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Applying Knowledge to Improve Water Quality

Great Lakes Regional Water Program

Progress & Impact Report

Applying knowledge to improve water quality
Great Lakes
Regional Water Program
A Partnership of USDA CSREES
& Land Grant Colleges and Universities

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Introduction

"Only from space can you see that our planet should not be called Earth, but rather Water, with specklike islands of dryness on which people, animals, and birds surprisingly find a place to live."

~ Oleg Makarov, The Home Planet, 1988

"Study finds Great Lakes threatened by aging sewage system"; "Study finds drugs, chemicals in treated waste sold to gardeners"; "Recovery of N.Y. lake offers hope for acid rain-ravaged region"; "Farmers, environmentalists unite to clean Iowa's waters"; "Dakotas 'epicenter' of drought-stricken nation". This is but a sampling of water-related headlines from 2006. The stories include all-too-common tears in the fabric of our environmental management systems, as well as hopeful stories of neighbors uniting in pursuit of a common cause.

The United States is fortunate to have a strong fabric of federal and state agencies, tribal governments and communities, local governments and citizens, professional and other non-profit organizations, business leaders, and institutions of higher learning caring for our nation's water. The Cooperative State Research, Education, and Extension Service (CSREES), and the Land Grant Universities have been helping communities generate and apply knowledge to clean up our nation's waters for more than 30 years. Through national and regional collaborations on water quality programs and projects, we are working to improve the effectiveness and efficiency of water quality programming nationwide. This report describes the CSREES National Water Program, the structure and goals of the Great Lakes Regional Water Program, and highlights specific successes and impacts in the Great Lakes Region. Please see the National Water Program website (**www.usawaterquality.org**) and the Regional Program website (**www.uwex.edu/ces/regionalwaterquality/**) for more information about what each program is doing to make sure that an supply of clean, usable water is available for future generations.

The CSREES National Water Program

The goal of the Cooperative State Research, Education, and Extension Service (CSREES) National Water Program is to protect or improve water resources throughout the United States, particularly in agricultural and rural watersheds. The CSREES National Water Program brings university scientists, instructors, and extension educators into more effective and efficient partnerships with Federal interagency programs to address priority water quality issues in U.S. agriculture. A key emphasis of the program is integration of extension, research and education resources to solve water quality problems at the local level. The National Water Program has identified eight priority themes for research, education, and extension projects:

- Animal Waste Management
- Drinking Water and Human Health
- Environmental Restoration
- Nutrient and Pesticide Management
- Pollution Assessment and Prevention
- Water Conservation and Agricultural Water Management
- Watershed Management
- Water Policy and Economics

The program is guided by a unique model for shared leadership that includes representatives from each of 10 regional projects, representatives from the 1890 and 1994 Land Grant University institutions and the CSREES National Program Leader for Water Quality. This group is called the CSREES Committee for Shared Leadership for Water Quality (CSL-WQ).

The CSREES National Water Program website (**www.usawaterquality.org/**) enhances communication and coordination within the CSREES/University network and with its national and regional partners. The website is designed for scientists, instructors, and extension educators to share and access information about successful water quality improvement programs from across the nation. For a national impact report that provides examples of how water resource professionals at universities and colleges, in cooperation with CSREES, are working with citizens, communities and partner agencies to address critical water resource problems across the United States, please see **www.usawaterquality.org/success.html**

The Great Lakes Regional Water Program

The Great Lakes Regional Water Program (GLRWP) supports water quality research, campus-based education, and outreach in Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin. Our purpose is to enhance the delivery and sharing of successful programs across our region and the nation. We encourage multi-state and multi-region efforts to protect and restore water resources. We make every effort to take advantage of the diverse knowledge bases available in each state, as well as the economies of scale available when states share water research, classroom curricula, and outreach programs and publications.

The following program goals and organizational framework guide and provide structure for our work:

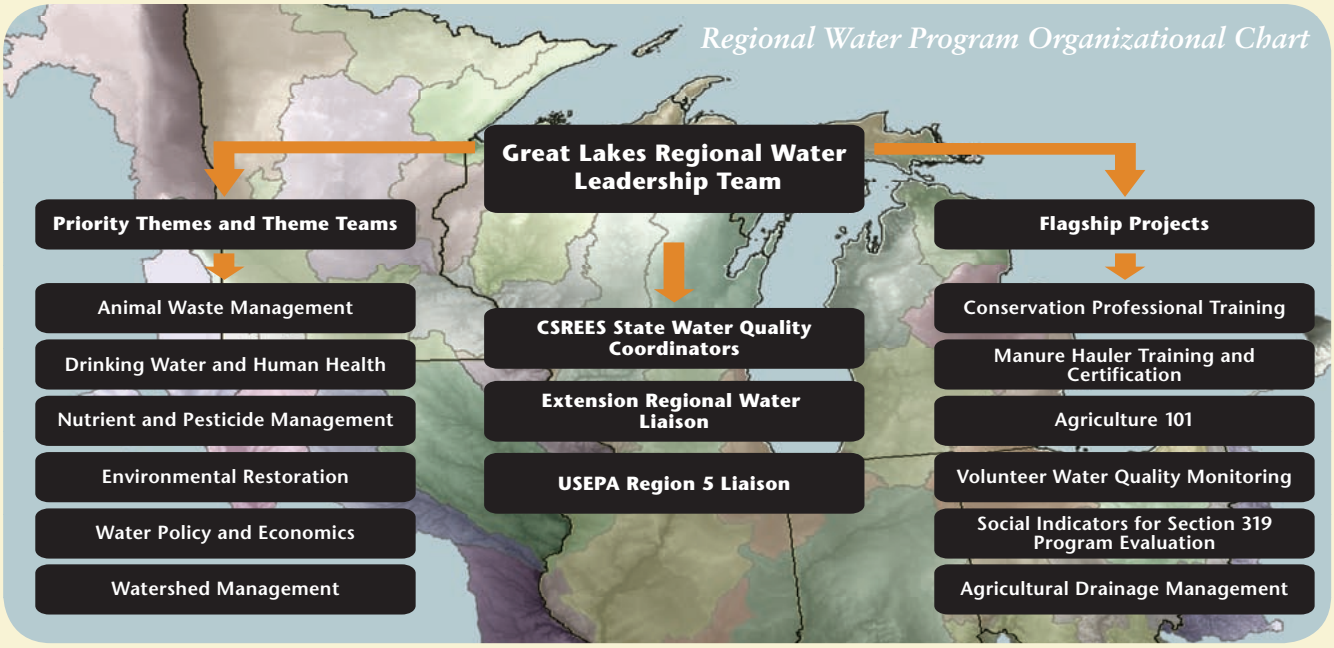
Program Goals

- Provide regional coordination of research, education, and extension/outreach efforts addressing water issues within Extension's North Central Region and USEPA Region 5.

- Work cooperatively to share responsibilities and resources in the interest of resolving water-related problems that are complex in nature and regional in scope.

- Build continuing education and professional development programs based on the best available water-related research.

- Offer an entry point for state and federal agencies, commodity organizations, and other non-governmental organizations to access resources within the Land Grant universities and collectively address water-related problems of mutual interest.



Framework and Organization

- A Regional Water Quality Leadership Team (Extension State Water Quality Coordinators from Great Lakes states, an Extension Regional Water Liaison, and a liaison from USEPA Region 5.

- Six regional themes that bring together experts from each state in the region to focus on water management problems and solutions. The six regional themes are derived from the eight National Water Program priority themes.

- Multi-state Flagship projects that bring together the research, education, extension/outreach, and technical skills groups interested issues that impact water quality. A "flagship" designation indicates a long-term commitment from the GLRWP to foster multi-state collaboration and impacts on a given project or topic.

- State water programs that are the foundation for all multi-state programs and projects.

The GLRWP has been in existence for six years. During that time, we have seen researchers and Extension educators, already doing excellent work in their own states, grow rich and productive working relationships with their colleagues in neighboring states. We think the result has brought more of what the Land Grants have to offer to the audiences we serve. In some cases, such as in manure management (**www.uwex.edu/ces/regionalwaterquality/FocusAreas/agriculture/awm.htm**), Extension educators with similar areas of expertise, state and federal agencies, and private sector professionals learn from each other's approaches to technical and policy issues. In other cases, such as our efforts to develop social indicators and a social data tracking system for state and regional nonpoint source programs (primarily Section 319), universities have experts that whose complementory knowledge and skills combine to deliver the best product possible (**www.uwex.edu/ces/regionalwaterquality/Flagships/Indicators.htm**).

Regional Coordination Impacts

The project summaries that follow are a sample of regional activities in the six national priority themes adopted by the Great Lakes Regional Program: Animal Waste Management, Drinking Water and Human Health, Environmental Restoration, Nutrients and Pesticide Management, Water Policy and Economics, and Watershed Management. We are also highlighting the successes of other projects funded directly by CSREES in the Great Lakes Region. For more information, please contact any one of the Regional Team members listed on page 3 of this document, or visit the Program website at **www.uwex.edu/ces/regionalwaterquality**.

WWW.UWEX.EDU/CES/REGIONALWATERQUALITY

Animal Waste Management

Over 1000 Converge on St. Johns, Michigan for the Great Lakes Manure Handling Expo: Keep it in the Rootzone (July, 2006) – This highly successful event truly reflects the value of multi-state collaboration and partnerships that the GLRWP supports. The purpose of the Great Lakes Manure Expo was to provide producers with practical and innovative ideas for land application of manure. By showcasing a systems approach to manure applications, the event focused on communicating the dollar value of manure nutrients, the cost associated with transporting them to the most appropriate fields, conservation practices that will impact retaining these nutrients, and odor control concerns. Although only ninety evaluations were returned (attendance was nearly 1300), respondents indicated that they were going to increase their frequency of: calculating hauling costs, replacing fertilizer with manure, manure testing, keeping better records, improving odor management and even crop producers taking manure from a livestock farm. The best comment indicating direct impact was from a large Michigan pork producer indicating, "as a result of the discussion at the field day the farm has decided to lay down 4-5 miles of pipe and purchase an Aerway and possibly a Cadman outfit (equipment used for incorporating manure)", directly related to the Expo theme "keeping manure in the rootzone". The tri-state Planning Committee felt that this event left participants with a strong positive impression of university Extension systems. The Planning Committee included farmers, custom manure applicators, a private consul-tant, and university educators. The diversity of interests involved in planning was key to the event's success. The Expo had many sponsors, including local farmers agri-businesses, and the Great Lakes Regional Water Program.

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Conservation Professional Training Program Serves Agencies, TSPs, Farmers - The Conservation Professional Development and Training program is a six state project designed to provide both a base level of training for conservation staff (soil and water conservation districts/partner agencies, Extension, and private sector) and targeted training in specialized areas (such as pest management, comprehensive nutrient management planning, forestry, etc). The project has fostered greater definition of how University Extension can assist its partner conservation agencies by providing training and professional development. Conservation professionals who completed the training program: 1) gained the necessary skills and knowledge to write conservation plans (esp. CNMP's and Nutrient Management Plans); 2) gained a holistic conservation perspective in order to write more effective conservation plans; 3) improved their ability to develop positive

relationships with landowners that either require conservation plans or that voluntarily implement them; 4) helped their agencies reach various goals for implementation of conservation planning; and 5) enhanced their own potential for career growth.

Between Wisconsin and Minnesota, more than 50 private sector consultants have been trained in Conservation Planning. Once certified, these consultants will increase the number of certified planners available to help farmers in the two states by more than 15%. More than two hundred agency staff and TSPs have been trained in Comprehensive Nutrient Management Planning across the region, generating more than 200 CNMPs in Wisconsin alone in the past 18 months. Trained TSPs and agency staff are developing 170 Pest Management Plans, resulting in a 7-fold increase in acres planned in just 3 years.

By partnering with agency staff and Land Grant institutions in curriculum development, deployment and implementation, we are able to build on each state's strengths and increase conservation delivery across the region. With the pilot phase complete, we are working with partners in all 6 states in the region to roll out the training in a cost and staff effective manner. An additional 4 curricula are currently under development; Forestry, Invasive Plants, Wetlands and Burning.

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Drinking Water and Human Health

Citizen Volunteers and Water Quality Benefit from Multi-State E. coli Monitoring Effort – This flagship project of the Great Lakes Regional Water Program is entering its fifth year. This project used seed funding from the GLRWP and a $275,000 grant from USDA-CSREES to evaluate five test methods for monitoring *E. coli* bacteria suitable for home use. The project is teaching *E. coli* monitoring methods to volunteers as well as testing the ability and preferences of volunteers using "home test kits" to evaluate local streams health using *E. coli* as an indicator. Michigan State University, in consultation with project partners, has produced a training manual: Citizens Monitoring Bacteria: A Training Manual for Monitoring *E. coli* (2006). The manual has been used in 29 training sessions involving 113 volunteers, and has been well received by both volunteers and state environmental agencies and USEPA regional staff.

While test kit analysis is ongoing, reliability results from this three-year investigation will provide crucial information for state agencies considering using volunteer monitoring data in watershed planning and perhaps TMDL development. Several states have implemented credible data legislation which will place added importance upon volunteer data as state budget and agency resources continue to diminish.

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Environmental Restoration

Joining Forces to Protect Manoomin (Wild Rice) Resources - The Great Lakes Regional Water Program, in partnership with Ferris State University in Michigan and the Lac Vieux Desert Band of Lake Superior Chippewa, led a diverse coalition that convened the Wild Rice Restoration and Preservation Conference in August, 2006. The conference brought together Native American communities, universities, tribal colleges, nonprofit groups, tribal and local governments, and federal and state agencies to share information and experiences. It developed new partnerships among Land Grant colleges and universities and tribal communities across the Great Lakes Region, and built a solid foundation for future initiatives. At the conference, participants learned about wild rice identification, management and restoration, ecological importance, harvesting, processing, nutrition and recipes, culture and the role wild rice plays in the spirituality of Great Lakes tribal communities, and communication and networking.

There were 109 attendees at the conference, and, based upon evaluation results, respodents learned a great deal regarding most of the presented topics. For example, 94% stated that they learned a significant or great amount about the cultural values of wild rice. Respondents also generated a wealth of ideas for future coalition building and networking. Participants frequently commented that they appreciated the hands-on elements, the interesting speakers, trips to lakes and rice beds, and the union of science and spirituality themes in the conference. There was also strong interest in more conferences like this in the future. The conference steering committee will use the participant feedback to develop potential next steps toward achieving sustainable wild rice populations across the Great Lakes Region.

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Nutrients & Water Quality

Promoting New Partnerships & Cover Crop Choices in the Great Lakes Region - Researchers, educators and farmers from the Great Lakes States and Iowa came together at Innovations in Cover Crops and Perenniality, a multi-state cover crop summit hosted by Michigan State University's Kellogg Biological Station. Many of the participants have been working on pieces of the perennial/cover crop puzzle for years, and the summit provided an opportunity to share their experiences and data and to explore more efficient mechanisms to deliver new information to farmers and stakeholders. The summit also covered practical cover technologies and promoted new partnerships in research, education, and additional resource opportunities. A new community of practice has been formed including a very broad base of backgrounds (researchers, educators, and innovative farmers). It has already enhanced participants' ability to receive future support and develop research projects, and will continue to work to increase and enhance the region's current perennials/cover cropping systems. Perhaps most importantly it has called attention to this critical issue throughout the region, and has established a framework for future efforts. The long-term goal of the project is to create significant changes in farming practices that improve soils, and reduce leaching and nutrient runoff into water systems.

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"Drainage Water Management for the Midwest" Bulletin Now Available! - Subsurface drainage is very common in the Great Lakes states, with the percentage of cropland that is drained estimated to be more than 30% in five of the six states. There are several water quality concerns related to subsurface drainage, the most critical being nitrate-N, a soluble N ion that moves wherever water moves. New drainage management systems have recently been developed to reduce nitrate loss due to agricultural drainage.

The Drainage Water Management for the Midwest bulletin synthesizes current research on drainage water management technologies that reduce nitrate loss and provide the information in an accessible form. The key message of the publication is that new research and technologies are available to reduce nitrate losses from drained land. The publication responds to a clearly expressed need of many agencies including USDA NRCS, universities, EPA and state

environmental agencies. It was funded by the Great Lakes Regional Water Program, and is a product of the multi-state Agricultural Drainage Management Systems (ADMS) Task Force, a partnership of ARS, NRCS, CSREES and Land Grant University researchers that focuses attention on new management practices that can mitigate the negative impact of drainage.

Eight thousand copies were printed and have been distributed regionally and nationally to Land Grant universities in the Midwest (MN, IL, IN, OH, WI, IA, and MO); NRCS state offices in the Great Lakes States; National Technology Support Centers (East, Central), the National Water and Climate Center, National Water Management Center, and National Headquarters; ARS National headquarters plus research units that work on drainage; industry (ADMC and manufacturers); and USEPA Headquarters. The publication has also been distributed at many events for decision-makers, agency staff, industry, and producers including the Upper Mississippi Hypoxia Nutrient Mgmt Subcommittee, USEPA Non-point Source Tour in Minnesota, National Irrigation Association, Innovations in Nonpoint Source Management conference, and it will be used in many Extension events this winter. The involvement by agencies such as EPA and NRCS in its review will enhance the widespread impact. This project has enhanced research/extension integration, through the synthesis of current research in a bulletin for target community audiences. Although university teaching is not a target outcome of the project, the bulletin may be useful in some courses. To access the bulletin, please see: **www.ces.purdue.edu/extmedia/WQ/WQ-44.pdf**

Partners Work Regionally To Benefit Farmers and the Environment - The Natural Resources Conservation Service awarded a $950,000 grant to a collaborative effort among Purdue University, the University of Illinois, the Minnesota Department of Agriculture, the University of Minnesota, the Ohio State University, Iowa State University, USDA - Agricultural Research Service, the National Corn Growers Association, and the Agricultural Drainage Management Coalition (ADMC) to study the impact of drainage water management systems on nutrient outflows and crop yields. Drainage water management systems have been shown to reduce nitrogen outflows by 30-60%, or more when paired with other conservation practices. The goal of the project is to promote and characterize drainage water management at larger scales than has previously taken place and over the entire Midwest region. This project builds on existing efforts and long-time collaboration to synthesize research results across the region and transfer the results to agencies that can use the results in decision-making. A database of the different sites, with their soil, crop, drainage system, slope, climate, and other relevant factors will be developed, and results from the different sites will be analyzed to explain similarities and differences in drainage water management effectiveness.

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Water Policy & Economics

Serving the Wastewater Treatment Needs of Small Communities – All Great Lakes Region states are facing the issue of how to implement decentralized wastewater treatment for small communities. Small communities in this context include unincorporated towns and clusters of homeowners on lakeshores. As the decentralized option is increasingly recognized, as a viable approach, policy makers, engineers, local government officials will need assistance. In addition, universities have differing capacities and expertise that, if shared, may increase the overall service they are able to provide to small communities. In response, the Great Lakes Regional Water Program has formed a multi-state team consisting of the primary educators from across the region to identify collaboration opportunities that address small community needs. The team has 1) summarized existing Land Grant research and outreach capacity in the region, 2) developed a list of potential projects, and 3) identified topic leaders that are drafting project description for three priority areas (educational materials, tracking and inventory of decentralized systems, and research) to be used in discussions.

Learning from TMDL Approaches Across the Great Lakes Region - Current regulations require the determination of total maximum daily loads (TMDLs) for surface waters. According to critics, this determination of loads often is determined from incomplete information. Depending on what models are used and what the data requirements are, results can vary for the same impaired water or watershed. Success of the implementation of practices to reduce loads within the TMDL is at least partially dependent on the degree that parties subject to the load allocation agree with the methodologies used and the answers they provide. Each of our states face this problem in establishing TMDLs.

A work group was formed at the University of Minnesota to develop a model curriculum for a comprehensive training program on evaluating effectiveness of TMDLs at addressing water quality concerns. The curriculum involves three elements: 1) training on why TMDLs need to be evaluated and effective evaluation methods, 2) incorporating information on a comparative regional economic analysis of best policies for TMDL development and implementation, and 3) evaluation of TMDL development and implementation plans/strategies (what is working and what isn't). This draft curriculum will be shared with a broader regional group and finalized in 2007.

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Watershed Management

"Watersheds come in families; nested levels of intimacy...As you work upstream toward home, you're more closely related. The big river is like your nation, a little out of hand. The lake is your cousin. The creek is your sister. The pond is her child. And, for better or worse, in sickness and in health, you're married to your sink."

~ Michael Parfit, National Geographic

Measuring Social Outcomes of Nonpoint Source Management Programs - USEPA Region 5, state water quality agencies, university researchers and educators, and local water managers have produced pilot methods and guidance for measuring social information and outcomes from nonpoint source (NPS) programs in the Great Lakes Region. This project will increase the ability of EPA Region 5 and state agencies to measure meaningful outcomes (such as increases in knowledge, or behavior change) that may precede water quality improvement. A regional approach has allowed states to develop a single shared evaluation system for less cost than individual systems. As a result, states will be able to share data to increase their understanding of the social dynamics of NPS management in the Region. All partners have shown strong and innovative leadership to accomplish project goals. CSREES has awarded additional funding to this group to test the validity of the indicators developed through this project.
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Behind the Scenes: Watershed Management Theme Team Helps Professionals Keep Current – The purpose of the Watershed Management Theme Team is to share research and outreach resources and foster multi-state collaborations. The Team holds regular conference calls where Team members can present and discuss existing or needed watershed–related resources. The Team has produced an inventory of watershed management programs and resources with region-wide applicability. Examples of program improvement directly resulting from Team communications include: 1) the Indiana Watershed Leadership Academy has incorporated elements of the Ohio Watershed Academy including modules and format; 2) Ohio Certified Volunteer Naturalists manual has incorporated research and outreach and resources from Wisconsin's Best Education Practices web site; and 3) the University of Illinois Extension is using University of Minnesota Extension Shore line web site and resources as a foundation for their own. An informal evaluation indicated

that Team members greatly value the time to exchange information with their colleagues in other states, and that it improves the service they provide in their states.

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Sneak Preview: Other Regional Initiatives

The GLRWP has recently funded five other projects that are contributing to water research, education, and outreach in the region:

- Building Capacity of Watershed Organizations, Agricultural Land Owners, and Land Planners to Protect and Restore Watersheds
- Social Dimensions of Private Well Testing - Challenges, Barriers, Strategies
- The Lake Superior Volunteer Stream Monitoring Program
- Manure Slurry Seeding of Cover Crops and an Evaluation of a Cover Crop Root System for Retaining Bacterial Contaminants in the Root Zone
- Phosphorus Removal and Recycling From On-Site Generated Wastewater and Animal Manure from Agricultural Facilities

Please contact the Great Lakes Regional Water Liaison for more information about these projects.

State Program Highlights

State water programs are the foundation for all multi-state programs and projects. The capacity and needs of each state provide direction and raw materials for regional initiatives. The following state accomplishments contribute to progress on regional and national themes. More information on state-specific programs is available on the regional website (see links in each state's section).

Illinois

www.uwex.edu/ces/regionalwaterquality/FocusAreas/states/illinois.htm

Broad Support for Illinois River Stewardship Highlighted at Governor's Conference (Theme: Watershed Management) - The Governor's Conference on the Illinois River is an ongoing project of the water quality program of University of Illinois Extension (UIE). Since the inaugural biennial conference was held in 1987, attendance has grown from 150 to over 350 participants representing diverse backgrounds, agencies, organizations and communities. The most recent conference, held October 4-6, 2005, opened with more than 110 attendees taking part in a Conservation Tour, highlighting current BMPs for river and watershed protection. Planning is underway for the 2007 conference, to be held October 2-4 in Peoria, Illinois. An UIE extension educator chairs the event each year.

The 2005 conference was one of the largest ever - a true indication of the sustained interest in protecting the Illinois River for the future. UIE was one of more than 60 agencies and organizations sponsoring the conference. As part of the conference, 30+ river-related exhibits and displays were featured, including one by U of I Extension's Natural Resources Management (NRM) team. The Great Lakes Region Water Quality Coordination project provided support for the development of the display by the UIE NRM team for use at the Illinois River conference and at the Farm Progress Show. The display highlights the large variety of land uses in the Illinois River watershed and BMPs for water quality protection applicable for each of those land uses.

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EZregs Makes Sense of Environmental Regulations That Affect Agriculture, Horticulture, and More (Theme: Water Policy and Economics) - If you're baffled by the myriad of environmental regulations that pertain to agricultural and horticultural operations, help is only a mouse-click away. EZregs, a new website hosted by University of Illinois Extension, can help farm producers, green industry professionals, land use planners and others make sense of environmental regulations in Illinois. The website can be found at: **www.ezregs.uiuc.edu**.

The EZregs website has a database of 13 sets of regulations, including IEPA Livestock Regulations (Parts 501, 506, 560, 570, & 580), the Livestock Management Facility Act (Section 900), the Illinois Construction Site Stormwater Permit, the Illinois Pesticide Act, the Endangered Species Act and the Historic Resources Preservation Act. Currently, users of the website can access sections on four different operation types--Livestock Production, Food Crop Production, Ornamental Horticulture Production and Landscape Maintenance.

This program is an excellent example of the impact of regional programming for state-specific programs. While the direct funding for EZRegs comes from the Illinois

Pork Producers Association (through the Pork Checkoff program) and US EPA Region 5, the Great Lakes Regional Water Quality Coordination project has helped provide much broader exposure for the project.

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Indiana

www.uwex.edu/ces/regionalwaterquality/FocusAreas/states/indiana.htm

Purdue Atrazine Response Benefits Water Users and Suppliers (Theme: Drinking Water and Human Health) - In response to the potential for cancellation of atrazine (the herbicide used on more than 80% of corn acres in Indiana) in watersheds used for drinking water if atrazine concentrations are too high, Purdue Extension worked with the Indiana Pesticide Watershed Work Group consisting of representatives from local, state and federal agencies, the pesticide industry (Syngenta), public water systems, crop consultants and farmers to create and distribute county-based maps of watersheds used for public water supply. The maps were used in presentations to approximately 10,000 pesticide applicators as part of the Private Applicator Re-registration Program, to help them be aware of sensitive watersheds affecting drinking water and take steps to reduce atrazine loss to surface water. The maps are available on the web at **http://pasture.ecn.purdue.edu/~frankenb/Indiana/map**, to provide easy access to watershed locations that are used for drinking water in Indiana. In addition, Purdue Extension is working with Veolia Water, which runs the largest water system in Indiana serving approximately 800,000 people, to identify potential solutions to this issue which cost them $25,000 at the peak of atrazine treatment in summer 2006 ($800,000 total for atrazine treatment in 2006).

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Purdue Extension Provides Training and Tools for Local Watershed Groups (Theme: Watershed Management) - The Indiana Watershed Leadership Academy increased the capacity of 24 watershed managers in its first year. The program has broad and enthusiastic support among conservation agencies in Indiana, demonstrated by the active participation of fifteen organizations and agencies on the Steering Committee. The participation of state conservation organizations and others representing major interests in this topic has been very beneficial both for the program itself and has a wider impact of coordinating watershed management education in Indiana. Regional funding leveraged an IDEM/EPA

Indiana continued

319 grant which now provides primary support for the program. Participants testified that the program had clear and direct impacts on watershed protection, with statements like "My involvement in the Indiana Watershed Leadership Academy has led to the success of our watershed planning efforts". The Indiana Watershed Leadership Web site, at **www.purdue.edu/watersheds**, provides information on all aspects of watershed management in Indiana, including the Academy.

Purdue Extension also created a prototype of a site called the Atlas of Indiana Watershed and River Organizations (**www.ces.purdue.edu/waterquality/atlas**). This GIS-based web site elevates awareness and visibility of watershed organizations across Indiana, connects citizens who are interested in learning more about their watershed and potentially participating with active watershed groups, and informs local and statewide decision makers about the need for watershed support in active and inactive areas of the state. Purdue Extension is currently working with state agencies to expand contact information. Finally, Purdue Extension is starting a statewide process to compile a water quality monitoring inventory, which involves people from all the state agencies and EPA Region 5. A Steering Committee has been established and an initial meeting held. The Web site is at **http://pasture.ecn.purdue.edu/~frankenb/Monitoring_Inventory/Index.htm**.

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www.uwex.edu/ces/regionalwaterquality/FocusAreas/states/michigan.htm

Protecting Drinking Water (Theme: Drinking Water and Human Health) - Michigan State University, the Michigan Department of Environmental Quality, and the Michigan Rural Water Association co-hosted a Source Water Protection Workshop designed for local health department personnel who deal with non-community groundwater supply systems. Approximately 90 local and district health department representatives and state agency staff attended the workshop. Topics included the groundwater inventory and mapping tools and how they can be applied at the local level, new arsenic rules implementation, updating source water assessment information, using Map Image Viewer software for local source water protection efforts and continuing education opportunities for non-community water supplies.

A Wellhead Protection Conference was also held in Midland, Michigan. More than 120 people attended the conference. Sessions included: abandoned well management, wastewater systems, land use planning and zoning, map image viewer, outreach and education, contaminant source inventory, recruiting and maintaining volunteers, groundwater flow model, business community engagement, updating wellhead programs, moving from assessment to protection, groundwater protection in agricultural areas, dealing with contaminated site, integrating storm water management and wellhead protection. Conference evaluations were overwhelmingly positive, and attendees stressed the need for continuing opportunities for information sharing and education regarding wellhead protection programs.

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Michigan State University - A Community Partner in Stormwater Management (Theme: Watershed Management) - Michigan State University continued its active involvement with the Greater Lansing Regional Committee on Phase II Non-Point Source Pollution Prevention (GLRC). The GLRC is a guiding body comprised of twenty participating Phase II communities within the Greater Lansing, Michigan Region. The committee has been established to guide the implementation of the entire Phase II Program for the communities within three identified watersheds; the Grand River, the Red Cedar River and the Looking Glass River watersheds. Michigan State University serves as an ex-officio member of the GLRC, and faculty and staff members serve on several GLRC committees.

In addition, MSU representatives worked with neighboring communities to design a uniform decal to be used in area catch basin labeling programs, watershed boundary signage for the three area watersheds and a series of brochures and posters addressing stormwater issues pertaining to motor oil, pet waste, car washing, and lawn care. Work continues on the development of additional printed materials.

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Training Programs for Lake and Stream Leadership (Theme: Watershed Management) – A series of training sessions and workshops dealing with inland lakes, watershed management, and stormwater were offered across the state. Target audiences included riparians, lake boards, drain commissioners, local government officials, and interested citizens. An alumni program for the Lake and Stream Leader's Institute was held and attended by over 80% of class members from the previous year. Advanced sessions on lake and stream ecology, legislation, and groundwater-surface water interactions were presented. Field sessions included plant mapping in lakes, stream discharge, and phosphorus analyses. The Michigan Watershed Management Short Course, a short course customized to the host community, county or watershed in partnership with a county MSU Extension

office or other local entity, was also held. Extension water team members help local groups plan the course agenda and deliver training modules for the program.

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Demonstrating Shoreline Restoration (Theme: Environmental Restoration) - A demonstration project to help shoreline property owners protect water quality and improve wildlife habitat was completed this fiscal year. Highlights include the installation of a variety of soil-bioengineered erosion control structures; the design and installation of four 100-foot alternative landscapes with multiple educational concepts embedded in each; and the creation of interpretive signage, educational materials and lesson plans to enhance and expand the value of this unique educational resources. A color brochure was also produced and distributed. Housed at the Kellogg Biological Station, the demonstration site has received hundreds of visitors since its completion.

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HIT (High Impact Targeting)(Theme: Water Policy and Economics) - This project focused on prioritizing watersheds based on sediment loading, and has recently incorporated an economic component. Because of coarse-resolution input data and a focus on agricultural land, targeting high risk areas within watersheds has not been effective at the 8-digit watershed scale. To reduce sediment loading, targeting needs to occur at a fine resolution and results need to be easily accessible for user groups to benefit. In this fiscal year, MSU and partners combined several fine resolution models including the Spatially Explicit Deliver Model (SEDMOD) and the Revised Universal Soil Loss Equation (RUSLE) and were able to estimate the amount of sediment from an individual cell that reaches a stream network within a given year. The costs and benefits of conservation practices have also been incorporated into the HIT system to evaluate the efficient allocation of conservation efforts within/among the high risk watershed areas. This program is in Phase I of development. Phase II will be available for use by government agencies such as NRCS, Conservation Districts and Michigan Department of Agriculture to prioritize areas for BMP implementation.

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Minnesota

www.uwex.edu/ces/regionalwaterquality/FocusAreas/states/Minnesota.htm

2006 Strip-Tillage Expo: Tillage for Today & Tomorrow (Theme: Nutrients and Water Quality) - Over 600 farmers and agricultural professionals participated in field demonstrations and education sessions at the July Strip-Tillage Expos held at the UM Research and Outreach Centers at Lamberton and Waseca. The nine strip-tillage implements may have been the largest collection ever run side-by-side. Attendance was strong at the education sessions on comparative yield response, soil fertility management, and guidance systems for strip-tillage. Of special interest was the noon panel of experienced strip-tillage farmers, who answered in-depth management questions. With the recent rise in fuel and fertilizer prices, farmers are attracted by the potential fuel savings and lower banded phosphorus and potassium fertilizer rates that strip-tillage offers. The Expos were capstone events following two years of on-farm conservation tillage trials and demonstrations. The project was facilitated by an EPA-funded and MPCA-managed 319 grant through the UM Water Resources Center, and was carried out by UM Extension and Experiment Station staff in collaboration with staff of the Monsanto Company.

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The Impact of Subsurface (Tile) Drainage on Fresh Water Aquatic Ecosystems (Themes: Nutrients and Water Quality and Environmental Restoration) - Environmental concerns about subsurface drainage have become the focus of numerous research efforts in recent years. Extensive summaries and reviews of literature on the environmental effects of drainage have been published, but these reviews have typically stopped short of describing the potential impacts to freshwater aquatic environments associated with these effects. A literature review was conducted to extend the known water quality and hydrologic effects of artificial drainage systems to subsequent impacts on freshwater aquatic ecosystems. A white

paper was developed by a interdisciplinary team to interpret the findings of the literature review for the beach ridge and valley floor land/soil formations in the Red River of the North Basin (RRB), a region that has experienced an increased interest in subsurface drainage in recent years. These publications are currently under review to be published. The interdisciplinary team is now developing appropriate environmental sampling schemes to test hypotheses related to the impacts of drainage on aquatic ecosystems in the RRB. The sampling schemes will be included as a section in the white paper. Information from the literature review and white paper will be used to contribute to the development of the "Riparian/Aquatic Resources" chapter of the literature review and synthesis currently under development by The Wildlife Society pursuant to the Wildlife Component of the USDA Conservation Effects Assessment Project (CEAP). Information generated from the RRB literature review will also be used to develop technical notes on maximizing aquatic habitat quality and other environmental benefits with respect to tile drainage actions and management.

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Shoring Up Shorelands for Wildlife, potential Water, and People - The Shoreland Education Program, sponsored by the University of Minnesota Extension Service in cooperation with the University of Minnesota WaterResources Center and Minnesota Sea Grant, works to improve water quality, habitat and aesthetics of lakes and rivers.

The project provides educational resources for shoreland property owners, the landscape and nursery industry, natural resource professionals, realtors, developers and local government agencies. Key components of the program include workshops, hands-on field experience, educational materials, and research and demonstration sites.

During 2006, the Shoreland Education Project worked with many federal, state, and local partners to conduct 30 workshops in areas of shoreland volunteering, planting, erosion control and aquatic plants, reaching over 3600 people. The project continues to produce the Shore-to-Shore newsletter, which reaches nearly 700 shoreland property owners, lake associations, local governments, and others interested in lake and stream health. For more information, visit **www.extension.umn.edu/shoreland.**

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Ohio

www.uwex.edu/ces/regionalwaterquality/FocusAreas/states/ohio.htm

Manure Nutrient Utilization on Growing Crops (Themes: Animal Waste Management and Nutrients and Water Quality) - Potential environmental impacts from animal manure are minimized when manure nutrients are fully utilized by a growing crop. Manure nutrients were used as the primary nitrogen source applied to corn and winter wheat during the growing season. Through the use of on-farm replicated demonstration plots liquid swine manure was applied between corn rows during the growing season (side-dress) and to winter wheat in early spring just prior to breaking dormancy (top-dress). Each plot was compared with petroleum based nitrogen fertilizers. There was no significant yield difference between manure or commercial fertilizer nutrients on these plots.

Great Lakes Regional Water Quality funding made it possible to demonstrate for three consecutive years that liquid manure applied at side-dress is a viable nitrogen resource for growing corn. This same funding source has made it possible to begin on-farm replicated demonstration projects utilizing liquid manure as a nutrient resource for winter wheat. Again, demonstrating the viability of manure nutrients as a resource and protecting water quality by more fully recycle these nutrients through a growing crop.

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Ohio Watershed Academy Builds Local Capacity to Manage Water Resources (Theme: Watershed Management) - The Ohio Watershed Academy program, which began in 2000, provides valuable opportunities for newly hired and experienced watershed coordinators and group leaders to develop the skills necessary to successfully complete watershed plans, to participate with Ohio's TMDL efforts, and to sustain local watershed planning and project implementation. All watershed coordinators funded by Section 319 grants are required to attend courses offered by the Academy. To date, more than 120 coordinators and watershed group members throughout Ohio have participated.

The sixth Academy class was completed in 2006. Seventeen participants completed the Academy, including eight watershed coordinators. Evaluation results indicated that their experiences in the Academy were helpful and helped participants address job responsibilities relative to watershed management. Participants also indicated that the course provided them with opportunities to network with other professionals and exposed them to new ideas. All participants indicated that they would recommend the Academy to other people in their watershed.

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Ohio continued

"Livestock and Streams" Fact Sheets Give Watershed Management Guidance To Rural Residents (Theme: Watershed Management) - In Ohio, modification of stream channels and resultant impacts on stream bank erosion and in-stream habitat are the number one source of impairment to surface waters. When livestock have access to streams, the results are often slumping stream banks, increased sediment and bacteria loads, and impairments to in-stream habitat. Livestock access to streams is a significant problem on much of Ohio's pasture lands. A new series of five fact sheets has been developed addressing the impacts of livestock on riparian areas. Titles include:

- Understanding the Benefits of Healthy Riparian Areas, LS-1-05
- Negative Effects of Livestock Grazing Riparian Areas, LS-2-05
- The Effects of Grazing Management on Riparian Area, LS-3-05
- Best Management Practices to Control the Effects of Livestock Grazing Riparian Areas, LS-4-05
- Pathogenic Effects from Livestock Grazing Riparian Areas, LS-5-05

Regional funding allowed for the printing of 1000 copies of LS-1-05. Copies will be distributed to farmers, 4-H clubs, watershed groups, and community development groups through County Extension Educators. All five fact sheets can be viewed on-line at **http://ohioline.osu.edu/ls-fact**

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Wisconsin

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Working with Farmers on Development and Implementation of Nutrient Management Plans (Themes: Animal Waste Management and Nutrients and Water Quality) - In Wisconsin, The Multi-Agency Land and Water Education Grant (MALWEG) Program was started to help integrate educational programming and local conservation efforts. Program support comes from the Natural Resources Conservation Service; the Wisconsin Department of Natural Resources; the Wisconsin Department of Agriculture, Trade and Consumer Protection; the Farm Service Agency (FSA); and the University of Wisconsin-Extension. The Program provides competitive money for local projects to help farmers and other private landowners develop nutrient management plans and improve on-farm environmental performance.

The MALWEG Program has allocated over $1 million to over 100 projects. Over 1,400 producers with nearly 423,000 acres farmed in 34 Wisconsin counties received on-farm consultation and nutrient management assessments since the project began. 95% of participating producers have completed or received a nutrient management plan or have a plan in development. Over 85% of farmers were following their NMPs on 76% or more of their acres; 42% were following their NMPs on 100% of their acres. A majority of the participants had their manure spreaders calibrated. Over 85% had their soil conservation plans reviewed and updated to assure their plans met accepted specifications. Many of the Nutrient Management Plan writers were the farmers themselves, which indicates a strong motivation to adopt conservation practices and shows the effectiveness of the training programs. In other cases they work with Extension specialists to write the plans. Finally, 80% of local education project providers plan to train additional farmers on NMP if funds are available.

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Wisconsin Great Lakes Freshwater Estuary Applied Research, Management, and Outreach Needs Assessment (Theme: Environmental Restoration) - The University of Wisconsin-Extension, with funding assistance from the Wisconsin Coastal Management Program, is conducting a Great Lakes freshwater estuary needs assessment for Wisconsin. In the 2006, three coastal community working sessions were held near the shores of Lake Michigan and Lake Superior. The working sessions brought together resource experts, community leaders, and knowledgeable citizens to identify and prioritize Wisconsin's Great Lakes estuary needs. At each session, small facilitated groups identify priority needs for Wisconsin's freshwater estuaries.

Priorities identified at the three working sessions were narrowed to a list of 19 research, management, and outreach and education needs. The next step will be a survey to gather expert input and quantitative data regarding the priority needs. The results of the survey will increase the relia-bility and validity of the needs assessment process and provide the basis for a strategy document for Wisconsin's Great Lakes freshwater estuaries. This project is a model that can be replicated regionally and used to increase the capacity of land grant institutions and others meet freshwater estuary needs. The needs assessment results will also be incorporated into relevant aspects of an ongoing effort to develop a National Estuarine Research Reserve on Wisconsin's Lake Superior shoreline.

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Discovery Farms Program (Theme: Animal Waste Management) - Discovery Farms are a network of real working Wisconsin farms in different geographic areas facing different environmental challenges. They work with researchers at UW-Madison, UW-Platteville and UW-Stevens Point to evaluate nutrient management strategies and practices aimed at reducing nonpoint source pollution while protecting farm profitability. A primary objective is to establish baseline data that can be used to determine environmental impacts of various farm management practices in the varying landscape and climate areas of Wisconsin.

In the past year, Discovery Farms continued existing programs related to comprehensive nutrient management planning, baseline monitoring, core farm development, and training of local citizen sampling volunteers. Discovery Farms staff worked with other nutrient management specialists to develop three additional training programs based on the information coming off Discovery Farms. These training programs included: 1) Managing manure and nutrients on tiled land; 2) Managing manure and nutrients on highly permeable soils; and 3) Adjusting diets to meet the NRCS 592 standard. In addition, programs related to education and producer training and efforts on the northwest shoreline of Lake Michigan were continued and expanded. The Discovery Farm Area on the northwest shoreline of Lake Michigan is working with local producers to develop sound baseline information on sediment movement and nitrogen and phosphorus losses. The long-term goal is to determine the contribution of nutrients (phosphorus and nitrogen) and sediment from agricultural production. This project is different from other Discovery Farms projects in that work is being conducted on three farms with different farming systems to gather information on nutrients and sediment losses in this region.

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Central Wisconsin Groundwater Center (Drinking Water and Human Health and Water Policy and Economics) - The Central Wisconsin Groundwater Center was established in 1985 to work with citizens and local governments throughout Wisconsin, particularly those in the central part of the state. In the past year, the Groundwater Center has 1) worked with county land conservation departments to develop and support private well testing programs and use the information gained to locate areas that are more likely to experience problems with nitrate and bacteria contamination, 2) provided statewide assistance to individuals with questions and concerns regarding drinking water quality and private well issues, and 3) assisted in coordinating the 2006 Wisconsin Groundwater Festival. The purpose of the festival is to increase groundwater awareness and provide examples of local people and programs

taking action to protect their groundwater resources. The 2006 festival was designed to reflect the groundwater issues and concerns that face Northeast Wisconsin. There were 920 students from 11 different schools that attended the festival, with nearly 200 volunteers and over 30 sponsors assisting with the event.

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Other CSREES-Funded Projects In the Great Lakes Region

"If you have knowledge, let others light their candles in it."
~ Margaret Fuller

These projects are important components of CSREES and Land Grant contributions to the knowledge and skills necessary to improve water management across the U.S. They are funded directly through the CSREES National Integrated Water Quality Program. We are proud to highlight their work here, with the hope that others will benefit from their insights.

National Facilitation Highlights

EPI-NET – Because Little Things Can Make A Big Difference! - The Environmental Pathogens Information Network (EPI-NET) provides a centralized resource of water-related environmental microbiological contamination information. EPI-NET encourages information sharing, connects a network of stakeholders, regulatory officials, and technical experts, provides methods and data interpretation references, and increases our ability to develop a coherent national research agenda and good public policy for pathogen management. The Network's primary method of information delivery is the **http://epi-net.org/** website, however, the organization has conducted two workshops (on microbial source tracking and pathogens as part of beach monitoring programs) and has three more planned for 2007.

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Great Lakes Radio Consortium Brings "The Great Coast" To Millions – The Great Lakes contain the world's largest supply of fresh water, and are surrounded by a basin that is home to more than 30 million people – over 10% of the US population. The Great Lakes Radio Consortium (GLRC) at Michigan Radio creates a weekly 29-minute satellite newsfeed of environmental reports about the Great Lakes region that is sent to more than 145 public radio stations in 20 states and two Canadian provinces. Under its most recent grant from the United States Department of Agriculture, GLRC is producing and distributing 120 public radio stories focused on the dynamic relationship between the agricultural sector and water quality in the Great Lakes watershed and in other watersheds in the eight Great Lakes states and beyond. Under the previous USDA grant

held by the GLRC, the final survey by the independent firm Market Trends Research showed that the impact of GLRC reporting is substantial. Comparing 2004 results with 2002 results, the percentage of listeners who recalled hearing one or more reports about common environmental topics increased by a combined total of 54%. Ninety-five percent of listeners remembered hearing a report about environmental issues on public radio, and the percentage of listeners who considered themselves well informed about environmental issues increased by 14% between 2002 and 2004. Listeners had greater awareness of each of the following GLRC topics (comparing 2002 and 2004): loss of farmland due to urban sprawl, the effect of pesticides on water quality, the effect of fertilizer or nitrogen on water quality, and the effect of animal feed operations on water quality. These results indicate that the GLRC is pursuing a successful course in reporting issues of agriculture and water quality in the Great Lakes region. During this new project, the GLRC is expanding upon its evaluation of listener knowledge and attitudes by initiating an independent study to determine if GLRC reporting on agriculture, water quality, and land use has an effect on the actual behavior of public radio listeners. In addition to making editorial changes in response to impartial evaluative information, the GLRC has also modified its website to make it more helpful to the public, adding more links and more photos to illustrate archived stories. Unique visits to the site nearly doubled between July and October 2005. Also, by streamlining the tool through which 145 collaborating radio stations report to the GLRC, the staff have made this reporting process easier and more accurate. In March 2005, the GLRC introduced podcasting, by which listeners can download the complete 29-minute modular environmental radio feed each week for playback whenever they want. The GLRC has been in the forefront of such expanding technologies, to reach more listeners with high-quality environ-mental news. For further information, see **www.glrc.org**.

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Integrated Research, Education & Extension Highlights

Enhancing Phosphorus Reduction Strategies in the Kalamazoo River Basin – The Kalamazoo River TMDL is nationally recognized for its watershed-wide, community-based approach. The Michigan State University Kellogg Biological Station Land & Water Program, in cooperation with the Kalamazoo River TMDL Implementation Committee, plays a lead role in facilitating the TMDL implementation process, conducting educational programs, and developing a web-based phosphorus reduction tracking system. Although the project is not yet complete, total phosphorus load to the Lake Allegan inlet has been reduced 30%, with a non-point load reduction of 27% and point source load reduction of 35%, compared to 1998 levels. Efforts to develop a watershed umbrella organization were strengthened by 1) the Kalamazoo River Watershed Council agreeing to assume that responsibility, and 2) their receipt of a $ 258,000 multi-year federal section 319 grant to develop a comprehensive watershed plan, and associated informational systems. Although it is difficult to quantify project contribution to the successful grant application, the combination of a track record of basin-wide successes, a strong data set and research basis no doubt increased proposal competitiveness. The strategy to improve the positive identity of the river has focused on creation of the first ever watershed-wide Michigan Heritage Water Trail. The first leg of that trail (from Comstock to Lake Michigan) is expected to be completed, dedicated and opened by next summer. A comprehensive and searchable data base of watershed organizations, communities and businesses has been refined and made more user friendly, and will be posted to the Watershed Council website in the near future. Members of both the TMDL Implementation Committee and the Watershed Council have affiliated with the newly formed Southwest Michigan Sustainable Business Roundtable. All of these tasks address the project goal of developing sustainable community organizational models for P reduction.

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Extension Education Highlights

Youth LEAP Toward Future of Ohio Agriculture - Ohio State University (OSU), OSU Extension, the Ohio Livestock Coalition, the Ohio Department of Natural Resources, Ohio Federation of Soil & Water Conservation Districts, United States Department of Agriculture Natural Resources Conservation Service, and the Ohio Environmental Protection Agency have completed a student manual for the Youth Livestock Environmental Assurance Program (Youth LEAP). This high-school agriculture education curriculum is designed to stimulate future generations of agriculture-based man-

agers to incorporate environmental best management practices into their daily operations. The curriculum integrates agriculture, food systems, and public health issues, and meets animal agriculture curriculum benchmarks. Modules on management address: odor, site evaluation, feedlot surface, egg wash water, milking center wastewater, silage storage, grazing strategies, nutrient storage and handling. The education modules include tools for teachers to assess changes in their students' levels of knowledge and skills related to environmental stewardship. Three training sessions with a total of 98 vocational agriculture education instructors have been conducted. 92% of those attending have requested a copy of the curriculum, supporting the need for this information for students. For a copy of the curriculum, please see the Ohio State University Curriculum Materials Service website: **www-cms.ag.ohio-state.edu/4DACTION/WEB_InventoryIndividualDisplay/LEAP**

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Communities Come Together to Protect a Local Treasure from Invasive Species - The Chippewa Flowage is a valued and sacred aquatic resource in Northern Wisconsin. The Chippewa Flowage Invasive Species Education and Management Project, led by the Lac Courte Oreilles Ojibwe Community College (LCOOCC), has mapped existing areas of Eurasian water-milfoil and purple loosestrife infestations and the distributions of native aquatic plants on the Chippewa Flowage. LCOOCC and its partners are using their findings and other research about aquatic invasives to develop integrated and collaborative solutions for invasive management. The project also provides education and leadership to targeted organizations, stakeholders and voluteers to help them implement selected management strategies. The project recently underwent a midterm external evaluation. The following are some comments from the external evaluator:

"Having been an external evaluator on a number of grants for various agencies, the documentation of accomplishments . . . is one of the best I have seen. . . I am convinced that the quantity and quality of work achieved in the first two years of this grant are exemplary of the kind of "return on investment" for public money that one could reasonably hope for. It is further indication of the quality of work being achieved by 'Tribal Colleges and Universities' on behalf of their own communities and that of the surrounding non-tribal areas."

Partners include, but are not limited to the WI Department of Natural Resources, University of Wisconsin Extension, the Lac Courte Oreilles Band of Lake Superior Chippewa, the US Forest Service, the Great Lakes Indian Fish and Wildlife Commission, local schools, local lake associations, the Hayward Area Lakes Visitors and Convention Bureau, the Natural Resource Conservation Service, local conservation departments, local businesses, Trout Unlimited, and the River Alliance of Wisconsin. For more information, please see **www.lco.edu/public/ext/water/WaterQuality.htm**

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Applying Knowledge to Improve Water Quality

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