

Lower Fox River Watershed School-Based Monitoring Program

www.uwgb.edu/watershed

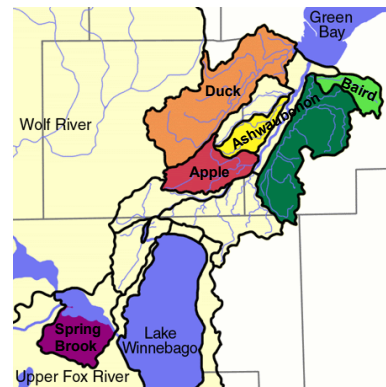
Program Overview

High school student and teacher teams gain hands on experience in assessing aquatic ecosystems by performing a variety of monitoring activities in selected watersheds of the Fox River Basin. The school monitoring program is a major element of a cooperative watershed monitoring and research program being conducted by university and agency scientists within the basin. Modeled after a successful program in Oregon, standardized methods and annual teacher training sessions allow students to collect quality-assured data in their watersheds. Data from the student monitoring is shared on the project website (www.uwgb.edu/watershed) and at an annual Student Watershed Symposium. The monitoring program is administered by the Department of Natural and Applied Sciences at UW-Green Bay, with additional expertise provided by scientists and students from the UW-Milwaukee Biology Department and the UW-Green Bay Center for Biodiversity.

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



Practicing bird counts at the First Annual Student Watershed Symposium, May 2004



Watersheds monitored by students in the program

Who's Involved and Where's the Monitoring Taking Place?

Five student/teacher teams each monitor a watershed, with 2 stations on their stream. Each team consists of two teachers and 10-25 students.

- Appleton East High School (Apple Creek)
- Green Bay Southwest High School (Duck Creek)
- Markesan High/Middle School (Spring Brook)
- Luxemburg-Casco and Green Bay Preble High Schools (Baird Creek)
- West DePere and Green Bay East High Schools (Ashwaubenon Creek)

Monitoring Approach: How do we collect data?

Program elements:

- Standardized equipment and methods
- Web accessible step-by-step procedure and data sheets
- Annual and periodic training sessions
- QA/QC protocols
 - Synthetic samples
 - Assistance of project staff
 - Duplicate/split samples
- Teacher training
- Data audited by project staff
- Comparison to real-time data from UW-Milwaukee and U.S. Geological Survey
- Equipment calibration and maintenance by project staff
- Opportunities for students and teachers to participate in university field research activities



Student-Teacher team collecting streamflow measurements at Apple Creek

Program Components

Annual Student Watershed Symposium
Provides a forum for students to:

- share what they have learned with others in the program
- present student research projects in oral or poster format
- Learn about other watersheds in the Fox River Basin
- Interact with water resource researchers



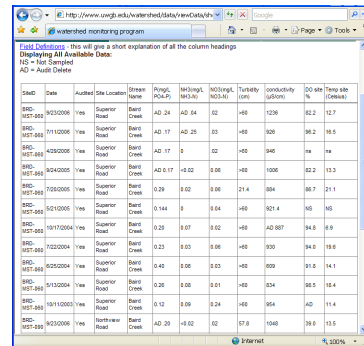
Teachers examining fish from Duck Creek during the 2005 teacher workshop.



Training teachers for online data entry at a Teacher Workshop

Annual Teacher Training Workshop
Provides program teachers with:

- Watershed tours in which teachers learn about watershed issues from local experts
- Training in science of watershed management
- Hands-on practice in lab and field monitoring methods
- Training in accessing and using university and agency monitoring data



Example query of student collected data from project website: www.uwgb.edu/watershed.



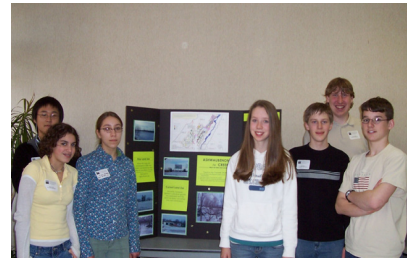
Equipment and field procedure sheet for sampling stream pH



Students performing conductivity tests during the "Procedure Challenge" at the 2004 Annual Watershed Symposium

Who's doing the monitoring? About the students

- Between 70 and 85 students participate in the Program each year
- For most of the students, participation in the program is as an extracurricular activity; as a club or research team
- Majority of participating students are sophomores or juniors
- Many (almost one-third) have been involved in the Program for more than 2 years



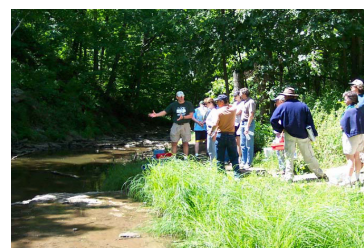
Students from West DePere High School exhibit their poster during the 2006 Student Watershed Symposium



Appleton East team at the Apple Creek Campground sampling location, May 2004

What Are The Students Studying? Examples of High School Research Topics

- The Effectiveness of Detention Basins on Apple Creek (Appleton East High School)
- Phosphorus Levels in Baird's Creek (Preble High School)
- Seasonal Diversity and Population Density of Macroinvertebrates in Spring Brook (Markesan High School)
- The Impact of Changing Land Use Patterns on Fish Populations of Baird Creek (Luxemburg-Casco High School)
- Comparison of Water Quality at French Road and Apple Creek Campground (Appleton East High School)
- How Does Substrate Affect the Colonization of a Riffle? (Green Bay Southwest High School)



Sampling procedures practice at Baird Creek during a Teacher Training Workshop



Students, teachers, researchers, and community members discuss findings at the poster session

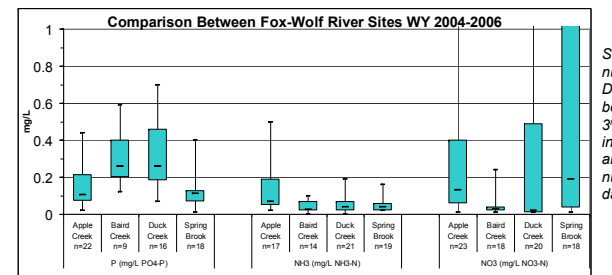
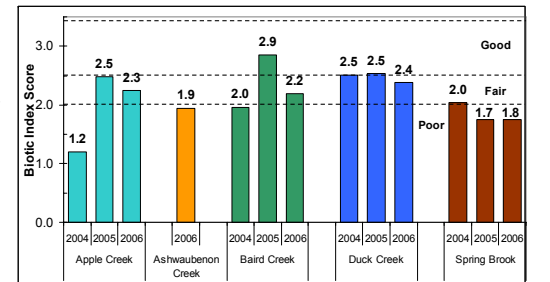
What are the students finding? Example monitoring results:

Ashwaubenon Ck - Little Rapids Rd. Macroinvertebrates: Aug 4, 2006

SiteID	Taxon	Common Name	Total in Sample	Percent of Sample
APP-SBR-121	Diptera	Blackfly	2	4%
APP-SBR-121	Amphipoda	Scud		
APP-SBR-121	Isopoda	Aquatic Sowbug	3	6%
APP-SBR-121	Diptera	Midge Larva	6	13%
APP-SBR-121	Gastropoda	Snails	1	2%
APP-SBR-121	Hirundinea	Leech	25	52%
APP-SBR-121	Decapoda	Crayfish		
APP-SBR-121	Plecoptera	Stonefly	2	4%
APP-SBR-121	Ephemeroptera	Mayfly	1	2%
APP-SBR-121	Coleoptera	Riffle Beetle	1	2%
APP-SBR-121	Odonata	Damselfly Larva	2	4%
APP-SBR-121	Cladocera	Water Flea	5	10%
Index Score	2.88	Totals	48	100%

Student-teacher teams have sampled macroinvertebrates at 10 sites and developed ratings of biotic index for their streams. These data will serve as a valuable baseline for future monitoring activities. They have also performed more than 215 nutrient determinations and performed many other monitoring activities during the past three years.

Student macro-invertebrate data show that area tributary streams rate fair to poor with respect to water quality and pollution loads. Data are averaged across two sampling sites within each watershed.

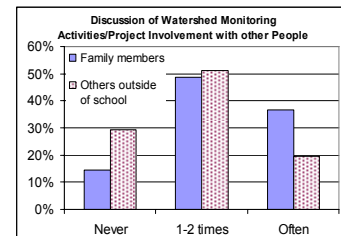


Student collected nutrient data. Details of box plots: box contains 1st and 3rd quartiles; dashes indicate min., max., and median; n = number of samples in dataset.

Has the Program Made an Impact?: What the students say

One of the goals of the school-based monitoring program is to improve student, teacher and community stewardship and understanding of watersheds. When asked, many LFRWMP students indicated that the Program has had an impact on their understanding of watershed science, laboratory skills, future education or career choices, or has given them a better understanding of human impacts on the environment. Student comments:

- "it gave me a much better understanding of watersheds"
- "better realization of the natural world and how human beings are affecting it"
- "helps me understand today's environmental problems;"
- "LFRWMP has definitely swung my career choices more towards environmental sciences"



Most students share information about their watershed activities with others.



Students participate in a Quiz Bowl session at the 2006 Annual Watershed Symposium

Program References and Resources used by high school monitoring teams:

- Bouchard, R. William, Jr., 2004. *Guide to Aquatic Invertebrates of the Upper Midwest*, University of Minnesota, St. Paul, MN.
- EcoWatch® for Windows™ software, YSI, Inc.
- Lindbo, D. Torrey, and Stacy L. Renfro, 2003. *Riparian and Aquatic Ecosystem Monitoring: A Manual of Field and Lab Procedures*, 4th Edition, Saturday Academy's Student Watershed research Project (SWRP); Oregon, 2003.
- Lower Fox River Watershed Monitoring Program website (www.uwgb.edu/watershed) and procedures.
- McCafferty, W. Patrick, 1983. *Aquatic Entomology: The Fisherman's guide and Ecologists' Illustrated Guide to Insects and Their Relatives*, Jones and Bartlett; Boston, MA.
- Peterson, Roger Tory, and Virginia Marie Peterson, 2002. *Birds of eastern and Central North America*, 5th edition, Houghton Mifflin Company, Boston.
- Traulmann, N. and W. Carleson, 2004. *Watershed Dynamics: Teacher Edition and Student Edition*. 252 pages. National Science Teachers Press.
- Water Action Volunteers, *Key to Macroinvertebrate Life in the River*, UW-Extension and Wisconsin DNR.

What's being measured? When does the monitoring occur? How is it done?

	Water Quality									Stream Habitat	In-stream Biotic Integrity	Stream Corridor	
	Physical				Chemical							Frogs	Birds
	Stream flow	Temp.	Transparency/Turbidity	Conductivity	pH	DO	Soluble Reactive Phosphorus	Ammonia Nitrogen	Nitrate Nitrogen				
Equipment	Floating Object	YSI 55 DO/Temp. Probe	Transparency/Turbidity Tube, 60 cm	Oakton EC Testr+ low	Oakton pHTester3+	YSI 55 DO/Temp. Probe	Hach DR/850 Colorimeter	Hach DR/850 Colorimeter	Hach DR/850 Colorimeter	Standardized schematic and inventory form	Macro-invertebrate taxonomic keys	GPS units, thermometer	GPS units, binoculars, field guides, CDs
Method	Floating Object Method	Meter and thermistor	Clear tube w/ secchi disk and drain valve	Meter and electrode	Meter and electrode	Meter and polarographic sensor probe	Colorimetric, Ascorbic Acid	Colorimetric, Salicylate	Colorimetric, Cadmium Reduction	USEPA Streamwalk and WDNR WAV	Biotic Index Calculation; WDNR WAV taxonomic key	5 min Amphibian Calling Survey	10 point counts; assisted by professional birder
When Monitored	Fall (September – October), Spring (May), Summer (July – August)									Summer	Summer	3 times in April-June	June