

## Program Overview

The LFRWMP was established in 2003 as a multi-year water monitoring and assessment program in and around the Lower Fox River watershed. It includes high school students and teachers, university students and teachers, university students and researchers, and scientists from federal and local agencies. The three components of the program are (1) a school-based monitoring program designed to enhance student, teacher, and community understanding and stewardship of the watershed; (2) studies of phosphorus and sediment sources and export in key watersheds; and (3) studies linking stream ecological integrity and land use.



Appleton East team at the French Road sampling location on Apple Creek, May 2004

## Overall Project Goal:

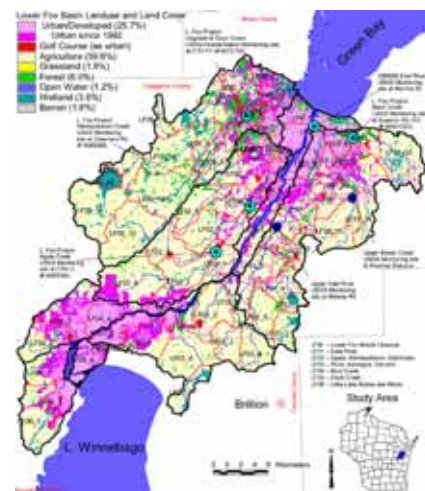
Establish a long-term monitoring program that will provide high quality data that can be used to make resource management decisions and predict impacts on the ecosystem.

## Partners:

- UW-Green Bay – Program Lead
- UW-Milwaukee
- U.S. Geological Survey (Contributes cost share for stations)
- 5 Area High Schools
- Green Bay Metropolitan Sewerage District
- Oneida Nation

Major funding for the program is through a four year grant from Arjo Wiggins Appleton, Inc.

## Continuous Monitoring Program



Land Use in the Lower Fox River Watershed

### Primary Goal - Water Quality and Load Monitoring:

Compare relative contributions of phosphorus and suspended sediment between watersheds and source areas within the Lower Fox River subbasin and UF04 in Upper Fox subbasin.

### Objectives:

- Better understand cause and effect through event and continuous monitoring.
- Compare flow, phosphorus, and suspended sediment concentrations and loads from different source areas (e.g. urban, urbanizing, and rural/agriculture).
- Identify phosphorus and sediment sources at multiple spatial scales.
- Analyze trends at all sites and relative trends between sites over time.
- Compare USGS load estimates to modeled loads for the same time periods (events, months, annual).
- Assess validity and ability of model to reliably estimate stream flow and loads from different watersheds on an event, monthly, and annual basis.

## Continuous Monitoring Stations

Five USGS continuous monitoring stations have been installed directly through the project. These stations will provide 3 years of data beginning in October 2003 and ending September 30, 2006:

- Duck Creek at CTH FF (276 km<sup>2</sup>)
- Baird Creek at Superior Road (~56 km<sup>2</sup>)
- Apple Creek at CTH U / Campground (117 km<sup>2</sup>)
- Ashwaubenon Creek at Creamery Road (~50 km<sup>2</sup>)
- East River at Monroe St. (374 km<sup>2</sup>) — last operated in 1985-86 (Sponsored by GBMSD)

UW-Milwaukee is also performing real-time monitoring activities using YSI multi-parameter sondes. Fixed stations are located at the USGS sites and at Spring Brook in UF-04. Additional sondes are deployed for focused research projects (e.g. Baird Creek 2004). The sondes provide data for continuous stage height, turbidity, conductivity, temperature, pH, and dissolved oxygen. Biotic surveys for fish, macroinvertebrates, and stream habitat are also conducted each summer by UWM.

## Methods / Parameters

The following methods detail operation of the USGS stations:

- Continuous stage/flow is collected and real-time data is provided on the web at <http://waterdata.usgs.gov/wi/nwis/rt>.
- During runoff events, 6 to 10 samples are collected by an ISCO sampler and refrigerated (10 to 12 events/year).
- UW-Green Bay collects subsets from the ISCO samples, splits the samples, and delivers them to the GBMSD lab for analysis.
- Low-flow/baseflow samples are manually collected with 2 samples per month from March through November and 1 sample per month from December through February.
- Chemical analysis on samples is conducted by GBMSD. Samples are analyzed for:
  - Total phosphorus
  - Total suspended solids (TSS)
  - Dissolved phosphorus (about 25% of samples)
  - Subset of samples run for suspended sediment concentration (SSC) to establish the relationship to TSS
- Rain gauges at 4 USGS sites provide precipitation data for the watersheds.



ISCO Sampler at Apple Creek

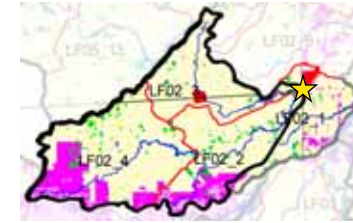


Collecting low-flow samples

From the data collected, USGS will compute daily total phosphorus and suspended sediment loads for each stream, and estimate the dissolved phosphorus loads. Suspended sediment concentrations will also be correlated with turbidity data from UW-Milwaukee.

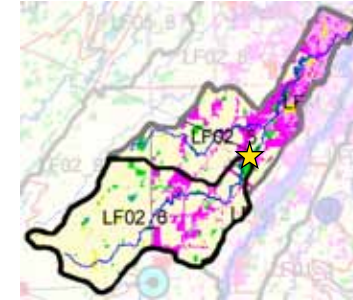
## Land Use Comparisons in Monitored Watersheds

### Apple Creek:



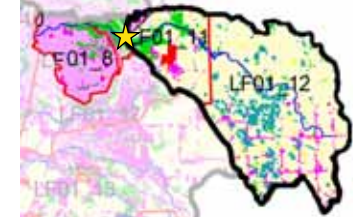
Land Use	Area	Location
Rural/Ag & Urbanizing	117 km <sup>2</sup>	Upstream of CTH U
<b>TOTAL</b>	<b>140 km<sup>2</sup></b>	

### Ashwaubenon Creek:



Land Use	Area	Location
Rural/Ag & Urbanizing	50 km <sup>2</sup>	Upstream of Creamery
Urban & Urbanizing	26 km <sup>2</sup>	Downstream of Creamery
<b>TOTAL</b>	<b>76 km<sup>2</sup></b>	

### Baird Creek:



Land Use	Area	Location
Rural/Ag & Urbanizing	56 km <sup>2</sup>	Upstream of Superior
Rural/Ag	43 km <sup>2</sup>	Upstream of Northview
Urbanizing	13 km <sup>2</sup>	Between Superior/Northview
Urban	12 km <sup>2</sup>	Downstream of Superior
<b>TOTAL</b>	<b>68 km<sup>2</sup></b>	

### Duck Creek:



Land Use	Area	Location
Rural/Ag	276 km <sup>2</sup>	Upstream of CTH FF
Primarily Urban	19 km <sup>2</sup>	Beaver Dam Creek (Proposed Station)
<b>TOTAL</b>	<b>295 km<sup>2</sup></b>	

### East River:



Land Use	Area	Location
Rural/Ag & Urbanizing	56 km <sup>2</sup>	Baird at Superior
Rural/Ag	36 km <sup>2</sup>	Bower at CTH MM
Mixed Urban to Rural	374 km <sup>2</sup>	East River at Monroe
<b>TOTAL</b>	<b>374 km<sup>2</sup></b>	

## School-Based Monitoring Program

The school-based monitoring pairs 5 area high schools with 4 watersheds to provide high-school students an opportunity to gain hands-on experience in assessing aquatic ecosystems. Modeled after a successful program in Oregon, standardized methods and annual teacher training sessions allow students to collect quality-assured data for streamflow, temperature, dissolved oxygen, conductivity, turbidity, pH, soluble reactive phosphorus, nitrate, ammonia, riparian habitat, birds, amphibians, and macroinvertebrates. Data from the student monitoring is shared on the project website ([www.uwgb.edu/watershed](http://www.uwgb.edu/watershed)) and at the Annual Student Watershed Symposium.

### Goals of the School-Based Monitoring Program:

- Enhance student knowledge and understanding of land use impacts on water quality and stream ecosystems.
- Develop a stream integrity database targeting subwatersheds of the Fox River that helps understand changes over time and contributes towards the design of future land management strategies.
- Enhance teacher capacity to teach watershed science by providing hands-on training in sampling techniques.
- Foster a relationship between high-school students, teachers, university faculty, and agency professionals.
- Establish a program that has the potential to grow and attract additional funding to enhance activities.



Student-Teacher team collecting streamflow measurements at Apple Creek

### Participating Schools:

- Appleton East High School
- Green Bay Southwest High School
- Luxemburg-Casco High School
- Markesan High School
- West DePere High School

## Targeted Supplementary Monitoring

### Baird Creek:

- Determine if the South and North Branch of Baird Creek differ in pollutant concentrations due to watershed land use dissimilarities.
- Establish whether the channel morphology of Baird Creek and its tributaries has changed in response to urbanization.
- Assess the potential impacts of future development on water quality as predicted by a watershed development assessment tool.
- Determine if a relationship exists between turbidity measurements and TSS concentrations for future monitoring efforts.

### Apple Creek:

- Track ratio between dissolved phosphorus and total phosphorus from farm, to channel/ditch, to stream using targeted sampling throughout the flow path.



Teachers collecting macroinvertebrate samples during training, assisted by a UW-Milwaukee graduate student



Appleton East students performing nutrient analyses on water samples from Apple Creek