

NWQEP NOTES

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NC STATE UNIVERSITY

PROJECT SPOTLIGHT

Whitewater River Watershed (Minnesota) Section 319 National Monitoring Program Project



Figure 1. Whitewater River Watershed Project Location

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Introduction

The Whitewater River Watershed Section 319 National Monitoring Program (NMP) project is located in southeastern Minnesota (see Figure 1). The NMP project is a small component of an overall watershed project involving several local, state, and federal agencies and organizations with various sources of funding.

The Whitewater River is a tributary to the Mississippi River at Weaver Bottoms, a nationally significant waterfowl staging area that is threatened by pollutants delivered in the river. Significant portions of the river are classified as wild or semi-wild trout waters. The Whitewater River watershed is 205,000 acres in size. Three main subwatersheds (South, Middle, and North Branches) drain gently rolling to steeply sloped karst topography. Land use in the watershed is predominantly cropland, pastureland and woodland.

Nonpoint source pollution from intensively cultivated fields, long unprotected slopes, and inadequate feedlot, pasture, and forestry management has been identified as significant problems in the watershed. These problems have resulted in impairments of aquatic life and recreation designated uses of the river and its tributaries.

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The Whitewater River NMP project was established to evaluate the effectiveness of various agricultural best management practices (BMPs) using NMP guidance that encourages the use of paired-watershed monitoring designs and biological monitoring in streams. There are two components to the project: 1) a multiple paired-watershed monitoring design incorporating physical and chemical monitoring of five small watersheds; and 2) biological monitoring at several sites throughout the watershed. The paired-watershed monitoring began in 1996, while the biological monitoring began in 1994. The project was accepted into the National Monitoring Program in 2001. Anticipated project completion is between 2004 and 2006.

The Watershed

The Whitewater River Watershed consists of four major subwatersheds: the South Branch, Middle Branch, North Branch, and Lower (mainstem) Whitewater River (see Figure 2). The landscape ranges from gently rolling hills to steep bluffs with rock outcrops. The predominant soils are silt loams,

which overlay bedrock formations of sedimentary sandstones, shales, and dolomites. Given the dolomite (limestone) formations, the terrain is characterized as incipient (poorly developed) karst.

The average annual precipitation in the watershed is between 30 and 32 inches. Approximately 60 percent of this precipitation falls during the growing season. The average growing season is 150 days.

Land use in the watershed consists of cropland (58%), woodland (13%), pasture land (8%), wetland and designated wildlife management areas (14%) and other land (7%). Dairy and beef farms were predominate in the past; however, recent trends in the farm economy have shown a shift from dairy to cash crop production. The watershed also includes two state parks, a state wildlife management area, and a trout hatchery.

The five paired-watershed monitoring sites are located on first-order streams that originate from springs and/or seeps from the Galena Dolomite aquifer (see Figure 2). The presence of the springs (and the geologic formations causing the springs) was a primary factor in selecting the sites for the project. The drainage areas of the sites range from 12 to 60 acres. The drainage areas of the biological monitoring sites are considerably larger, ranging in size from 2,500 to 50,000 acres.

EDITOR'S NOTE

This issue of *NWQEP NOTES* features the most recent project to join the Section 319 National Nonpoint Source Monitoring Program (NMP). The project, located in Minnesota, is evaluating the effectiveness of agricultural best management practices through paired watershed and biological monitoring designs. Due to the long-term nature of NMP projects, the data collected is highly valuable and often contributes to water quality efforts beyond the scope of the particular project. In this case, the Whitewater River Watershed project's extensive biological data base is being used to develop and refine the biological metrics for assessing cold-water streams throughout the state. In addition, project data is contributing to a TMDL study for three reaches of the Whitewater River.

As always, please feel free to contact me regarding your ideas, suggestions, and possible contributions to this newsletter.

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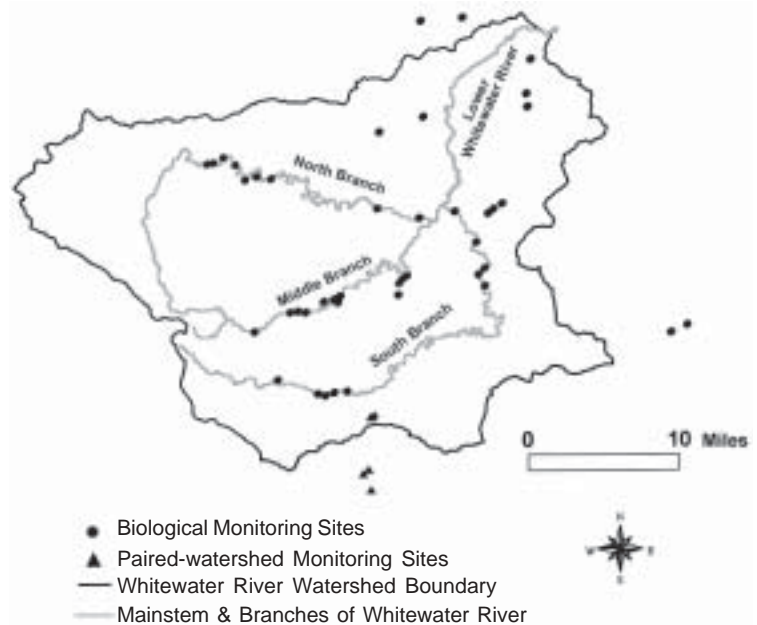


Figure 2. Water Quality Monitoring Stations for Whitewater River NMP Project.

Water Quality Impairments

The primary water quality problems in the Whitewater River watershed include elevated water temperatures, sediment, fecal bacteria, low dissolved oxygen concentrations, reduced

base flows, and degraded habitat. Other pollutants of concern include nutrients and pesticides. Three reaches in the watershed were listed as impaired for turbidity and/or fecal coliform bacteria in Minnesota's 1998 303(d) List.

Pollutant sources include several small wastewater treatment facilities; however, the primary sources of concern are nonpoint sources from agriculture, including streambank erosion, degraded riparian areas, runoff and erosion from cropland, feedlot runoff, animal waste on cropland and pastures, and livestock access to streams.

Water Quality Objectives

The *overall goals* of the Whitewater River Watershed NMP project are:

1. to provide the information needed to evaluate BMP implementation effectiveness, and
2. to provide long-term monitoring for continued evaluation of problems and solutions in the Whitewater River watershed.

Specific objectives for the project are:

1. To evaluate surface and groundwater interactions in the five small paired-watershed study areas.
2. To detect improvement in water quality from a treatment watershed as compared to a control watershed using a paired-watershed monitoring design in the five study sites.
3. To characterize and evaluate the biological conditions of the Whitewater River and its tributaries as they relate to watershed hydrology, land use, land cover, geology, and location.
4. To evaluate the effect of BMPs on water quality using biological monitoring at a watershed scale larger than the paired-watershed study. Efforts will involve a reference stream monitoring design and a paired-watershed monitoring design.

Nonpoint Source Control Strategy

The project is designed to evaluate the effectiveness of various BMPs in two components.

Component One

The small paired-watershed component will be used to evaluate the effectiveness of selected cropland management practices in a series of paired-watershed control and treatment evaluations. Two sites will be used to evaluate the difference in water quality between Conservation Reserve Program (CRP) cover and a corn-soybean rotation (C-S). A second pair of sites will compare no-till planting (ORG) with conventional tillage and row cropping (CRP). A third pair will

evaluate the addition of small grains and alfalfa (Finley West) to a corn-soybean rotation (Finley East). A treatment involving nutrient management will also be explored at the Finley East and West sites.

Component Two

The biological monitoring component of the project will evaluate the effectiveness of nonpoint source BMPs implemented through the use of USDA P.L. 566 and Minnesota Clean Water Partnership funds in the overall watershed project. Practices targeted for use include land treatment practices (i.e., conservation tillage, use of cover crops, critical area plantings, diversions, field borders, grade stabilization structures, livestock exclusion, contour farming, etc.), planned grazing systems, nutrient and pesticide management plans, forestry BMPs, waste management systems, and stream filters and buffers.

Water Quality Monitoring

Component One

A paired-watershed monitoring design of five small watersheds is employed to evaluate changes in water quality after BMP implementation. Continuous recording equipment is being used at the five H-flume monitoring sites to measure stream flow, temperature, and specific conductivity (see Figure 3). An automated weather station collects various climate data at one site. Water samples are collected on a time and flow interval basis. The flow interval sampling provides for storm event sampling throughout individual event hydrographs. Water samples are analyzed for a suite of cations and anions, total suspended solids, and total phosphorus. Some samples have been analyzed for oxygen-18 and deuterium for source delineation.



Figure 3. HL-flume at the Finley West paired-watershed monitoring site.

Component Two

The biological monitoring involves annual stream assessments at up to 42 stream sites. The assessments include the use of physical habitat, benthic macroinvertebrate, and fish surveys to assess watershed condition, generate baseline data to evaluate changes in the watershed, and provide comparisons of BMPs with conventional agricultural practices. Sampling was initially conducted in the cold water portions of the three branches of the Whitewater River and their tributaries, along with cold water streams in nearby watersheds to gauge the relative condition of the watershed. Sampling has now been extended into the warm water portions of the watershed where there is more agricultural and urban land uses, to examine BMP and conventional sites, as well as riparian buffer types.

Physical habitat measurements include water depth, mean water column velocity, substrate type, substrate embeddedness, and cover with a quantitative measurement of bank erosion along each bank. Fish habitat ratings are calculated using the procedures of Simonson et al. (1994). Macroinvertebrates are sampled using the Rapid Bioassessment Protocol III as described by Plafkin et al. (1989). Fish sampling is conducted with a backpack electrofisher (see Figure 4). The fish assemblage at all sites are assessed with the Index of Biotic Integrity (IBI) recommended by Plafkin et al. (1989), using regional modifications for cold water (Mundahl and Simon, 1998) and warm water (Lyons, 1992) streams.



Figure 4. Winona State University students, under the direction of Dr. Neal Mundahl, conduct fish sampling for the biological monitoring component of the Whitewater River Watershed NMP Project.

Progress and Findings to Date

Component One

The physical and chemical water quality data collected from the paired-watershed monitoring sites since 1996 should be sufficient to provide adequate calibration period relationships for two sets of paired watersheds (Finley East/Finley West; and CRP/C-S sites), which exhibited significance for several variables. Figure 5 provides an example of a calibration period regression for flow, observed at the Finley East and West sites.

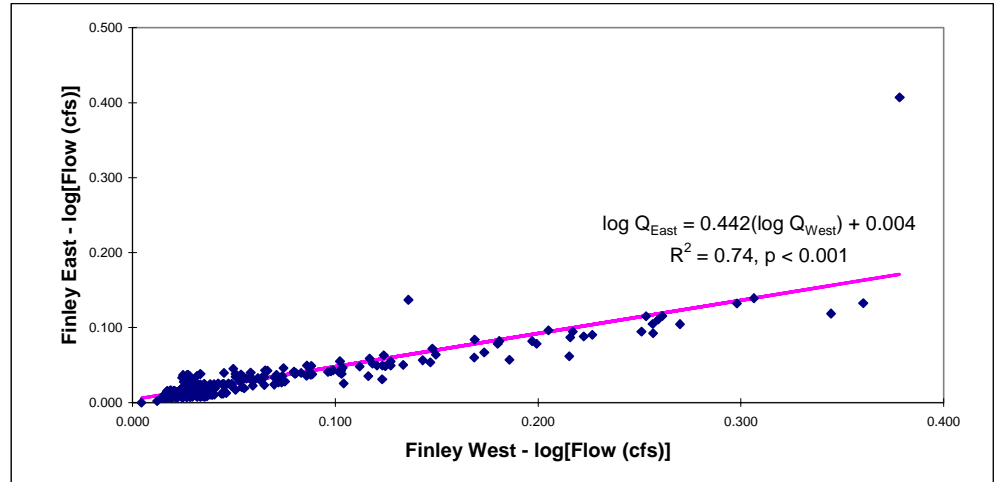


Figure 5. Mean Daily Flows (log-transformed) with “Calibration” Regression Line between Finley East and Finley West Monitoring Sites.

A third set of watershed sites may also provide an adequate calibration period relationship, but the data has not been analyzed yet. Data to evaluate a change in land use from Conservation Reserve Program enrollment back to annual cropping in 1998 has been collected, but has not yet been analyzed.

The implementation of BMPs in two treatment sites (ORG and Finley West) began in 2001 and 2002. There is a concern that more extensive BMP implementation will be needed to detect a change in the water quality of the two sites. Monitoring is proposed to continue for three additional years to obtain the necessary post-BMP/treatment period data.

Component Two

The biological monitoring has shown that most stream sites had fair to good fish habitat ratings. Fish assemblage assessment using two indices of biotic integrity (IBI) indicated that several cold water sites rated fair to good; whereas, most warm water sites rated poor to very poor. Invertebrate assemblage assessments rated most sites throughout the watershed as having moderate impairment. Figure 6 provides a summary of the cold-water IBI scores recorded in the watershed.

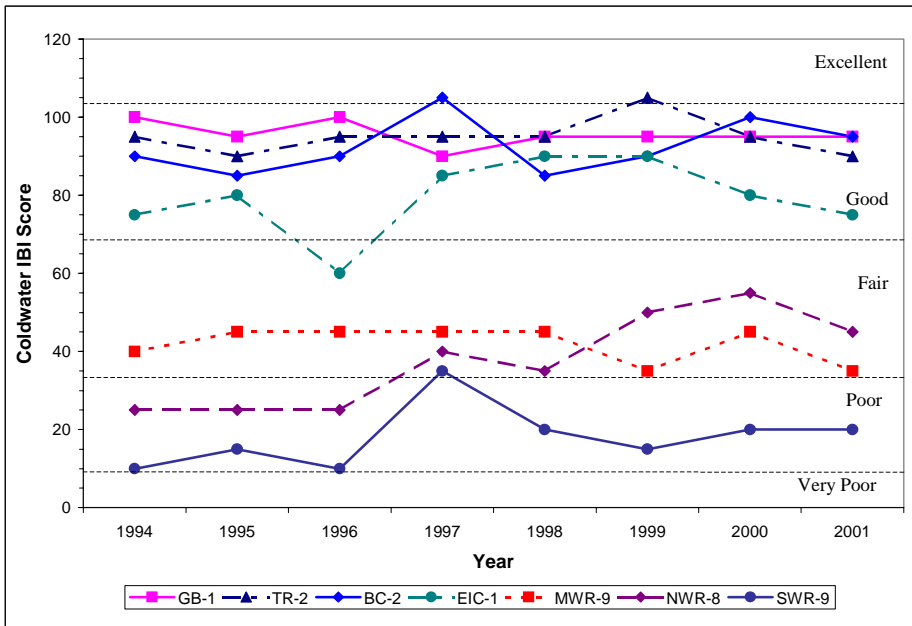


Figure 6. Selected Coldwater Site IBI Scores in and near the Whitewater River Watershed, 1994 - 2001.

The biological monitoring database developed through this project is extensive. In addition to characterizing the biological quality of the streams in the Whitewater River watershed, it has been used to develop and refine the biological metrics used in assessing the quality of cold water streams in Minnesota.

Use of the data to evaluate the effectiveness of BMPs in the watershed is just beginning. It is likely that a paired-watershed design can be established for both a warm water and a cold water set of streams. The existing data is adequate to provide the necessary calibration period relationships. Data will continue to be collected as BMP implementation activities are accelerated via USDA P.L. 566 and Minnesota Clean Water Partnership funding. An implementation effectiveness project using special project funds from USEPA Region V will assist in accelerating BMP installation. Following a transition period of BMP implementation, the formal post-BMP/treatment period is targeted to begin in 2004.

Information, Education and Publicity

Paired-watershed monitoring activities will be discussed informally with the three landowners in the five small watersheds. Information on the paired-watershed and biological monitoring activities will be presented to the Whitewater Watershed Joint Powers Board (WWJPB) and its overall project committees. WWJPB staff will coordinate information and education activities for landowners and local units of government in the overall watershed project.

Impact of Other Federal and State Programs

The overall watershed project has received monitoring and BMP implementation funding from the Minnesota Clean Water

Partnership (CWP) Program and the USDA P.L. 566 Program.

The project has worked hard to incorporate and integrate the project activities of these programs, as well as the activities of other local, state, and federal organizations. The BMP implementation plan was developed by the Whitewater Joint Powers Board following extensive input from a citizens' advisory committee. Additional funding and support has been received from the USEPA, Minnesota Board of Water and Soil Resources, the Legislative Commission on Natural Resources, the Minnesota Department of Natural Resources, the U.S. Fish and Wildlife Service, and private sources including Land O'Lakes and the McKnight Foundation.

For Further Information

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Literature Cited

Lyons, J. 1992. *Using the index of biotic integrity to measure environmental quality in warmwater streams of Wisconsin*. General Technical Report NC-149. U.S. Department of Agriculture, Forest Service, North Central Experiment Station, St. Paul, Minnesota. 51 pp.

Mundahl, N.D. and T.P. Simon. 1998. Development and application of an index of biotic integrity for coldwater streams of the upper midwestern United States. pp. 383 – 415 in T.P. Simon (editor): *Assessing the sustainability and biological integrity of water resource quality using fish assemblages*. Lewis Publishers, Boca Raton, Florida.

Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross and R.M. Hughes. 1989. *Rapid bioassessment protocols for use in rivers and streams: benthic macroinvertebrates and fish*. EPA/444/4-89-001.

Simonson, T.D., J. Lyons, and P.D. Kanehl. 1994. *Guidelines for evaluating fish habitat in Wisconsin streams*. General Technical Report NC-164. U.S. Department of Agriculture, Forest Service, North Central Experiment Station, St. Paul, Minnesota. 36 pp.



Information

Conference Report

The 10th National Nonpoint Source Monitoring Workshop: *Monitoring and Modeling from the Peaks to the Prairies* was held on September 8-12, 2002, in Breckenridge, Colorado. The workshop focused on the technical issues of quantifying effectiveness of best management practices in improving water quality, including challenges of nonpoint source management, study design, monitoring approaches, and data analysis. Progress of Section 319 National Nonpoint Source Monitoring Program projects, as well as other nonpoint source control watershed projects, were highlighted at the workshop. Over 130 people participated in the conference, which included a pre-conference stream restoration field tour, a workshop on TMDLs, half-day local tours, and an all-day field trip. Conference session topics included stream restoration, nonpoint source modeling, BMP implementation/evaluation, TMDL development, and nonpoint source public information/education. The field tour included stops at the towns of Fairplay, Buena Vista and Leadville, and focused on legacy mine restoration. Highlights of the tour included breakfast with a local geology/history presentation in Fairplay, and a visit to the National Hall of Fame Mining Museum in Leadville. Immediately following the workshop was the Third Annual Colorado Watershed Assembly Conference, held September 12-13, 2002.

A special thanks goes to Randy Ristau, Lower South Platte Watershed Coordinator and NPS Agricultural Outreach Specialist with the Colorado Dept. of Public Health and Environment, for chairing the conference planning committee. Thanks also to Tammy Taylor with Conservation Technology Information Center (CTIC), and workshop sponsors and hosts for organizing an informative and enjoyable conference. Next year's annual conference, *The Eleventh National Nonpoint Source Monitoring Workshop: Monitoring and Modeling the Urban Environment*, will take place in Southeast Michigan, September 7-11, 2003. See page 9 for the Call for Papers announcement.

Comments Solicited on EPA's Draft Urban Management Measures Document

National Management Measures to Control Nonpoint Source Pollution from Urban Areas is a draft technical guidance and reference document for use by State, local, and tribal managers in the implementation of nonpoint source pollution management programs. It contains information on the best

available, economically achievable means of reducing pollution of surface and ground water from urban areas. **The due date for comments on the draft is December 9, 2002.** Please send comments to Rod Frederick of EPA at frederick.rod@epa.gov. The document can be viewed at <http://www.epa.gov/owow/nps/urbanmm/index.html>.

National Water Quality Inventory Report

The U.S. EPA has released The National Water Quality Inventory Report to Congress (305(b) report), which is the primary vehicle for informing Congress and the public about general water quality conditions in the United States. The report is online at: <http://www.epa.gov/305b/2000report/>. ■

Meetings

Call For Papers

Illinois Lake Management Association 18th Annual Conference: April 3-5, 2003, Bloomington, IL. Presentations encouraged on: innovative and/or creative watershed and lake management techniques; watershed and in-lake efforts to reduce erosion and runoff, and improve water quality or habitat; and case studies and reports of ongoing lake and watershed efforts. Submit abstracts by email to amy.walkenbach@epa.state.il.us. For general conference information, contact Dick Hilton at Wildick@mc.net; Tel: 800-338-6976 access code 01. **Abstracts due December 13, 2002.**

StormCon '03 - The North American Surface Water Quality Conference & Exposition: July 28-31, 2003, San Antonio, Texas. Presentations sought for the following conference tracks: Meeting the Regulatory Challenge; Choosing the Right BMPs; Monitoring Water Quality; and Public Education & Outreach. **Abstracts due December 13, 2002.** For more information, visit www.stormcon.com.

Community Based Collaboratives Research Consortium's National Conference: Evaluating Methodologies and Environmental Outcomes of Community Based Collaborative Processes: September 14-16, 2003, Salt Lake City, Utah. The conference will feature the results of research projects funded by the Consortium as well as emerging developments in the field of community based collaborative approaches to environmental management. **Abstracts due December 20, 2002.** Contact CBCRC Coordinator Karen Firehock at 434-924-5041; Fax: 434-924-0231; Email: kef8w@virginia.edu; Web site: <http://www.cbrc.org>.

11th National Nonpoint Source Monitoring Workshop

September 7-11, 2003
Southeast Michigan

<http://www.ctic.purdue.edu/CTIC/NPSCall.html>

About the Conference: The 11th year of this workshop will once again bring together land managers and water quality specialists to share information on the effectiveness of best management practices in improving water quality, effective monitoring techniques, and statistical analysis of watershed data. The workshop will focus on the successes of Section 319 National Monitoring Program projects as well as other innovative monitoring projects from throughout the U.S. The agenda will include three days of workshop sessions/presentations and a one-day field trip to visit nonpoint source project sites relating to the workshop.

Session Topics:

- Urban Stream Restoration
- NPS Modeling
- BMP Tracking and Monitoring Techniques
- Low Impact Development Approaches
- Stream Buffers

Presentations will be 20 minutes long, plus 10 minutes for discussion. Poster presentations are also encouraged. All presenters will submit a brief paper due one month before the conference. Abstracts for committee review are limited to one page, single-spaced or 300 words. Submission via email is encouraged. Preferred format is MS Word. Please include your name, affiliation, mailing address, email address, telephone/fax numbers, session topic and presentation type - oral or poster. Authors will be notified by May 3, 2002 regarding the status of their abstract.

Deadline for abstract submission — April 4, 2003

Nonpoint source workshop web site: www.ctic.purdue.edu/NPSWorkshop.html

Mail disk and hardcopy to:

Nonpoint Source Workshop
1220 Potter Drive, Suite 170
West Lafayette, IN 47906
Phone: 765-494-9555; Fax: 765-494-5969

Contact Tammy Taylor at taylor@ctic.purdue.edu or call 765-494-9555.

Production of NWQEP NOTES is funded through U.S. Environmental Protection Agency (EPA) Grant No. X825012. Project Officer: Tom Davenport, Office of Wetlands, Oceans, and Watersheds, EPA, 77 W. Jackson St., Chicago, IL 60604. Website: <http://www.epa.gov/OWOW/NPS>

Meeting Announcements - 2003

January

Stream and Surface Water Identification for Riparian Buffer Applications: Piedmont and Coastal Plain: January 6-9, 2003, Raleigh and New Bern, NC. Contact Susan Moore, Forestry Education Outreach Program, NC State University. Tel: 919-515-3184; Fax: 919-515-6883; Email: susan_moore@ncsu.edu.

February

Urban Stormwater: Enhancing Programs at the Local Level: February 17-20, 2003, Chicago, Illinois. Contact conference coordinator Bob Kirschner, Chicago Botanic Garden, 1000 Lake Cook Road, Glencoe, Illinois, 60022; email: bkirschn@chicagobotanic.org.

International Erosion Control Association 34th Annual Conference and Expo: February 24-28, 2003, Las Vegas, Nevada. Tel: 970-879-3010; Fax: 970-879-8563; Web site: www.ieca.org.

April

Restore America's Estuaries Inaugural National Conference on Coastal and Estuarine Habitat Restoration: April 13-16, 2003, Baltimore, MD. Contact Heather Bradley, Conference Coordinator, at 703-524-0248, or hbradley@estuaries.org. Website <http://www.estuaries.org/>.

6th National Mitigation Banking Conference: Practice and Policy: April 23-25, 2003, San Diego, CA. Web Site: <http://www.mitigationbankingconference.com>, or contact Carlene Bahler at cbahler@erols.com or 703-548-5473.

May

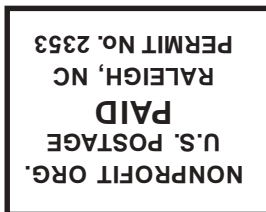
The American Water Resources Association Agricultural Hydrology Technical Committee 2003 Spring Specialty Conference: Agricultural Hydrology and Water Quality: May 11-14, 2003, Kansas City, Missouri. Contact Harriette Bayse at harriette@awra.org; website: www.awra.org/meetings/Kansas2003/.

June

Environmental Statistics Short Course: June 16-18, 2003, Colorado State University, Fort Collins, Colorado. For information contact Jim Loftis, loftis@engr.colostate.edu.

The Fourth National Workshop on Constructed Wetlands/BMPs for Nutrient Reduction and Coastal Water Protection: June 23-25, 2003, Wilmington, North Carolina. Contact Dr. Frank Humenik, Waste Management Programs, College of Agriculture and Life Sciences, Campus Box 7927, North Carolina State University, Raleigh, NC 27695-7927. Tel: 919-515-6767; Fax: 919-513-1023; e-mail: frank_humenik@ncsu.edu.

AWRA's 2003 International Congress: Watershed Management for Water Supply Systems: June 29-July 2, 2003, New York City, NY. Contact Peter E. Black, International Congress Organizing Chair, SUNY ESF, 1 Forestry Drive, Syracuse, NY 13210. Tel: 315-470-6571; Fax: 315-470-6956; Email: pebchair@esf.edu; web site: www.awra.org.



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