Problem Area 3: Improving Conservation Effectiveness

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Water Availability and Watershed Management

USDA Agricultural Research Service

NP211 Customer Workshop

Improve Conservation Effectiveness

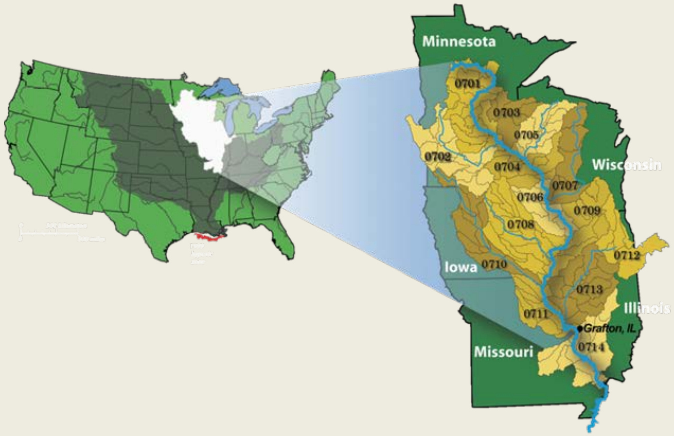
- Aggregate effects of conservation practices at the watershed scale
- Ability to select and place conservation practices on the landscape for maximum effectiveness
- Improving conservation practices
- Effectiveness of conservation under changing climate and land use
- Conservation effects on ecosystem services
- Economic impacts and social drivers of conservation

Problem Area 3: Improving Conservation Effectiveness

- **Aggregate effects of conservation practices at the watershed scale**
  - **Modeling capacity to support assessments**
  - **Field and simulation results**

Soil and Water Assessment Tool (SWAT)

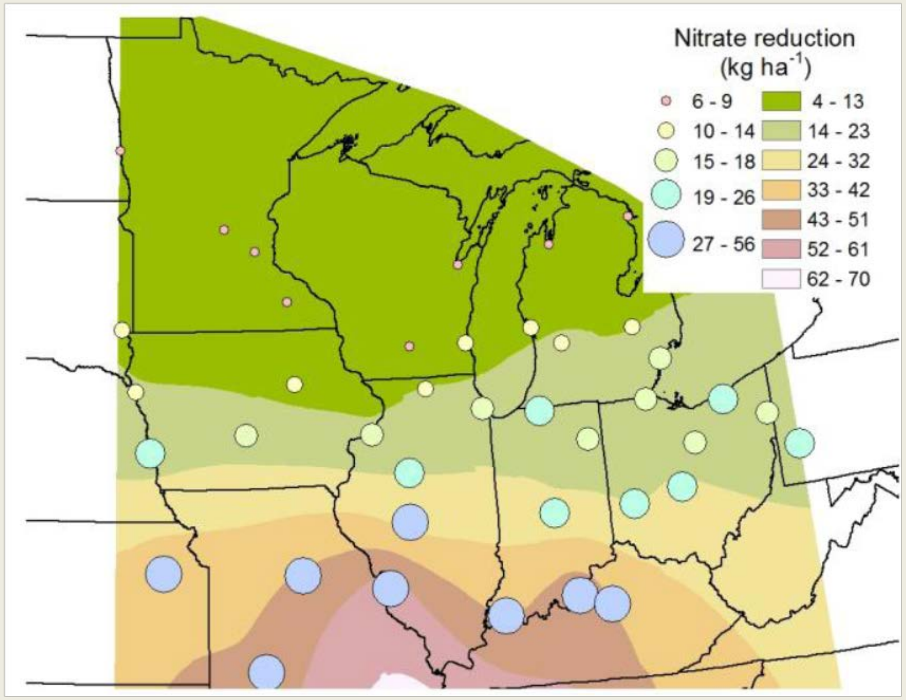
- Relied upon world-wide to guide natural resource management, planning, decision-making, and policy.
- Current US applications include:
  - Assess benefits of existing and future conservation policies (USDA CEAP project)
  - Address Congressional and Cabinet level inquiries concerning policy impacts
  - Support Farm Bill development
  - Support USDA, EPA policy formulation
  - Assist with local conservation planning

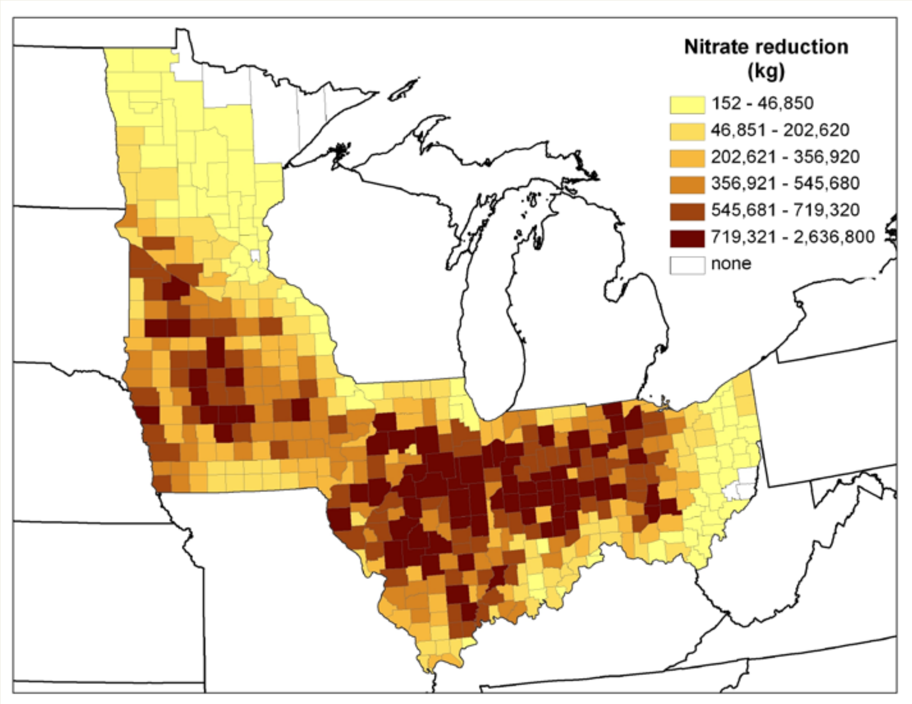


ALMANAC Model

- Biofuel Production Systems
  - **At request of US Navy and Hawaiian CS&S:**
    - Conducted feasibility study to determine the role that sugar-cane biofuel and the Hawaiian agricultural base could play in fueling the Navy's Pacific Fleet.
  - **For economic and environmental sustainability analyses:**
    - Developing parameters for major oilseed crops, for hybrid poplar, and for perennial grasses such as switchgrass

U.S. Cornbelt: Nitrate reduction in tile drains from including winter rye into a corn-soybean system





On average, RZWQM predicts that winter rye can reduce nitrate loss to tile drains more than 40% across the U.S. Midwest.

On average, RZWQM predicts that winter rye can reduce nitrate loss by more than 150 million kg-N or about 20%.

Thus, adoption of cover crops on the drained row crop lands in five states Midwest could meet a substantial portion of the reduction in nitrate loading needed to reduce the size of the hypoxic zone in the Gulf of Mexico.

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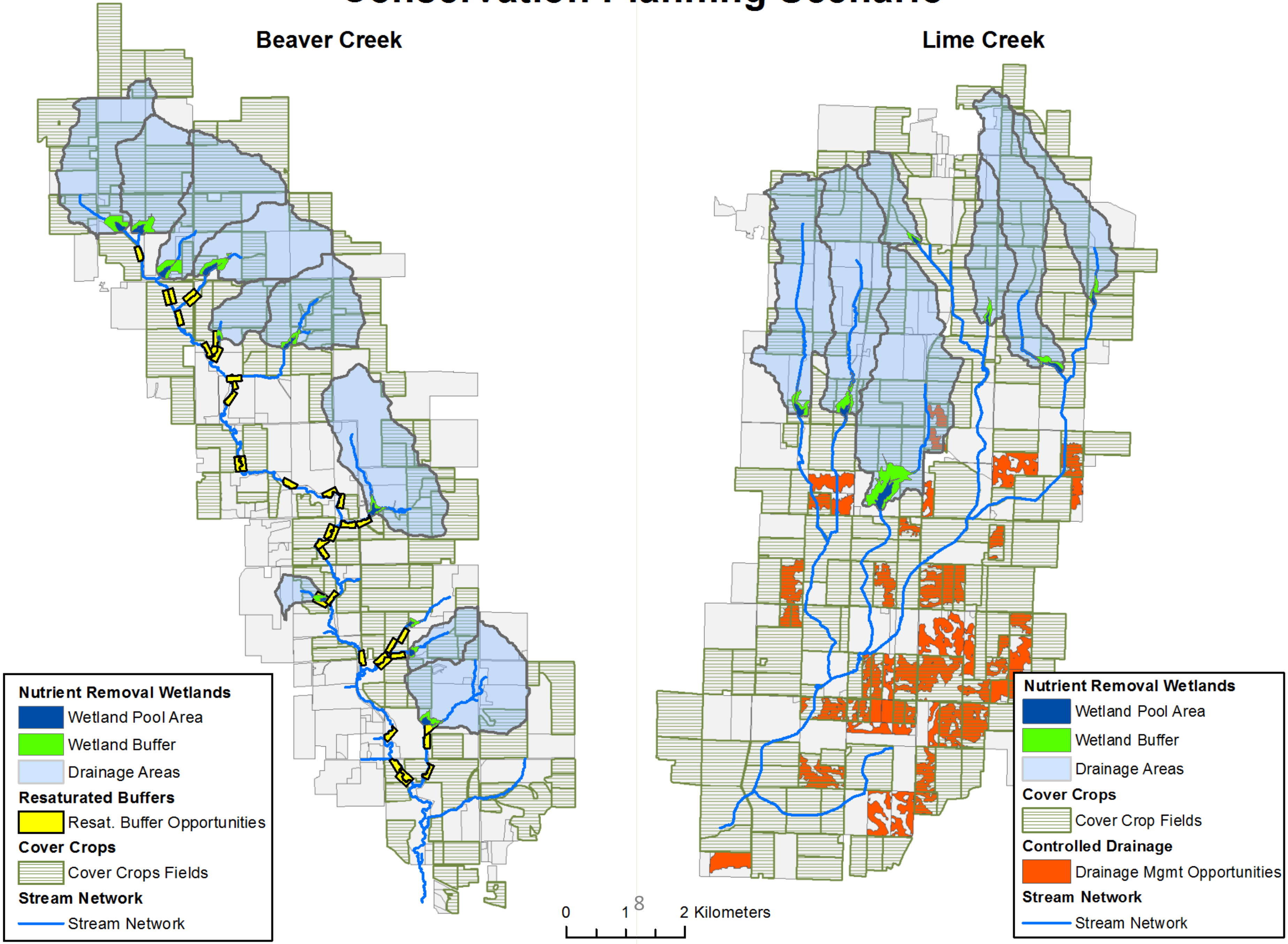
- **Ability to select and place conservation practices on the landscape for maximum effectiveness**

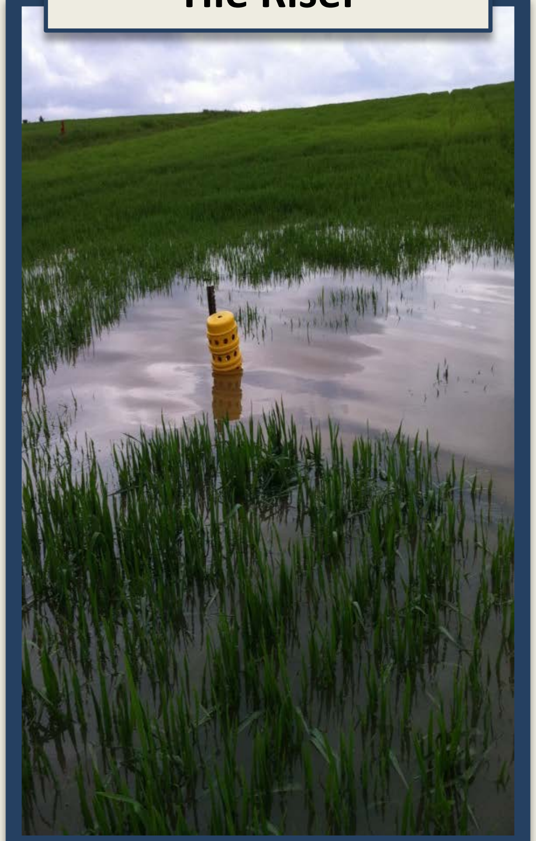
Conservation Planning Scenario



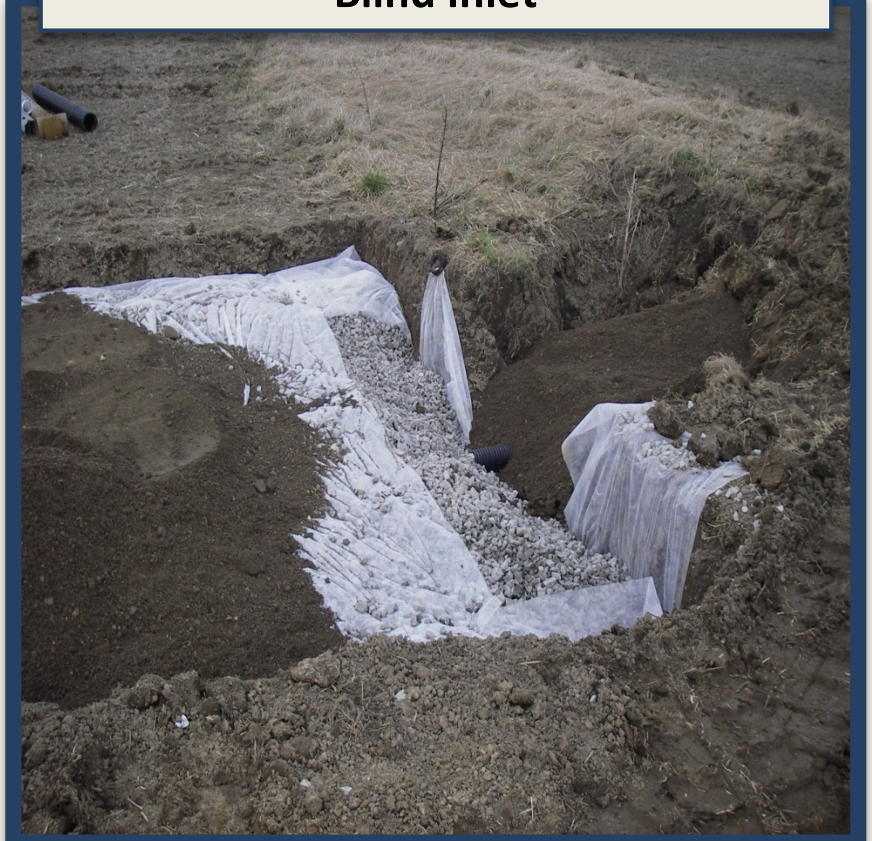

Problem Area 3: Improving Conservation Effectiveness
• Improving conservation practices

Alternative Surface Drainage

Tile Riser



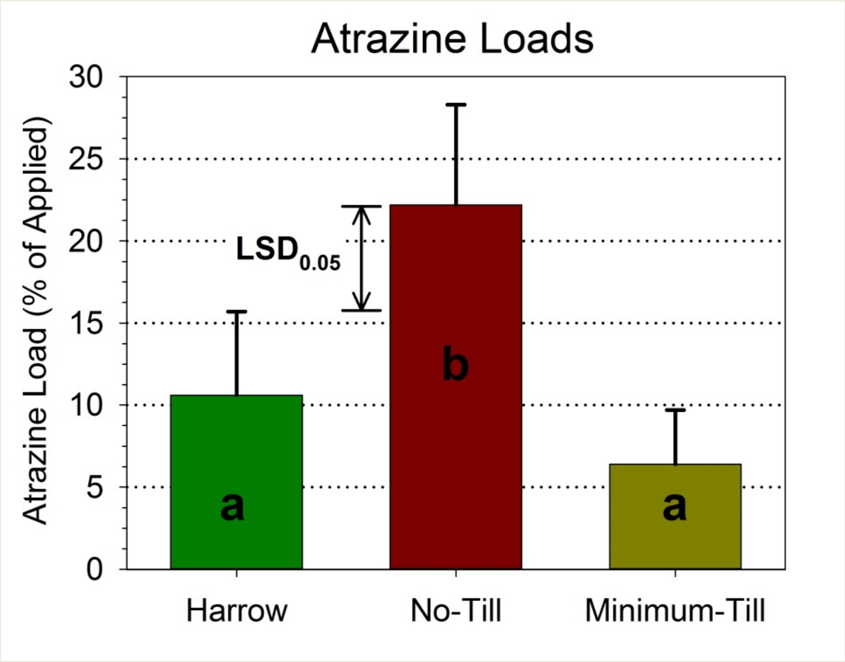
Blind Inlet

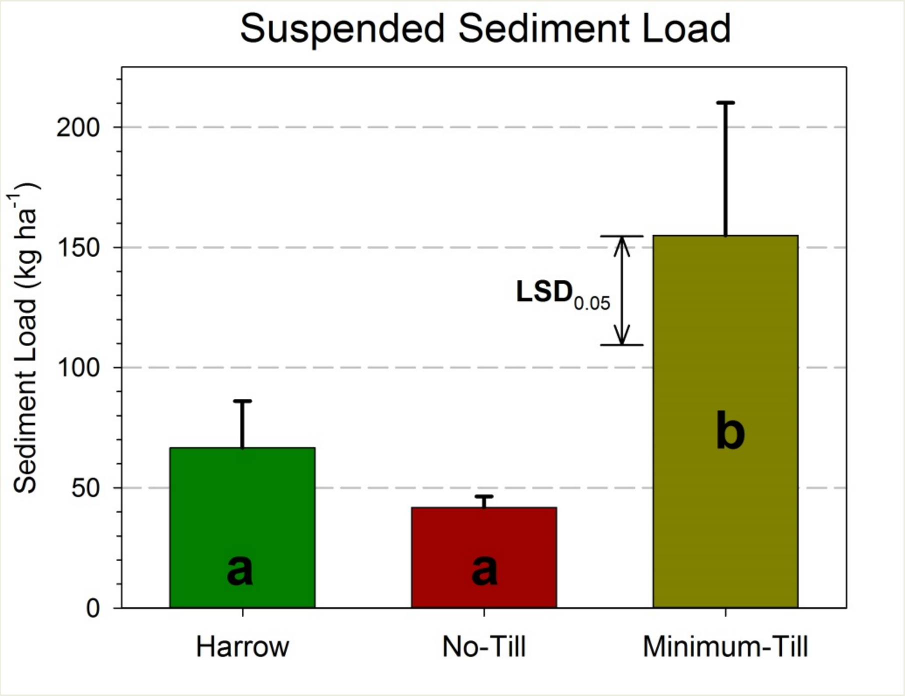


Percent Reductions in Sediment and Nutrient Loads: Blind Inlet vs. Tile Risers

Nutrient	% Reduction
Sediment	79
Ammonium-N	59
Nitrate-N	24
Total Kjehldahl N	48
Soluble P	72
Total P	78

Managing Atrazine and Soil Loss for Claypan and Restrictive Layer Soils

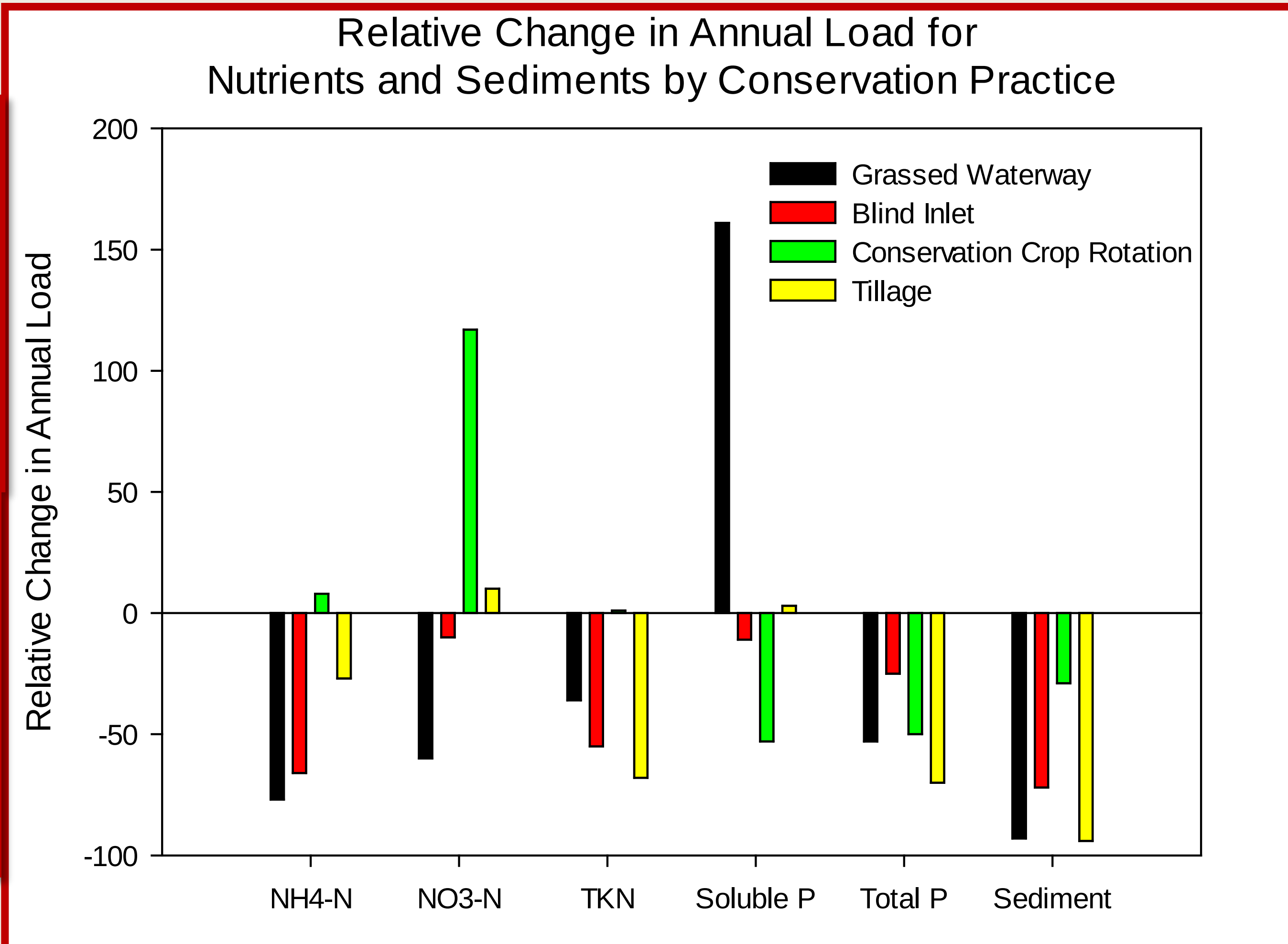




Phillips 4500 rotary harrow showing rotating tines and interlocking offset arrangement. (Photo from Kelley Manufacturing Co.)

Lerch et al., 2013

Conservation Tradeoffs: St. Joseph River, Indiana



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- **Effectiveness of conservation under changing climate and land use**

Adoption of Cover Crops and Strip Tillage

A five-year winter cover residue input was ~14,000 kg ha^{-1} C and 300 kg ha^{-1} N.

Included beneficial insect nectar crop borders to enhance non-chemical insect control. Non-irrigated corn yield increased 1.9-fold during drought years.

Mitigation of Erosion Impacts During Extreme Precipitation Events

Soil erosion exceeded soil tolerance in 3 of 10 years under conventional tillage, but never under strip tillage…even during tropical events in the Coastal Plains.

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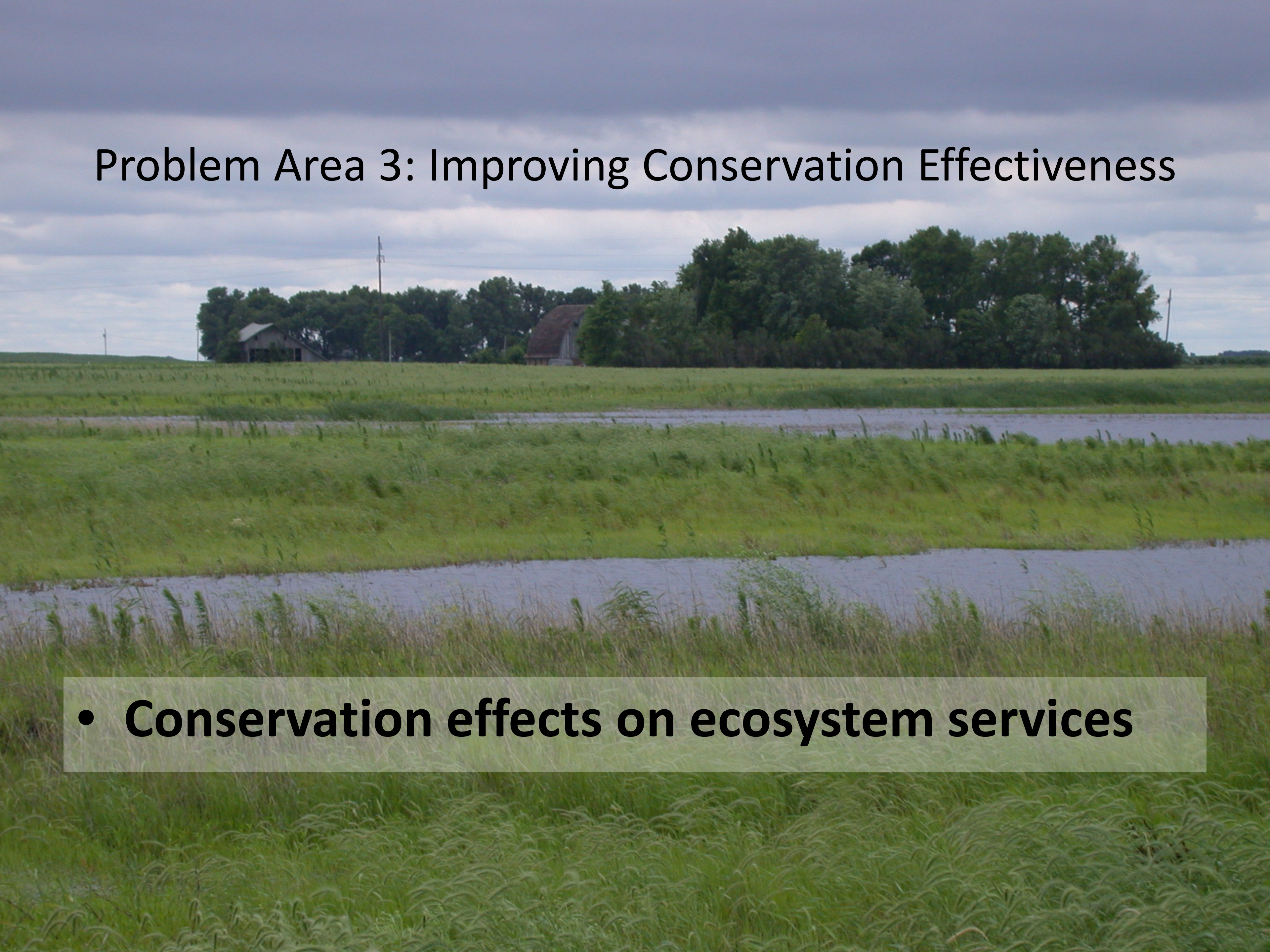
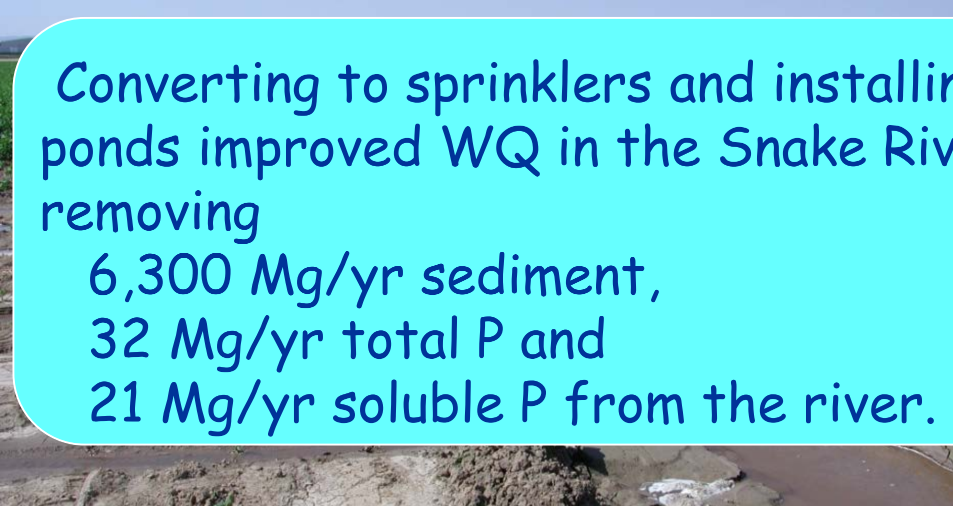
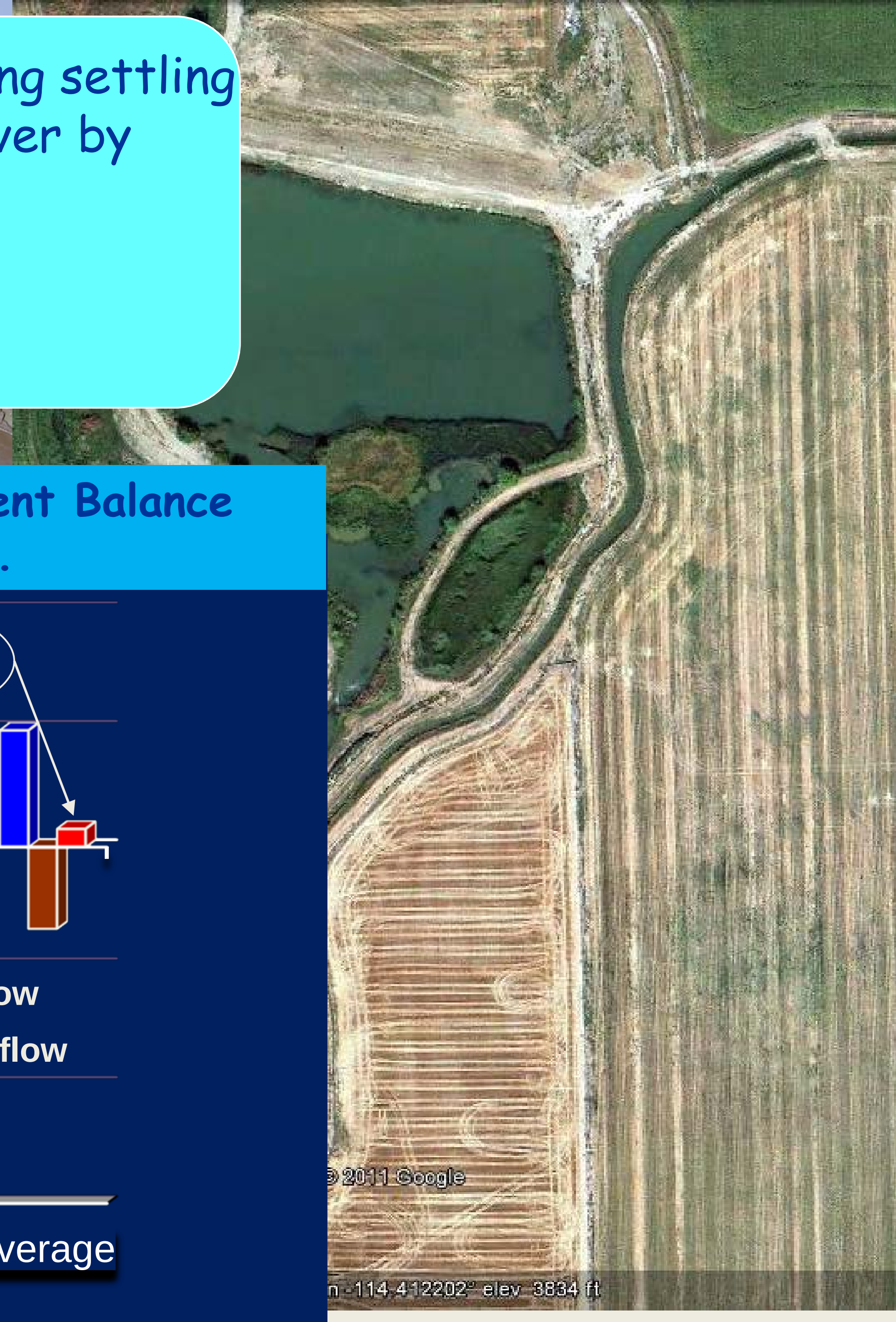


- **Conservation effects on ecosystem services**

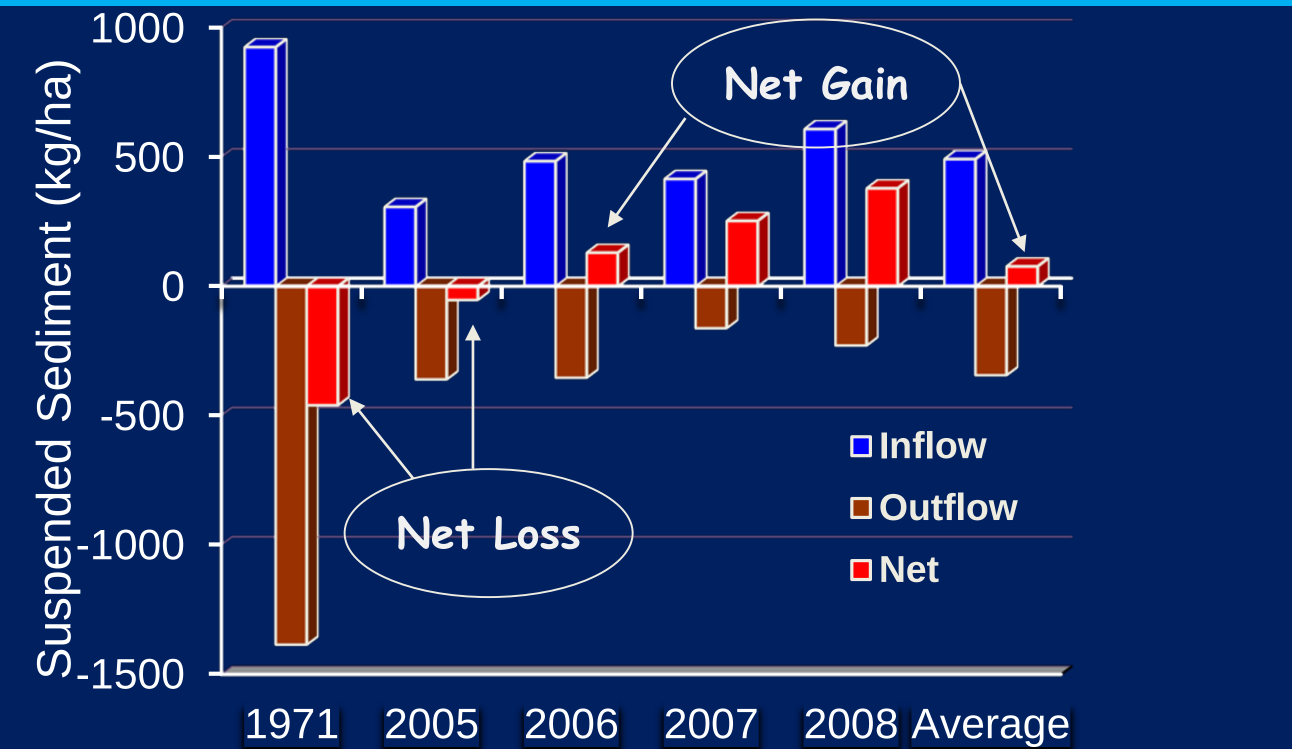
Converting to sprinklers and installing settling ponds improved WQ in the Snake River by removing

- 6,300 Mg/yr sediment,
- 32 Mg/yr total P and
- 21 Mg/yr soluble P from the river.

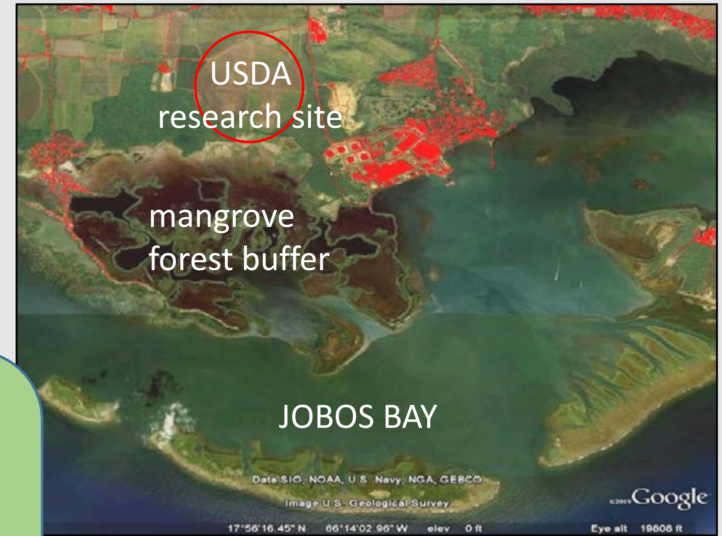


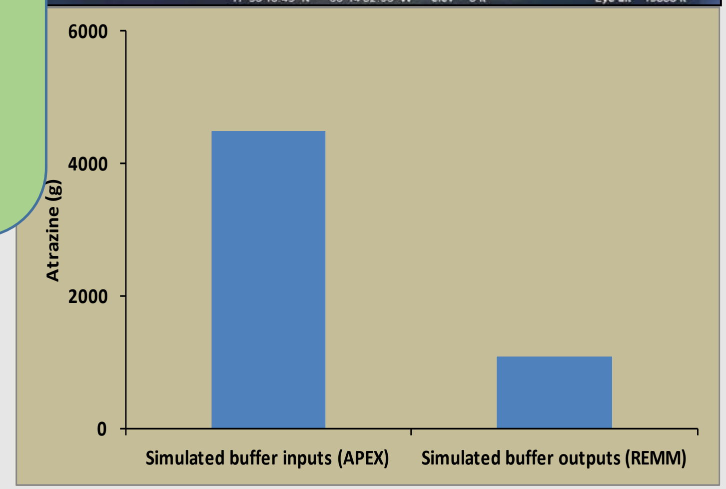


Irrigation Season Suspended Sediment Balance (May through September).



Potential Contamination of Environmentally Sensitive Area by Agricultural Chemicals





During a 3-yr study, nearly all herbicide transport to the Bay occurred during one tropical storm soon after fields were treated. Field data and modeling showed herbicide degradation in field soil and attenuation within the forested buffer limited contaminant transport to the Bay during other storm events.

Beasley Lake Watershed, Mississippi

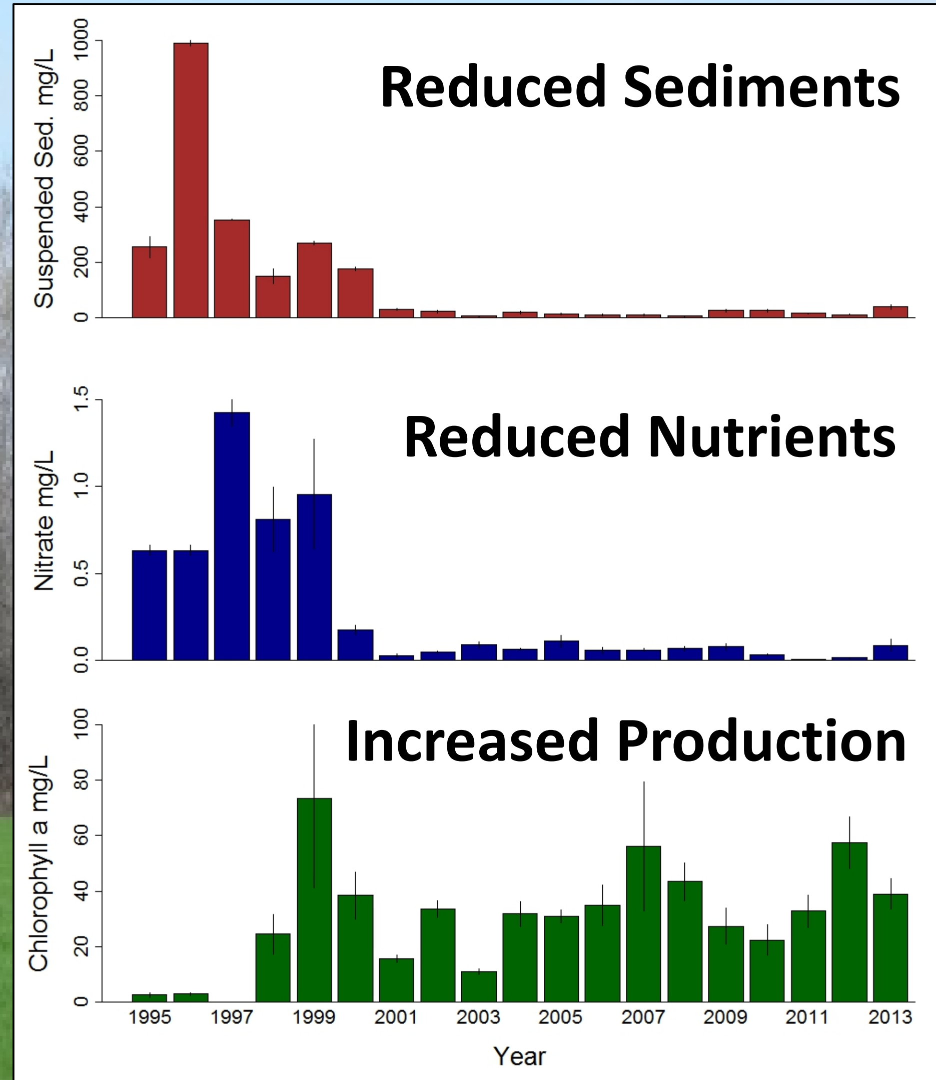
- Conservation practices such as cover crops, CRP, riparian and vegetated buffers were established by farmers within Beasley Lake Watershed over the last 20 years

- For example, vegetative buffers were established in 2007

- ARS scientists quantified significant reductions in nutrients and sediment from fields adjacent to buffers

Beasley Lake Watershed, Mississippi

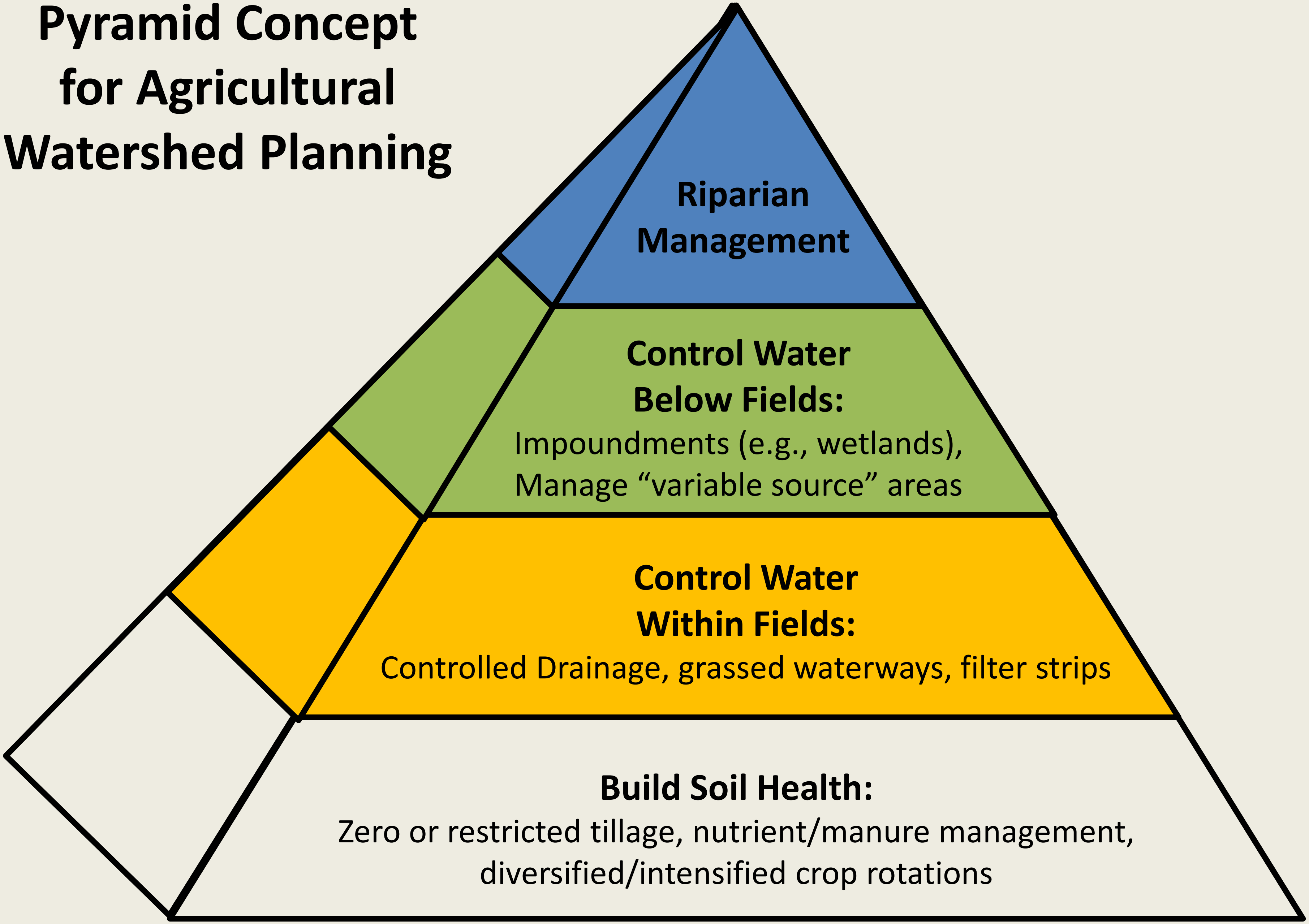
- Conservation practices have led to:
  - Improved water quality in the lake
  - Recovery of viable fishery production



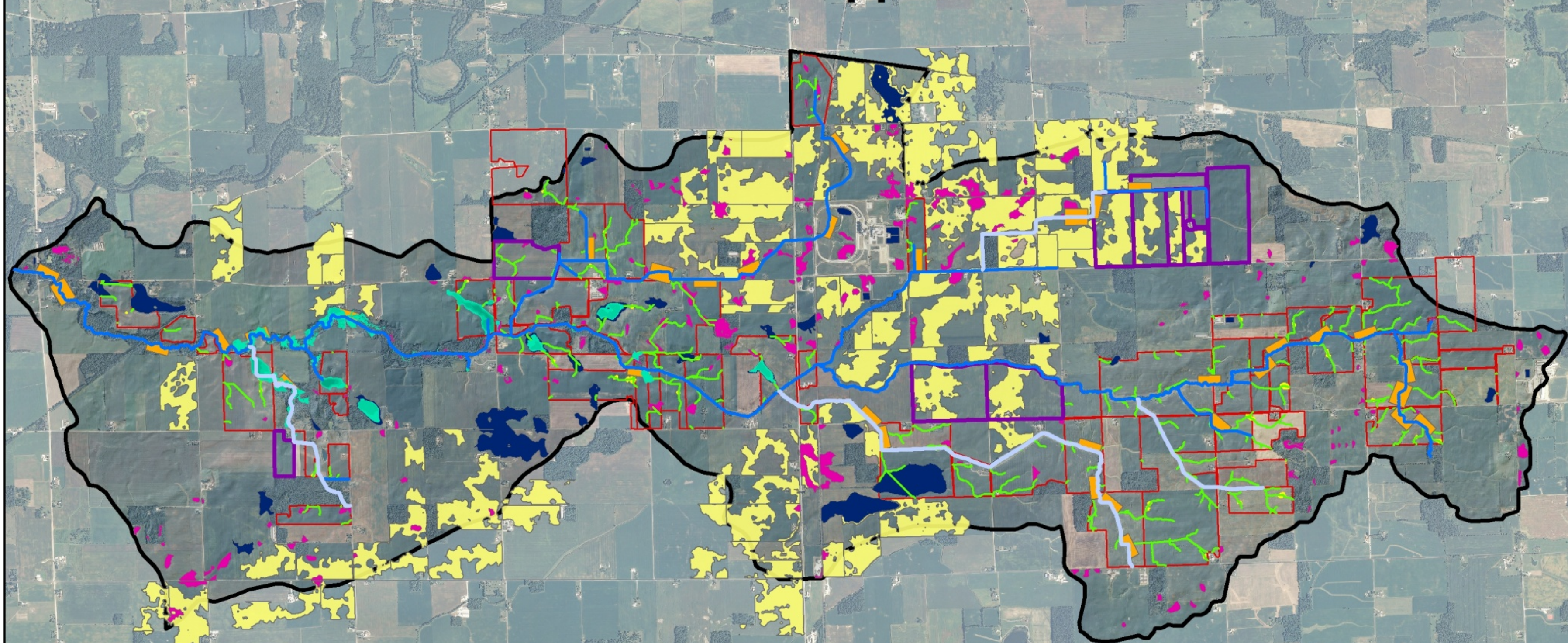
Problem Area 3: Improving Conservation Effectiveness

- **Economic impacts and social drivers of conservation**

Pyramid Concept for Agricultural Watershed Planning



All Practice Opportunities



Across watershed: Nutrient/manure management, Cover Crops, No-tillage or strip tillage

In Field Practices

In Field Surface Depressions

Depressions with likely tile intakes (classified by depth)

- < 1 meter
- > 1 meter
- Drainage Management Opportunities

Runoff Control

- Grass Waterways (> 5 acres drainage)
- WASCOBS (Water and Sediment control basins)
- Fields at risk of direct surface runoff to stream

Edge of Field Practices

- Bioreactors

Riparian Practices

- 2-stage ditch possibilities

Depressions Along Stream (Divert & Treat)

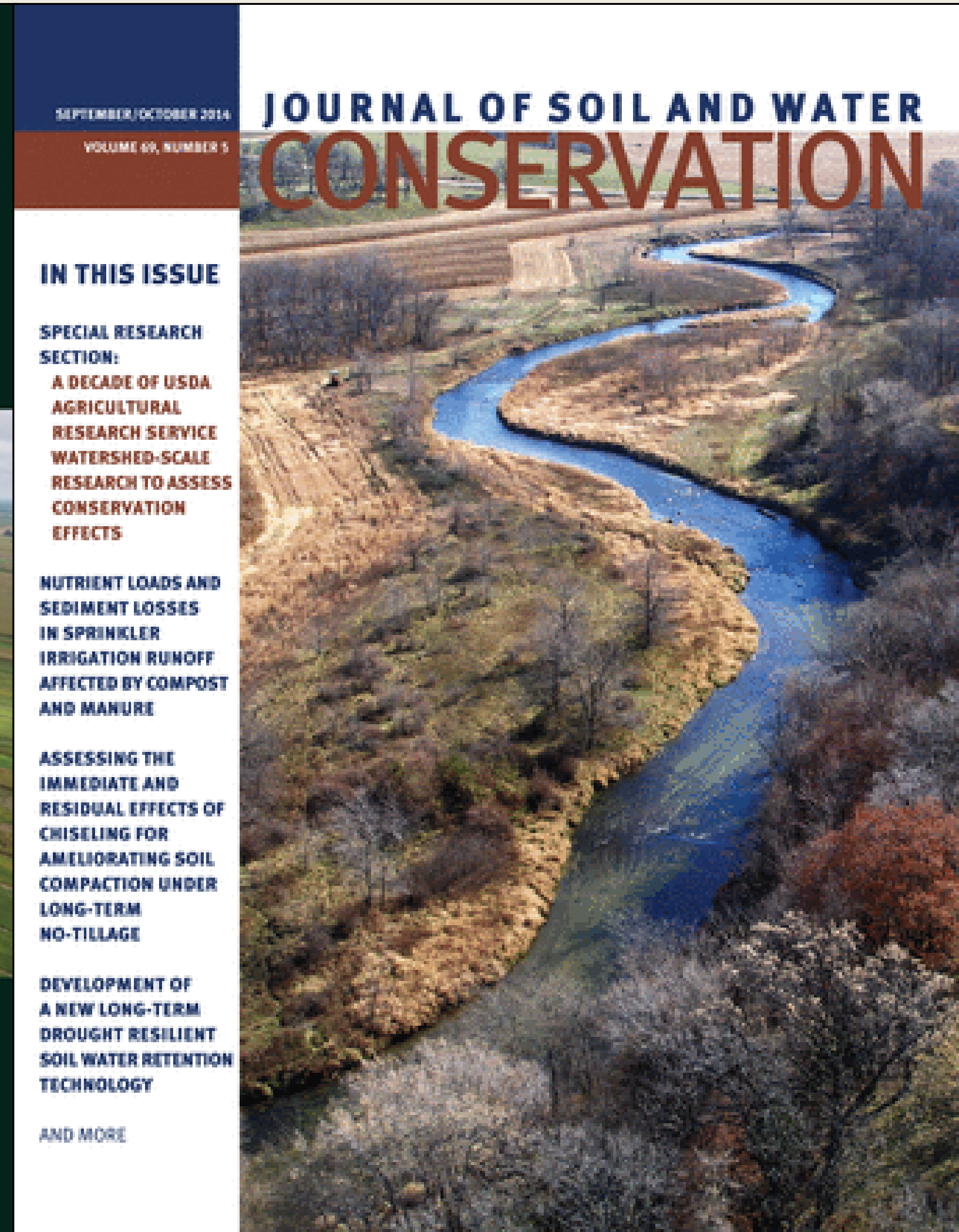
Estimated Water Table Depth

- Channel
- 0 - 50 cm
- 50 - 100 cm
- 100 - 150 cm

Riparian Function

- Critical Zone / Multi Species Buffer

Special Section Publications – Multi-watershed overview and single location compendium



Questions?