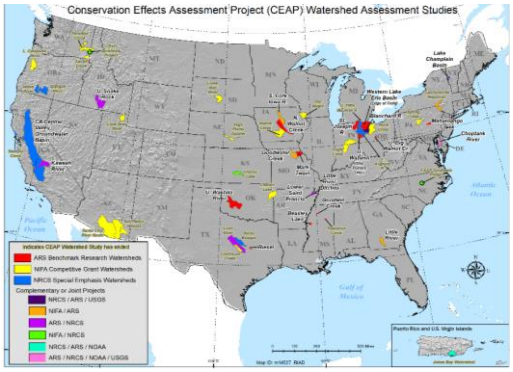
St. Joseph River Watershed

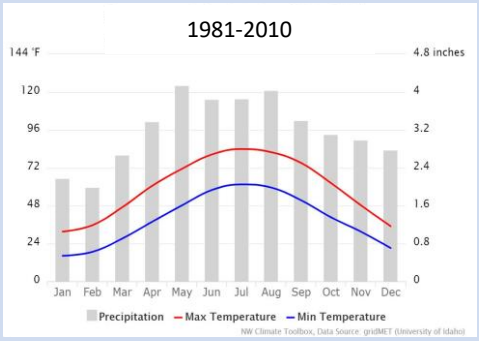


A Conservation Effects Assessment Project (CEAP) Watershed Assessment Study: A collaboration between the Agricultural Research Service and the Natural Resources Conservation Service

Location

The Saint Joseph River Watershed (1093 sq. mi.) located in northeastern Indiana is part of the Maumee Basin (6354 sq. mi.) which drains into Lake Erie near Toledo, Ohio.

Temperature and Precipitation



Major land uses

Cropland: Corn, Soybean, Wheat.
Grassland: Pasture and Hay.

Data collection

Beginning in 2002, stream gauges measure discharge every 10 minutes. Automated samplers collect water samples from most flowing sites on a daily basis, with additional samples collected during high flow events on some stream locations. Since 2004, monitoring equipment measure discharge and collect water samples from multiple fields. Measurements of sediment from some field sites, along with nitrogen, phosphorus, and herbicides concentrations from all sites in these samples assess water quality. Meteorological stations since 2004 measure precipitation, temperature, relative humidity, and solar radiation.

Issues

Closed depressions or 'potholes' dominate the watershed area and must be artificially drained to support agricultural crop production. Poorly drained soils combined with depressional topography result in increased runoff, increased sediment transported to surface waters via surface inlets and direct overland flow, excessive agricultural nutrients and pesticides transported to surface water via subsurface tile and surface runoff, organic matter depletion, and poor soil health. Increased peak flows in streams cause higher rates of stream bank erosion.

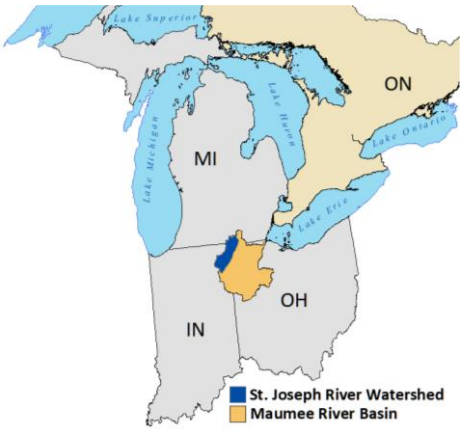
The poorly drained soils also affect grain production. Excessively wet fields can delay planting, and in some cases, make it impossible because farm equipment cannot enter fields. During dry and hot summer periods, there is a potential for insufficient soil moisture for optimum plant growth.

Water, sediment, and nutrients from the St. Joseph River Watershed flow into Lake Erie, which experiences annual harmful algal blooms initiated by excess nutrients from primarily agricultural sources.

Main conservation practices used

A number of conservation practices are regularly used in the watershed. Several have been assessed and developed as part of CEAP research. These practices include no-till, conservation tillage, cover crops, grass waterways, fertilizer placement (broadcast vs. injection), fertilizer application rate, in-stream water treatment, alternative surface drainage inlets (blind inlet), and phosphorous removal structures.

Other practices used in the watershed include water and sediment control basins, riparian buffers, streambank protection, precision fertilizer placement, among others.



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St. Joseph River Watershed

Outcomes/Findings

Plot and field scale research

Blind inlets

- Replacing tile risers with blind inlets resulted in a 78-79% reduction in sediment and total phosphorus losses.
- Blind inlets reduced atrazine (57%), 2,4-D (58%), metolachlor (53%), and glyphosate (11%) compared to tile risers.
- Blind inlets did not influence the frequency of flow, but may increase or decrease the length of ponding in fields compared to a tile riser.

Phosphorus removal structures

- Phosphorous removal structure utilizing steel slag as the phosphorus sorption material decreased soluble phosphorus load in surface and subsurface flow by 37 to 55%. (see graph on the right).

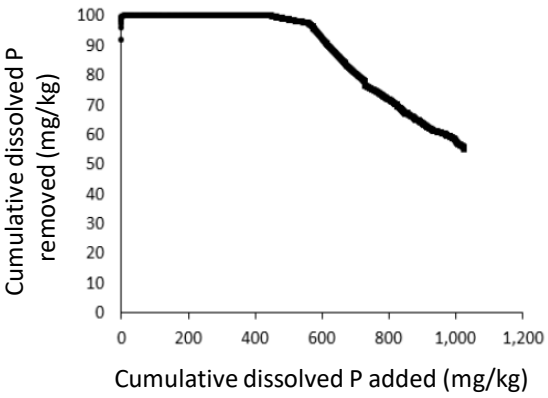
Tillage

- Soluble phosphorous and nitrogen losses were greater from no-till plots before and after fertilization compared to tilled plots.
- Atrazine and glyphosate loads were higher from no-tilled plots than conventionally tilled plots.
- No-tillage doubled soluble phosphorus loading, but decreased total phosphorus loading by 69%.

Other practices

- Grassed waterways increased soluble phosphorus, but not total phosphorus.
- A corn-soybean-wheat rotation decreased soluble phosphorus (85%) and total phosphorus (83%) compared to a corn-soybean rotation.

Clockwise from left: Measuring surface runoff from an edge-of-field plot; In-field phosphorous removal structure designed to treat surface and subsurface flows; Water quality monitoring site infrastructure.



Watershed scale research

- Ditch dredging activities decreased ammonium (-94kg), soluble phosphorus (-6.6kg) and total phosphorus (-5.4kg) within 12 months of dredging.

Modeling studies indicated that cover crops and forage were most successful at reducing sediment and nutrient loss (56-88% and 28-91%, respectively).

Compared to single practices, two and three practices resulted in greater sediment and nutrient reductions.

Total phosphorus load decreased by 2-4% with the addition of vegetated buffer strips.

- Combining buffer strips with conversion to grassland, resulted in a total reduction in total phosphorus of 7%.

Collaborators and Stakeholders

National Corn Growers Association · USGS science for a changing world · The Nature Conservancy · Purdue University

DeKalb County SWCD DeKalb County farming community

More Information

CEAP Site Lead: Mark Williams, Mark.Williams2@usda.gov
ARS website: ars.usda.gov NRCS website: nrcs.usda.gov
CEAP website: nrcs.usda.gov/wps/portal/nrcs/main/national/technical/nra/ceap/