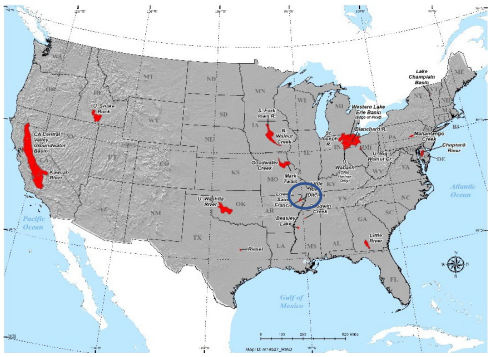
Little River Ditches & Lower St. Francis Watersheds

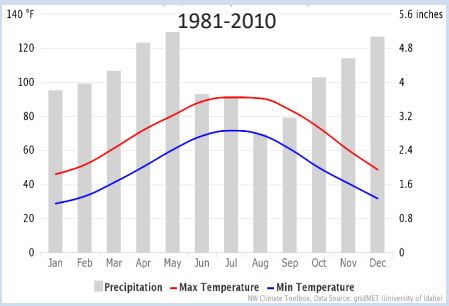


A Conservation Effects Assessment Project (CEAP) Watershed Assessment Study: A collaboration between the Agricultural Research Service and the Natural Resources Conservation Service

Location

The Lower Mississippi River Basin (LMRB) is the lowest elevation of the basins of the Mississippi-Atchafalaya River Basin. The narrow band along the Mississippi River Alluvial Plain in the LMRB is considered the Delta Region. The region is characterized by humid subtropical climate with long, hot summers, and mild winters.

Temperature and Precipitation



Major land uses

Cropland: Rice, Soybean, Cotton, Peanut, Corn, Sorghum, Wheat.
Grassland: NA
Woodland: NA

Data collection

The two study watersheds were established in 2014. Little River Ditches (LRD) in Mississippi County and Lower St. Francis (LSF) in Poinsett County each had five instream water quality monitoring stations. The watersheds complement ongoing edge-of-field (EOF) monitoring studies that measure nutrients and sediment from agricultural fields as part of a state-wide monitoring network.

Concerns

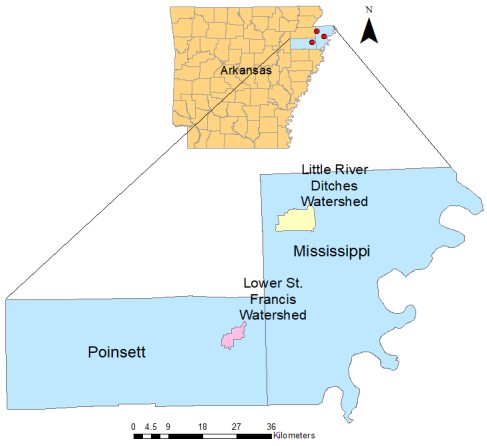
Non-point source pollution from agriculture is the leading source of water quality impairment in U.S. water resources. Nutrients and sediment lost in runoff from agricultural fields can impact water quality in downstream waterways. Such losses present both an agro-economic and environmental challenge.

When agricultural managers apply fertilizers in fields, their expectation is that those nutrients will contribute to farm profits through improved crop performance and not be lost in surface water runoff. Instead, losses of excess nutrients occur in turbid, hypoxic (low oxygen) and anoxic (no oxygen) waters, and erosion contributes to sediment buildup in water resources.

Hypoxia in the Gulf of Mexico due to nutrient loading from the Mississippi River watershed is well documented. Non-point source pollution from agriculture and urban activities are primary contributors to the hypoxic zone in the Gulf of Mexico and local waterways.

Main conservation practices used

A number of conservation practices are regularly used in the watershed. These practices include irrigation water management (e.g., row rice irrigation, alternate wetting and drying rice irrigation, irrigation termination, and computerized hole selection), nutrient management (e.g., conservation tillage, winter cover crops, grid soil sampling with variable rate fertilizer applications, in-field and EOF buffers), as well as shallow water management for waterfowl during the winter season and surface water storage for irrigation.



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Site Description

Edge-of-field Sites

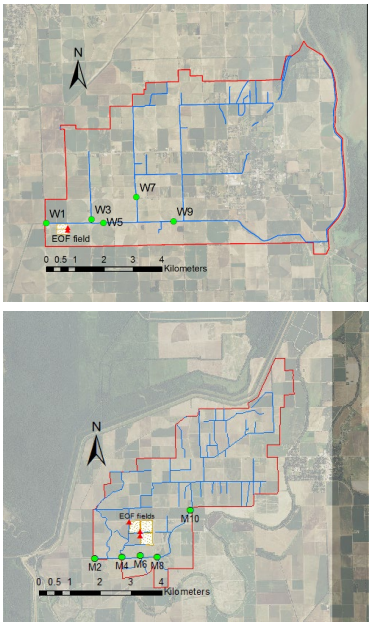
- The statewide network of edge-of-field sites includes all major commodities of Arkansas, with ARS and partners staffing sites in rice, cotton, and soybean.
- The sites consist of pairs of fields similar in soil type and size. For each pair, one of the fields is managed conventionally, while the other has a suite of conservation practices. Runoff quantity and quality are measured at both.

Outcomes/Findings

Plot and field scale

- The non-growing season loads and concentrations of several measured components were higher than those measured during the growing season, lending support to the need for off-season practices such as winter cover crops and shallow water management for waterfowl during the winter.
- Lower concentrations and loads of nutrients and sediment were observed from rice compared to cotton and soybean systems. These differences are likely due to soil type but are also related to the water management system of flooded rice fields compared to furrow irrigated row-crops.
- Cover crops effectively reduced concentrations of dissolved nitrogen by 85% and dissolved phosphorus by 53% at a cotton edge-of-field location.
- Runoff water quality after irrigation was not different from that after rainfall.
- Given the proximity of the sites to the Mississippi River and the northern Gulf of Mexico, baseline runoff water quality data from this generally under-studied region will help inform regional budgets of nutrients and sediment loss.

Clockwise from top left: Water quality sonde deployed, installation of water quality sonde, automated sampler at LRD outlet location, and monitoring site in the LSF watershed.



Sampling sites in Little River Ditches (top) & Lower St. Francis Watersheds (bottom).

Outcomes/Findings

Watershed scale

- Source control in spring and late fall could be more effective in reducing sediment and nutrient losses coming off agricultural fields.
- Differences in sediment and nutrient loads were compared between the two CEAP watersheds, and differences were primarily due to cropping practices and soil type.
- Sediment and nutrient loadings increased from upstream to downstream in LSF. In LRD, nutrient loadings increased but sediment loadings showed no change in spite of measured edge-of-field reductions in conjunction with conservation practice adoption.

Collaborators and Stakeholders

Collaborating Producers

More Information

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