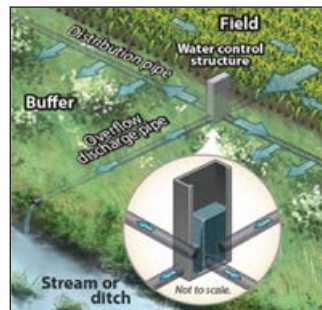
Saturated buffers retain water in the soil of the field buffers by using a control structure to divert tile water, resulting in treatment of the nitrate.
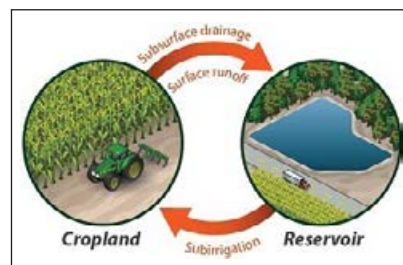
Drainage water recycling retains drainage water in on-farm ponds or reservoirs, from which it is irrigated onto crops to meet crop water demand and recycle nutrients.