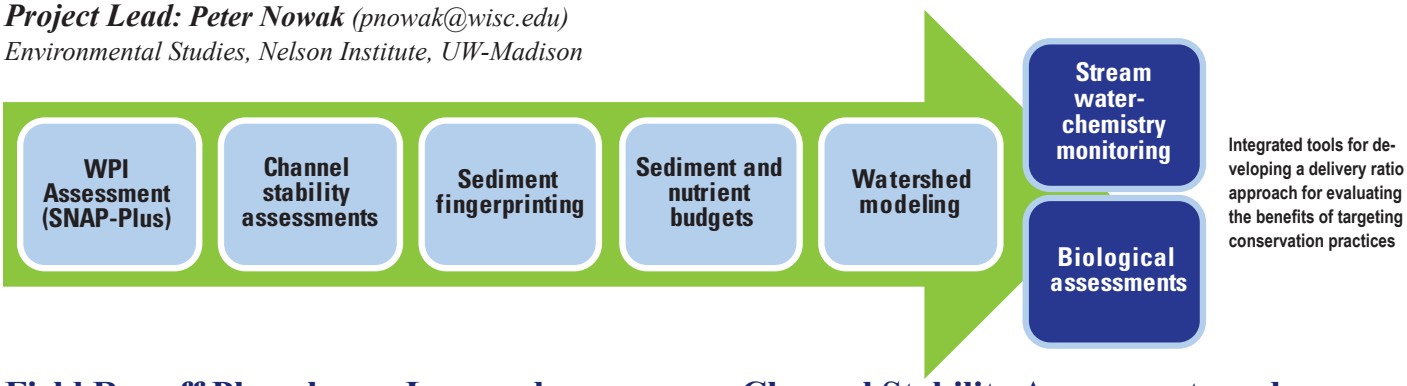
Pecatonica River: Wisconsin Buffer Initiative Pilot Project

Connecting Targeted Phosphorus Reduction with Healthy Watersheds

The Pecatonica River pilot project is testing Wisconsin Buffer Initiative recommendations for using targeted strategies in small agricultural watersheds (5,000–25,000 acres) to achieve water-quality improvement goals (http://www.nelson.wisc.edu/people/nowak/wbi/). The small watershed scale is optimal for identifying nonpoint pollution sources, implementing strategies, and measuring success. This is a paired watershed project with an experimental and control watershed. Within one monitored watershed, Pleasant Valley, changes in management are being applied to a small percentage of area that is identified as contributing comparatively high levels of sediment or phosphorus to the stream. A second similar watershed is being monitored as a reference. The monitoring is complemented with multi-disciplinary measurements and modeling to better quantify overland flow and in-stream delivery processes between fields and watershed outlets.

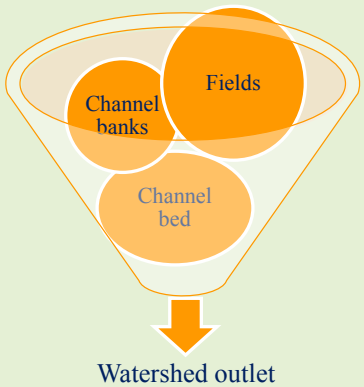
Project Lead: Peter Nowak *(pnowak@wisc.edu)*
Environmental Studies, Nelson Institute, UW-Madison



Field Runoff Phosphorus Loss and Erosion Assessment

The first step was to identify fields and pastures contributing high levels of nutrients and or sediment using the Wisconsin Phosphorus Index (WPI, *wpindex.soils.wisc.edu*). The WPI uses routine soil test and field management information to estimate runoff phosphorus delivery from a field to a stream or lake under average weather conditions. It is calculated with software developed by the UW-Madison Soil Science Dept. (SNAP-plus, *www.snapplus.net*) that also computes field erosion using the NRCS's RUSLE2 model. The second step in the strategy is to identify and implement alternative management practices for fields with high WPI and/or erosion values to bring them below target levels; this step is underway.

Contact:
Laura Ward Good
(lwgood@wisc.edu)
Soil Science,
UW-Madison



Phosphorus and sediment measured at a watershed outlet originate from multiple upstream sources. Depositional bars in channels may act like a sediment source or sink.

Channel Stability Assessments and Sediment Fingerprinting

A combination of channel stability assessments, sediment budgets, and radio-isotope sediment source tracking is being used to proportion the potential erosion, transport, deposition, and resuspension of phosphorus and sediment in the test watershed. Channel stability assessments were completed in the fall of 2009 at 60 sites in the experimental and reference watersheds to estimate additional sources and sinks of sediment between field edges and the watershed outlets. The amount of eroding banks and fine sediment deposition in streams was measured, along with riparian land use and habitat conditions. Data from the channel stability assessments will be used for a watershed sediment budget.

Fine-grained sediment samples collected from fields, ephemeral channels, banks, streambed, and from suspended sediment samplers are being analyzed for cesium and lead isotopes, nutrients, and organic content. The results will allow scientists to estimate the proportion of sediment coming from different sources in the watershed.

Contacts:
Faith Fitzpatrick *(fafitzpa@usgs.gov)*
U.S. Geological Survey, Wisconsin Water Science Center
Anita Thompson *(amthompson2@wisc.edu)*
John Panuska *(jcpanuska@wisc.edu)*
Biological Systems Engineering, UW-Madison

Photo credit: Mark Godfrey, TNC

Photo credit: David Housner

Watershed Modeling

Pollutant source identification is critical to a successful targeted control strategy. The complexity of phosphorus delivery from the edge-of-field to a point of interest is confounded by channel storage. Modeling will be used to evaluate approaches to link SNAP-plus estimates of edge-of-field sediment and phosphorus loss to the watershed outlet. Several levels of model complexity will be used to identify key processes governing phosphorus delivery. Data from flow and load monitoring, channel stability assessments and sediment fingerprinting will be used for model calibration and validation. The model will test the WBI concept that targeted strategies for phosphorus and sediment reduction can achieve water-quality goals.

Contacts:
Anita Thompson *(amthompson2@wisc.edu)*
John Panuska *(jcpanuska@wisc.edu)*
Biological Systems Engineering, UW-Madison

Photo credit: Faith Fitzpatrick

Severe soil erosion and gullying were commonplace in the Wisconsin Driftless Area in the 1930s. This SCS sediment retention structure is now completely filled with sediment and hidden by trees and vegetation. Its presence is an obvious clue of a time of much higher erosion rates.

In the Driftless Area, high eroding banks usually contain legacy sediment deposited in overbank areas during past destructive flood events. These eroding banks illustrate a component of the long-term delivery process of sediment that occurs over decades and centuries as streams respond to the historical consequences of excessive erosion.

Photo credit: Rebecca Carvin

Stream Water-Quality Monitoring

Monitoring for phosphorus and suspended sediment loads at the watershed outlets in the test and control watersheds started in October 2006, three years before implementation began. Monitoring will continue through practice implementation and beyond. A significant reduction in phosphorus and sediment loads from Pleasant Valley compared to the control watershed will indicate that the targeted strategies are effective.

Photo credit: Steve Richter, TNC

Contact: Rebecca Carvin *(rbcarvin@usgs.gov)*
U.S. Geological Survey, Wisconsin Water Science Center

Photo credit: WI DNR

Biological Assessments

The experimental watershed, Pleasant Valley Branch, is on the Wisconsin Impaired Waters list for degraded habitat from nonpoint sources of sediment. The WI Department of Natural Resources (DNR) conducted fish, macroinvertebrate, and habitat assessments along main stem streams in both the test and control watersheds. The DNR will continue to monitor these stations for changes in biological richness and diversity.

Contact: Bob Hansis *(robert.hansis@wisconsin.gov) WI DNR*

Funding: USDA-NRCS Cooperative Conservation Partnership Initiative, The Nature Conservancy, National Integrated Water Quality Program of the USDA Cooperative State Research, Education, and Extension Service, Dane County, Wisconsin Department of Natural Resources; USGS Cooperative Water Program

For more information: http://www.nature.org/wherewework/northamerica/states/wisconsin/science/art29451.html
http://wi.water.usgs.gov/surface-water/geomorph.html