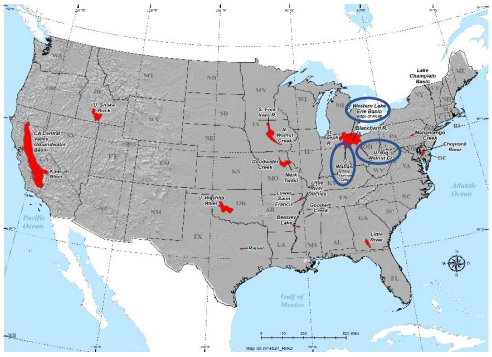
Western Lake Erie Basin, Upper Big Walnut Creek, and Upper Wabash River

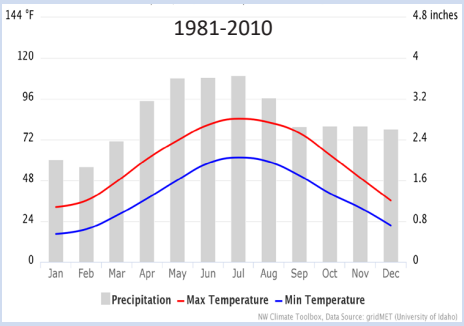


A Conservation Effects Assessment Project (CEAP) Watershed Assessment Study: A collaboration between the Agricultural Research Service and the Natural Resources Conservation Service

Location

CEAP-related research is occurring in the Western Lake Erie Basin (WLEB), Upper Big Walnut Creek (UBWC), and the Upper Wabash River (UW) watersheds.

Temperature and Precipitation



Major land uses

Cropland: Corn, Soybean, Wheat.

Data collection

Hydrology and water quality (nitrogen and phosphorus) data are collected year round from 40 private farm fields and streams within three Ohio watersheds. Fields are paired (20 pairs) in order to assess the impact of single and "stacked" practices. Field-scale data includes surface runoff and subsurface (tile) drainage discharge and nutrient loads. Within WLEB, there are fourteen paired edge-of-field sites. Within UBWC, there is one paired edge-of-field site and twelve ecological measurements locations. The remaining four paired field sites are located in the UW watershed.

Concerns

WLEB is comprised of about 6 million acres, the majority of which is used for agricultural production. Lake Erie has been identified as impaired due to excessive loadings of sediment and nutrients. The Maumee River watershed covers over half of WLEB and has been identified as the largest single contributor of P transport and focus of Lake Erie algal blooms.

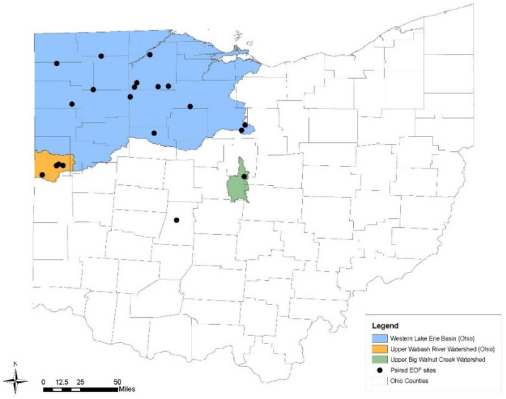
Located in Central Ohio, UBWC is about 122,000 acres and is comprised of 467 perennial and intermittent stream miles that drain into Hoover Reservoir, the water supply for 1.1 million Columbus residents. The primary land use of the watershed is row crop agriculture (55%) followed by woodlands (27%) and urban development (13%), but the watershed is rapidly urbanizing.

The UW watershed is characterized by extensive animal agriculture and row crop agriculture.

An extensive portion of WLEB, UBWC, and UW are systematically tile-drained. Without the tile systems, agricultural production would be limited. At the watershed scale, tile drainage represents about half of the discharge and nutrient load.

Primary conservation practices

CEAP-related research efforts within WLEB, UBWC, and UW are concerned with the edge-of-field and watershed scale water quality and ecological impacts of conservation practices. Studies continue to quantify the edge-of-field water quality impacts of conservation practices such as NRCS avoiding, controlling, and trapping practices, the 4R initiative (right source, rate, time, and place) and innovative practices such as P-removal structures, woodchip bioreactors, and 2-stage ditches. The ecological research is aimed at quantifying the effects of individual and combined conservation practices on different ecological metrics.



Location of ARS edge-of-field sites.

Western Lake Erie Basin, Upper Big Walnut Creek, and Upper Wabash River

Outcomes/Findings

In-Field Practices

- Two consecutive annual applications of gypsum significantly decreased combined surface and subsurface dissolved-P loadings by 36% (28.27g/ha).
- In one study, cover crops reduced discharge and nitrate loadings by 28% and 84% respectively, but phosphorus load reductions varied.
- Incorporating perennial crops (i.e. alfalfa) into the rotation reduced discharge and nutrient loadings.

4R Management Framework:

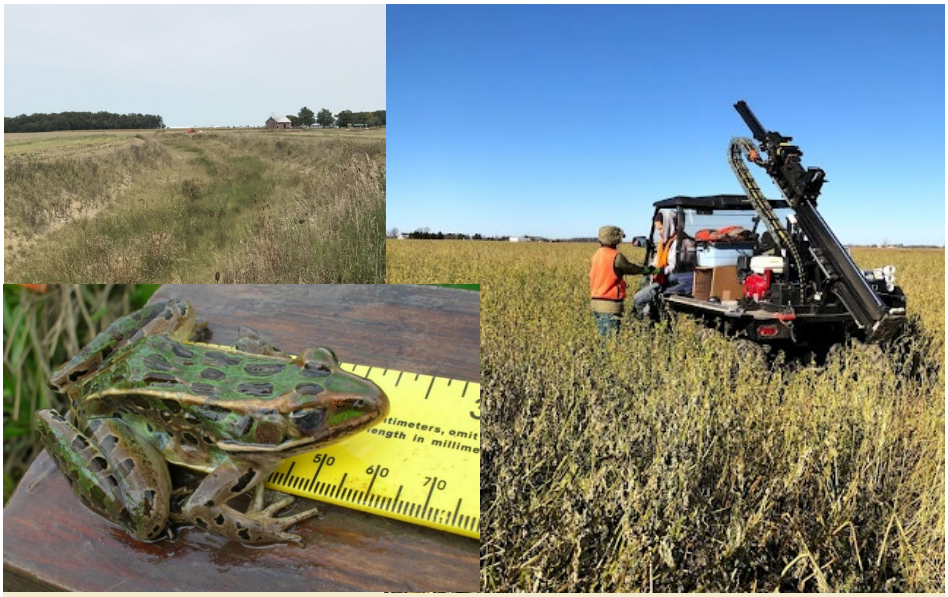
- Applying fertilizer at crop removal rates reduced risk of P loss.
- Greater P losses occurred with rainfall in the first five days following application.
- At a plot scale, injecting or tilling fertilizer into the soil reduced DRP concentrations by 66% and 75%, respectively, in subsurface discharge compared to broadcast applications.

Edge-of-Field

- Drainage water management provided a mechanism to store more water in the landscape, reducing discharge volume and N loading. The impacts on reducing P loss are not well defined.
- Stacked practices: An upland practice (in-field management) with an edge-of-field or structural type practice may further reduce agrichemical transport originating in crop production areas. Current research is documenting the benefits of stacked practices.

In-stream

- Two-stage ditches construct "mini-floodplains" within the stream channel and have effectively improved water quality, particularly during inundation or storm events, by increasing bank stability, reducing turbidity, enhancing denitrification, and reducing nutrient concentrations.



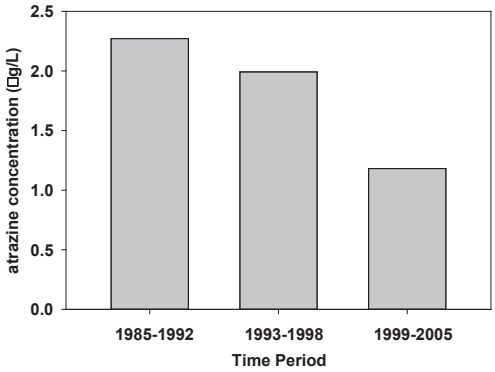
Clockwise from top left: 2-stage ditch, example of a well-established cover crop at an edge-of-field site in WLEB, Northern leopard frog *(Lithobates pipiens)* measured as part of CEAP ecological metrics.

Ecological Metrics

- Grass filter strips widened riparian habitat, but did not restore ecosystem structure in channelized agricultural headwater streams.

Watershed scale

- EQIP efforts reduced concentrations of Atrazine in drinking water for Columbus, resulting in $2.73 saved for every $1 spent on NRCS 595 Pest Management (see bar graph at right).



Mean monthly atrazine concentrations in Hoover Reservoir when no label restrictions were present (1985-1992), after label restrictions were applied (1993-1998), and following implementation of EQIP targeting atrazine reduction (1999-2005).

Collaborators/Funding Sources

BECK'S · OHIO FARM BUREAU · THE OHIO STATE UNIVERSITY EXTENSION · OHIO SOYBEAN ASSOCIATION · THE OHIO STATE UNIVERSITY · Blanchard River DEMONSTRATION FARMS NETWORK · Ohio Corn&Wheat · IPNI International Plant Nutrition Institute · The Nature Conservancy

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