

NWQEP NOTES

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PROJECT SPOTLIGHT

Monitoring of both land treatment and water quality is necessary to document the effectiveness of nonpoint source pollution controls in restoring water quality. The Section 319 National Monitoring Program, administered by the U.S. Environmental Protection Agency, is designed to support watershed projects throughout the country that meet a minimum set of project planning, implementation, monitoring, and evaluation requirements. The requirements are designed to lead to successful documentation of project effectiveness with respect to water quality protection or improvement. The National Monitoring Program projects comprise a small subset of nonpoint source control projects funded under Section 319 of the Clean Water Act Amendments of 1987.

Stroud Preserve (Pennsylvania) Section 319 National Monitoring Program Project

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Project Synopsis

The effectiveness of riparian reforestation to reduce nonpoint source pollution from crop production is being evaluated in three experimental agricultural watersheds in the Stroud Preserve, a farm protected by conservation easements located in the Piedmont physiographic region of southeastern Pennsylvania (see Figures). Streams in the three watersheds flow into the Brandywine River, which feeds the Delaware Estuary. Prior to 1992, all three watersheds were primarily in crop production (maize, soybeans, hay) under a soil conservation plan including contouring and crop rotation. Agricultural practices contributed to water quality impairment due to excess nutrients and suspended sediments.

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Water quality monitoring is based on a modified paired-watershed design with three paired watersheds. One treatment watershed (Morris Run), currently in agricultural production, contains a restored riparian zone that was planted in hardwood seedlings in 1992. A second treatment watershed (Half Way Run) was taken out of agricultural production in 1992 and reforested in its entirety. The control watershed (Mine Hill Run) has been, and will continue to be, maintained in agricultural production comparable to that of Morris Run.

Water quality monitoring for nutrients and suspended sediments includes grab samples collected every 14 days from all three streams, intensive storm runoff sampling eight times a year (treatment/Morris Run and control/Mine Hill Run), sampling of overland flow (Morris Run), and quarterly sampling of groundwater (Morris Run).

For purposes of the paired-watershed analysis, the years 1992-1999 are considered as the baseline phase, during which time the seedlings became established. Over this period, nutri-

ent chemistry in the stream with the reforested buffer (Morris Run) showed trends comparable with that in the control watershed (Mine Hill Run), with no evidence of increasing nutrient removal attributable to tree growth. Mass balance calculations, based on groundwater and streamwater concentrations, however, suggest that some nitrogen removal has occurred within the riparian zone since the project's inception. In the watershed that was entirely reforested (Half Way Run), streamwater concentrations of both nitrogen and phosphorus have declined steadily since 1992.

The Stroud Preserve project was accepted for the National Monitoring Program in April 1997. The project has received financial support for various periods since 1991 from the USDA Forest Service, the Pennsylvania State Bureau of Forestry, and the Chesapeake Bay Program. Technical assistance has been provided by the USDA Forest Service, the Pennsylvania State Bureau of Forestry, and the USDA Natural Resources Conservation Service (NRCS).

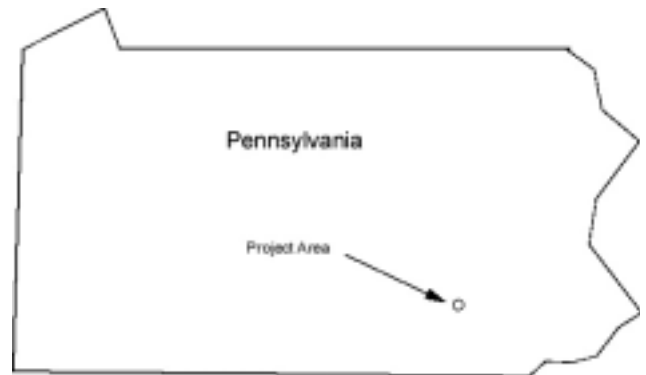
EDITOR'S NOTE

Riparian buffers are gaining wide-spread recognition for their role in protecting water quality and habitat. They provide numerous benefits, such as removing pollutants, maximizing sheet flow, stabilizing streambanks, protecting wetlands, providing food and habitat for aquatic organisms and streamside plants and animals, and moderating stream temperatures. They can also provide recreational uses and reduce flood damage. Riparian buffers are important to both rural and urban communities.

This issue of *NWQEP NOTES* features a Section 319 National Monitoring Program project in Pennsylvania, which is evaluating the effectiveness of riparian reforestation to reduce nutrient and sediment loadings from crop production. Results from the project will be used to establish specific guidelines for planting and managing forest buffer zones in the mid-Atlantic region of the United States.

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

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Stroud Preserve Watershed Project Location

The Watershed

The project is being carried out on three experimental agricultural watersheds within the Stroud Preserve, a 197-hectare tract held in conservation easements, ensuring control over land use in perpetuity.

The average annual precipitation is 115 mm (45 inches). Soils on the Preserve are mainly typic hapludults, but those in the riparian areas are aquic fragiudults. A weathered rock or saprolyte extends to a typical depth of 5-7 m with a bedrock consisting mainly of fractured schist. Slopes average about 10%.

Morris Run, Mine Hill Run, and Half Way Run are perennial headwater streams in the three watersheds of 16.2, 36.1, and 15.1 hectares, respectively. They flow into the Brandywine River, which has a 750-km² watershed, and is a tributary to the Delaware Estuary. The Brandywine River provides various water supply and recreational uses and is classified for warm water and migratory fishes in its lower reaches, trout stocking and cold water fishes in various upper reaches. Agricultural

sources contribute to elevated nutrient concentrations and sediment loads in the three streams and the River.

Land use for the Morris Run (treatment) watershed and the Mine Hill Run (control) watershed is primarily agriculture. All but a few hectares of the 16.2 ha Morris Run watershed are maintained in contoured strips under a crop rotation program established by the NRCS. The primary crops are maize, soybeans, and hay (alfalfa). Records are being kept of all fertilizer applications and of crop yields. The area in riparian reforestation is approximately 1 hectare.

Most of the watershed of Mine Hill Run (control) is planted in alfalfa, maize, and soybeans, also under NRCS conservation tillage. A sparsely forested, brushy zone extends 50-200 m from the stream. Land use in this watershed is being maintained without alteration.

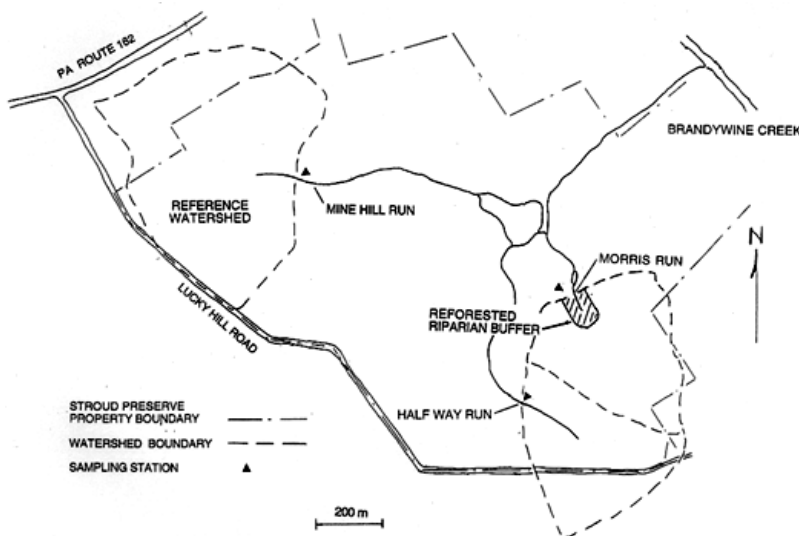
The Half Way Run Watershed (treatment) was in production for row crops and hay prior to 1992, when it was entirely reforested with hardwood seedlings.

Agricultural fertilizers and atmospheric deposition are the primary sources for elevated exports of nitrogen from the three watersheds. Erosion from tilled fields is the primary source of sediment export. Both erosion and fertilization contribute to elevated phosphorus exports.

Pre-Project Water Quality

Grab samples taken in August 1991 yielded the following:

	Morris Run	Half Way Run
Nitrate-N (mg/L)	3.6	2.7
Ammonia-N (mg/L)	0.10	0.05
Dissolved Orthophosphate-P (mg/L)	0.029	0.02



Sampling Stations and Boundaries for Stroud Preserve Watershed

Water Quality Objectives

Primary objectives of this project are to:

- 1) demonstrate the effectiveness of riparian reforestation, when used in conjunction with sound nutrient management and erosion control practices on uplands, in reducing non-point source pollution from agricultural sources; and
- 2) establish specific guidelines for planting and managing forest buffers zones in the mid-Atlantic region.

Project Time Frame

April 1997—March 2002

Nonpoint Source Control Strategy

A riparian forest buffer system was established in Morris Run (the treatment watershed) in April of 1992, in accordance with the specification published by the USDA Forest Service (Welsch, 1991). Seedlings of Sugar Maple, Red Oak, Tulip Poplar, White Ash, Black Walnut, and Trembling Aspen were planted in a zone extending 23 meters (75 feet) from the stream bank on either side and upslope from its source. Prior to the planting, the buffer area consisted of mowed grass, some tilled area, and a narrow riparian strip (3-10 m) of hardwood trees and brush.

An additional 6 meters (minimum) beyond the reforested buffer is maintained as grassland, representing “Zone 3” of the Riparian Buffer specification. In accordance with this specification, the grassland zone was contoured in late May 1994 to form a level-lip spreader, designed by the NRCS. The purpose of the spreader is to intercept surface runoff, which is delivered to the buffer via grassed waterways, and to release the runoff to the forested buffer as dispersed sheet flow in order to minimize erosion within the buffer.

Additional nonpoint source control measures applicable to both the treatment and control watersheds include contoured strips, waterways, and crop rotations in accordance with a soil conservation plan.

Water Quality Monitoring

The monitoring program is based on a paired watershed design. Although the riparian forest buffer was established in the first year of monitoring, the first several years (prior to rapid tree growth) serve as a calibration period. To supplement the paired watershed design, nutrient and sediment retention by the riparian buffer will be estimated by mass balance, using data from groundwater monitoring wells and overland flow collectors.

Parameters measured include suspended solids (SS), volatile solids, nitrate+nitrite, ammonia, organic nitrogen, total

phosphorus, total dissolved phosphorus, dissolved orthophosphate, organic carbon, chloride, pH and conductivity. Also measured are precipitation, streamflow, groundwater level, streamwater temperature, and basal area of woody vegetation within the riparian zone.

Streamwater samples are collected every 14 days throughout the year from all three streams. Discharge is continuously monitored at all three streams using v-notch weirs. Intensive sampling of streamwater during runoff events is conducted eight times annually from Morris Run and Mine Hill Run. Groundwater is sampled quarterly from 27 monitoring wells. Overland flow in Morris Run watershed is collected from eight events annually.

Between January 1992 and March 1997 regular grab samples from all three streams were taken for nitrate, dissolved ammonium, dissolved orthophosphate, conductivity, and pH, at a frequency of 18-24 times per year. Particulate phosphorus and total dissolved phosphorus were sampled regularly from October 1993 through September 1994. Dissolved organic nitrogen was not sampled regularly prior to April 1997. Sampling for suspended sediments began in late 1993 for Morris Run and Half Way Run, and March 1995 in Mine Hill Run. Seven runoff events were sampled in Morris Run between November 1993 and June 1995.

As of March 1999, eight storm events (rainfall > 20 mm) instead of four are sampled per year. As much as possible, the sampled storms will be distributed evenly throughout the year with preference given to the largest storms. During each event, discharge is sampled hourly after reaching a given stage. Two of the samples collected hourly from each rising and falling limb are selected for analysis. Samples are analyzed for the same constituents as the biweekly grab samples.

Data analysis includes:

- (1) comparisons of concentrations and annual exports of nitrogen, phosphorus, and suspended solids from each of the three watersheds, testing the hypothesis that these parameters are reduced by riparian reforestation;
- (2) mass-balance estimates of nitrogen, phosphorus, and sediment retention within the reforested riparian buffer.

Findings to Date

Comparisons of groundwater with streamwater concentrations suggest that significant nitrogen removal, tentatively estimated at 60 kg ha⁻¹ y⁻¹ (or 31% of subsurface nitrate input) is occurring within the riparian zone. However, relatively large annual variations in the groundwater nitrate concentration upslope from the buffer introduce substantial uncertainty into this estimate of removal.

Between 1992 and 1998 streamwater nitrate concentration increased in both the buffered and control watersheds. It is expected that tree growth and associated increase in denitrifi-

cation and nutrient uptake will begin to decrease nitrate levels in the next few years.

Streamwater nitrate concentration in the treatment watershed that was entirely reforested (Half Way Run) declined by approximately 30% between 1992 and 1998. This decline was significant relative to the control watershed.

Information, Education and Publicity

The project targets both professionals involved in development of nonpoint source control strategies and the public at large. Results will be made available to professionals through scientific papers prepared for refereed publication, presentations and meetings and symposia, and the annual reports. In addition, the project receives considerable exposure through the Stroud Water Research Center's educational program, which reaches thousands of students and adults annually.

For Further Information

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Literature Cited

Welsch, David J. 1991. *Riparian Forest Buffers: Function and Design for Protection and Enhancement of Water Resources*, USDA Forest Service, Northeastern Area, Radnor, PA. Publication NA-PR-07-91 ■

WEB RESOURCES

Water Resources Fact Sheets

The University of Wisconsin – Extension Water Resources Program web site: <http://clean-water.uwex.edu/pubs> has a number of fact sheets in pdf format. *Erosion Control for Home Builders* describes methods of preventing soil erosion during home construction, including a look at lawn sodding and seeding, silt fences and a sample erosion control plan. *Pet Waste and Water Quality* describes why pet waste is a water quality concern, and how pet owners can prevent problems.

Other fact sheets available on the web site include the *Yard Care and the Environment* series, *Stormie's Clean Water Tips* stormwater management series, the *Shoreland Stewardship* series, numerous *Land Stewardship* articles for use in newsletters, and the *Keeping Current* newsletter.

All the fact sheets on the web site can be printed and are also available free from Extension Publications (608)262-3346. ■

INFORMATION

1999 Summary of Section 319 National Monitoring Program Projects

Lombardo, L.A., G.L. Grabow, K.L. Tweedy, D.E. Line, D.L. Osmond, and J. Spooner. 1999. *1999 Summary Report: Section 319 National Monitoring Program Projects*, National Nonpoint Source Watershed Project Studies, NCSU Water Quality Group, Biological and Agricultural Engineering Department, North Carolina State University, Raleigh, NC. 339 p.

The annual report of the Section 319 National Monitoring Program Projects is available on-line at <http://h2osparc.wq.ncsu.edu/319index.html>. This report provides project profiles for 23 watershed projects, selected under the Section 319 National Monitoring Program, that are being monitored over a 6- to 10-year period to evaluate how improved land management reduces water pollution. These projects will help communities and citizens protect their local water resources by providing information on the effectiveness of tools and techniques for solving nonpoint source problems.

Low Impact Development Manual

Two guidance manuals have been developed that contain information on the Low Impact Development (LID) approach to site designs. The LID methodology is intended to be used and adapted by storm water managers as a primary tool for protecting water quality from the impacts of new development. These two documents, developed by Prince George's County, Maryland Department of Environmental Services, contain a description of LID principles, programmatic considerations, design strategies and an example of an analytic and computational procedure to use in designing appropriate runoff treatment systems.

Low-Impact Development: An Integrated Design Approach (EPA 841-B-00-003, January 2000) was prepared for local planners, engineers, developers, and officials. This document details how to develop and implement LID methods from an integrated design perspective.

Low-Impact Development Hydrologic Analysis (EPA 841-B-00-002, January 2000) is the companion document to the LID design manual. This document contains a methodology that can be used to estimate changes in site hydrology due to new development and also to design appropriate treatment systems to maintain the predevelopment hydrology of the site.

Copies can be obtained from the National Service Center for Environmental Publications (NSCEP) 1-800/490-9198 or online at <http://www.epa.gov/ncepihom/orderpub.html>.

Protocol for Developing Sediment TMDL's

U.S. EPA. *Protocol for Developing Sediment TDL's*. 1st Ed: Oct 1999. Rept # EPA 841-B-99-004.

Available from National Service Center for Environmental Publications: phone: 513-489-8190; fax: 513-489-8695. Also available on-line at: <http://www.epa.gov/owow/tmdl/sediment/sediment.html>

Economics of Water Quality Protection Report

Economics of Water Quality Protection from Nonpoint Sources: Theory and Practice. By M.O. Ribaud, R.D. Horan, and M.E. Smith, Resource Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 782 (AER-782).

This report outlines the economic characteristics of five instruments that can be used to reduce agricultural nonpoint source pollution (economic incentives, standards, education, liability, and research) and discusses empirical research related to the use of these instruments. The report is available on-line in PDF format at <http://www.econ.ag.gov/epubs/pdf/aer/782/>

New Video Examines Polluted Urban Runoff

Is the water that flows from your tap safe to drink? Are the fish you buy or catch safe to eat? Can you recreate in nearby rivers, lakes, or streams without facing serious health hazards? Residents of towns and cities across America are facing these questions with greater frequency, as growing populations, sprawling development, and pollution threaten the purity of our fresh water supplies.

In an effort to help communities deal with these issues, the Oregon State University Extension Service has produced a new video entitled "After the Rain: Urban Runoff." The program explores the importance of water, the pressures that towns and cities place on the resource, and ways that individual can protect local drinking waer supplies.

"After the Rain: Urban Runoff" (VTP 029) costs \$19.95 (including shipping) per copy. Send your request and check or money order payable to Oregon State University to: Publication Orders, Extension & Experiment Station Communications, Oregon State University, 422 Kerr Administration Building, Corvallis, OR 97331-2119. Further information about the video and other water-related educational materials is available on the Web at <http://eesc.orst.edu>.



ANNOUNCEMENTS

NCSU Water Quality Group Adds Staff

We would like to welcome Karen Hall to the NCSU Water Quality Group effective April 2000. Karen will serve as Riparian Vegetation Specialist for the Stream Restoration Institute. Her primary responsibility is to plan riparian vegetation restoration, which includes determining species selection, quantities, times to plant, seed mixes, and instructing contractors on correct ways to plant. Karen will also be experimenting with riparian vegetation at different project sites to determine such things as best plants to plant at different sites and under different circumstances, staking versus transplants, and exotic weed interactions with riparian plants.

Karen comes to us from a consulting firm, where she worked as a biologist on natural resource surveys, wetland delineation and restoration, environmental planning, and NEPA documentation. Karen received her BS degree in Biology from University of North Carolina–Chapel Hill and her MS degree in Forestry from North Carolina State University. Welcome Karen! ■

MEETINGS

Notice of Training Events

Delineation of Piedmont and Coastal Plain Jurisdictional Wetlands: May 29–June 2, 2000, Raleigh and New Bern, NC. Sponsors: Forestry Educational Outreach Program, NC State University, Department of Forestry. Contact Judy Rogers, 919-515-3184. Web site: www.ces.ncsu.edu/nreos/forest/feop/

This workshop is designed to equip natural resources professionals with the knowledge and field skills necessary for delineation of jurisdictional wetlands and application of 404 regulations. Topics include 1) systems of wetlands classification, 2) basic science of wetland hydrology and hydric soils, 3) identification and delineation of jurisdictional wetlands in accordance with U.S. Army Corps of Engineers methods, 4) current status of 404 regulations, and 5) principles of wetland mitigation. The course includes extensive field practice in representative wetland types of the Piedmont and Coastal Plain.

Environmental Statistics Short Course: June 12–14, Colorado State University, Fort Collins, CO. Contact Jim Loftis, loftis@enr.colostate.edu.

This course is designed to provide information and experience with statistical methods appropriate for environmental monitoring, including water, air, and soil. Applications will include biological monitoring as well as chemical and physical variables.

Call For Papers

Water Research Symposium'2000: Advances in Water and Land Monitoring Technologies and Research for Management of Water Resources. Nov 8–10, 2000, Virginia Tech, Blacksburg, VA. The purpose of the symposium is to facilitate an interdisciplinary forum to present and discuss all aspects of advanced and innovative water monitoring (physical, chemical, biological) technologies and research for natural waters (surface water, ground water, estuarine, wetlands, and precipitation, etc.) and advanced land use monitoring (such as remote sensing and satellite imageries) that impact decision-making processes in management of water resources. The symposium is intended for individuals involved with developing monitoring technologies, research scientists (e.g., hydrologists, biologists, ecologists, chemists, water resources specialists, economists, engineers), educators, consultants, watershed managers, and policy/decision makers. Abstracts are accepted in the following topical areas:

1. Advanced water (quantity and quality) monitoring technologies and instrumentation;
2. Water monitoring research (sampling, analytical, and statistical techniques);
3. Monitoring network design;
4. Pollutant source identification;
5. Monitoring studies for TMDL plan development;
6. Legal, institutional and financial issues related to water monitoring;
7. Advanced land-use monitoring technologies, research, and case studies for management of water resources;
8. Other topics relevant to the purpose of symposium

Abstracts (500 to 750 words in length) should be submitted by mail, fax, or electronic means **by May 30, 2000** to: Dr. Tamim Younos, Virginia Water Resources Research Center, 10 Sandy Hall, Virginia Tech, Blacksburg, VA 24061-0444. Phone: 450-231-8039; FAX: 540-231-6673; E-mail: tyounos@vt.edu.

The deadline for submission of papers (7,500 to 10,000 words) for inclusion in the symposium proceedings is September 30, 2000. Additional information will be posted on the symposium Web site: <http://www.vwrrc.vt.edu>.

5th International Conference on Diffuse Pollution and Watershed Management: Jun 10–15, 2001, Milwaukee, WI. Sponsored by the International Water Association, Specialist Group on Diffuse Pollution. Web site <http://www.mu.edu/environment/iwa-page.htm>. Sessions will be organized around five general themes: Source Identification and Measurement; Water Quality Impacts; Solutions to Diffuse Pollution; Socioeconomic and Policy Considerations; and Information Management, Transfer and Exchange. Submit an abstract (<500 words) in Word or WordPerfect format to mburkart@nstl.gov by **September 30, 2000**.

Meeting Announcements — 2000

MAY

Second National Extension Natural Resources Conference – Excellence through Partnerships: May 16–18, South Lake Tahoe, NV. Contact Larry Biles, USDA/CSREES/NRE, Stop 2210, Suite 821, Aerospace Center, Washington, DC 20250-2210, Tel: 202-401-4926, email: lbiles@reusda.gov

JUNE

2000 Nutrient Management and Water Quality in Southeast United States Symposium: Problems and Solutions: Jun 4-6, Tallahassee, FL. Contact Dr. O. S. Mbuya, 119 Perry Paige Bldg., Center for Water Quality, Florida A&M University, Tallahassee, FL 32307-4100. Fax: 850-561-2221, email: ombuya@famu.edu

Management Information Systems 2000 – Incorporating GIS and Remote Sensing: Jun 14-16, Lisbon, Portugal. Second International Conference. Contact Gabriella Cossutta, Conference Secretariat, Wessex Institute of Technology, UK, email: gcossutta@wessex.ac.uk

Science and Engineering Technology for the New Millennium: Jun 21-24, Colorado State University, Fort Collins, CO. Sponsored by the American Society of Civil Engineers, Water Resources Engineering Division and Water Resources Planning and Management Division. Contact ASCE, 1801 Alexander Bell Drive, Reston, VA, 20191-4400; Tel: 800-548-2723 or 703-295-6300, Fax: 703-295-6144, web site: <http://www.asce.org/gsd/sections/colorado/wm2000/>

JULY

2000 American Society of Agricultural Engineers Annual International Meeting: Jul 9-12, Milwaukee, WI. Web site: <http://asae.org/meetings/am2000/>

5th International Conference on Precision Agriculture and Other Precision Resources Management: Jul 16-19, Bloomington, MN. Contact Mary Kay Ferguson, Tel: 612-625-8215 or 800-367-5363, ext. 58215, Fax: 612-624-9221, email: mferguson@extension.umn.edu, web site: <http://www.precision.agri.umn.edu/2kconf>

Living Downstream in the Next Millennium: Reconciling Watershed Concerns with Basin Management. Universities Council on Water Resources Annual Meeting: Jul 31-Aug 4, New Orleans, LA. Contact Jeffery A. Ballweber, Water Resources Policy Analyst, Water Resources Research Institute, PO Box AD, Mississippi State, MS 39762. Tel: 662-325-3620, Fax: 662-325-3621, email: ballweber@engr.msstate.edu

AUGUST

The Millennium Wetland Event: Aug 6-12, Quebec City, Canada. Contact Ms. Elizabeth MacKay, Millennium Wetland Event Secretariat, Bureau 620, Le Delta II, 2875, boulevard Laurier, Ste-Foy, Québec, Canada G1V 2M2, Tel: 418-657-3853, Fax: 418-657-7934, email: cqvb@cqvb.qc.ca, web site: <http://www.cqvb.qc.ca/wetland2000/>

3rd Annual North Carolina Stream Restoration Conference: Aug 16-17, Boone, NC. Sponsored by the North Carolina State University Stream Restoration Institute. Contact Joni Tanner, NCSU Campus Box 7619, Raleigh, NC 27695-7619; Tel: 919-513-1678; Fax: 919-515-7494; email: Joni_Tanner@ncsu.edu; web site: <http://www5.bae.ncsu.edu/programs/extension/wqg/sri/>

Agrochemical and Nutrient Impacts on Estuaries, 220th American Chemical Society National Meeting, Aug 20-24, Washington DC. Co-Sponsored by Agrochemical and Fertilizer and Soil Chemistry Divisions. Contact Laura L. McConnell, USDA-ARS, Environmental Chemistry Laboratory, Bldg. 007, Rm. 225, Beltsville, MD 20705, Tel: 301-504-6298; Fax: 301-504-5048; email: mconnel@asrr.arsusda.gov.

International Conference on Riparian Ecology and Management in Multi-Land Use Watersheds: Aug 27-31, Portland, OR. American Water Resources Association. Contact Mike Kowalski, AWRA Director of Operations, 4 West Federal Street, P.O. Box 1626, Middleburg, VA 20118-1626. Tel: 540-687-8390, Fax: 540-687-8395, email: mike@awra.org, web site: <http://www.awra.org/meetings/Portland/Portland.html>

SEPTEMBER

8th National Nonpoint Source Monitoring Workshop: Monitoring and Modeling Nonpoint Source Pollution in the Rural-Urban Interface: Sept 11-14, Hartford, CT. Contact John Clausen, University of Connecticut, Dept. of Natural Resources Mgt. & Engineering, 1376 Storrs Rd., U-4087, Storrs, CT 06269-4087. Tel: 860-486-2840, Fax: 860-486-5408, email: jclausen@canr.uconn.edu, web site: <http://www.ce.uconn.edu/nps.html>

Coastal Environment 2000 – Environmental Problems in Coastal Regions, Third International Conference: Sept 18-20, Las Palmas de Gran Canaria, Spain. Contact Sally Walsh, Conference Secretariat, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, SO40 7AA, UK. Tel: +44(0)238 029 3223, Fax: +44(0)238 029 2853, email: slwalsh@wessex.ac.uk

OCTOBER

1st International Conference on Wood in World Rivers: Oct 23-27, Oregon State University, Corvallis, OR. Web site: <http://riverwood.orst.edu>

NOVEMBER

International Conference on Atmospheric, Surface and Sub-surface Hydrology and Interactions: Nov 5-8, Research Triangle Park, NC. Sponsored by the American Institute of Hydrology. For details visit web site: <http://www2.ncsu.edu/ncsu/CIL/WRRRI/aihconf.html>

Irrigation Symposium 2000: Nov 12-16, Phoenix, AZ. Contact American Society of Agricultural Engineers at Tel: 616-429-0300; Fax: 616-429-3852; email: mcknight@asae.org

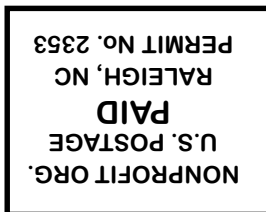
Meeting Announcements — 2001**JANUARY**

International Symposium on Integrated Decision-Making for Watershed Management: Jan 7-9, Chevy Chase, MD. Contact Dr. Darrell Bosch at Tel: 540-231-5265, email: bosch@vt.edu, web site: <http://www.conted.vt.edu/watershed.htm>

International Soil Erosion Symposium: Jan 15-18, Hawaii. Contact American Society of Agricultural Engineers at Tel: 616-429-0300; Fax: 616-429-3852; email: mcknight@asae.org

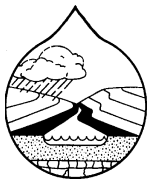
MARCH

9th National Symposium on Individual and Small Community Sewerage Systems: Mar 12-14, Fort Worth, TX. Contact American Society of Agricultural Engineers at Tel: 616-429-0300; Fax: 616-429-3852; email: mcknight@asae.org



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