

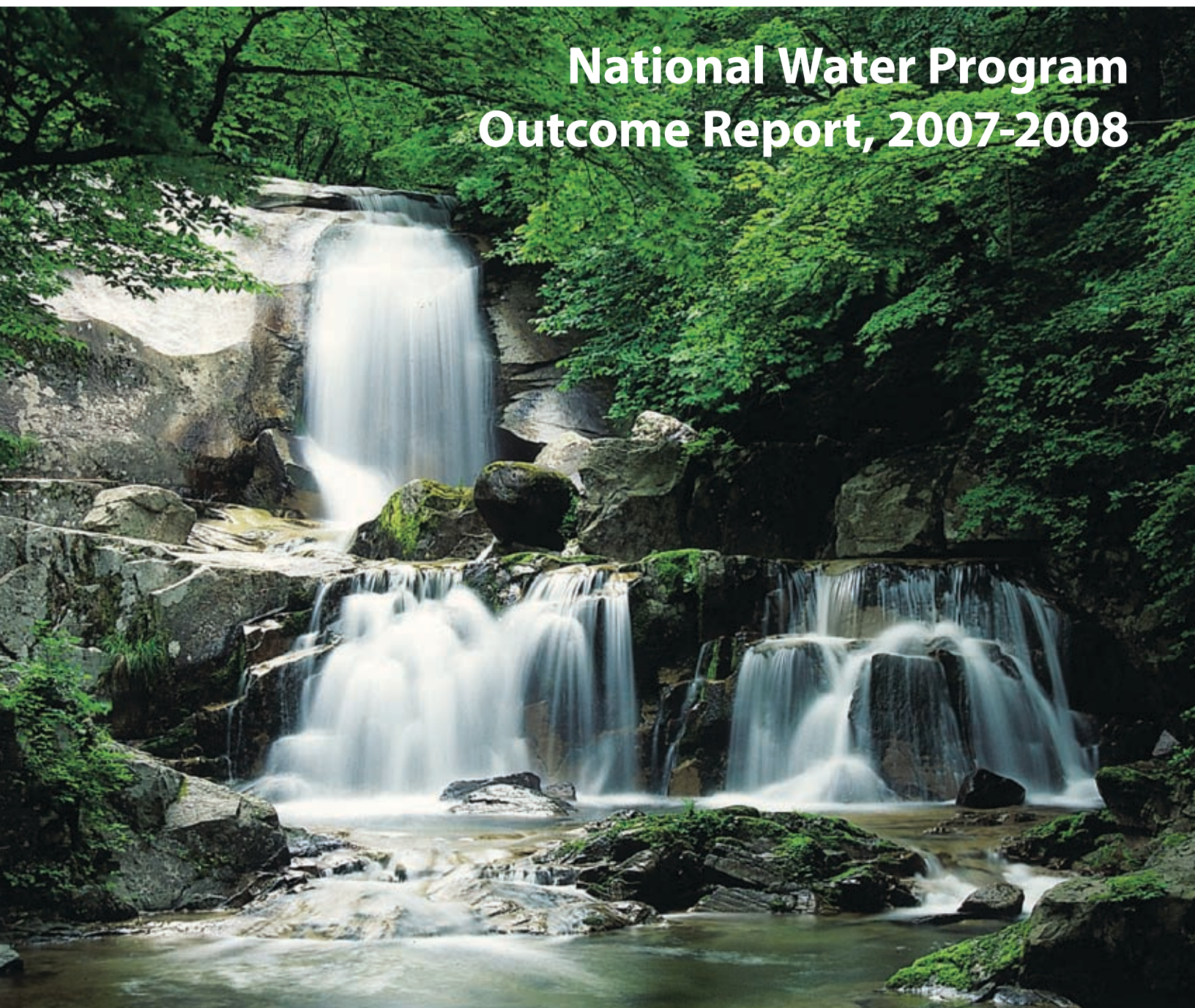


Applying knowledge to improve water quality

National Water Program

A Partnership of USDA CSREES & Land Grant Colleges and Universities

National Water Program Outcome Report, 2007-2008



A network that responds to water resource issues by advancing knowledge through research, education and extension projects.

The
Land-Grant
University
System

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CSREES National Water Program

This outcome report provides key 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.

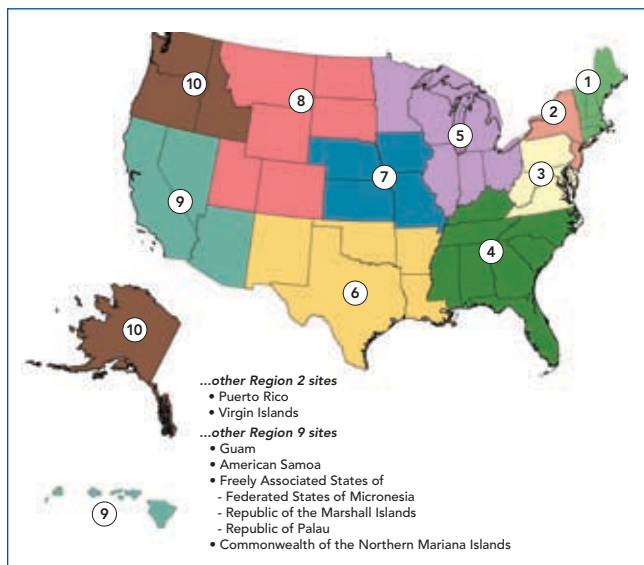
The goal of the Cooperative State Research, Education, and Extension Service (CSREES) National Water Program is to protect or improve water resources throughout the United States, particularly in agricultural, rural and urbanizing watersheds.

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 program is guided by a unique model for shared leadership that includes representatives from each of the 10 regional projects, representatives from the 1890 and 1994 Land Grant 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).



<http://www.usawaterquality.org>



The CSREES National Water Program website (<http://www.usawaterquality.org/>) enhances communication and coordination within the CSREES/Land Grant 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.

This impact report provides key 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.

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Regional Coordination Projects

Integrated Research, Education and Extension Projects

Extension Education Projects

National Facilitation Projects

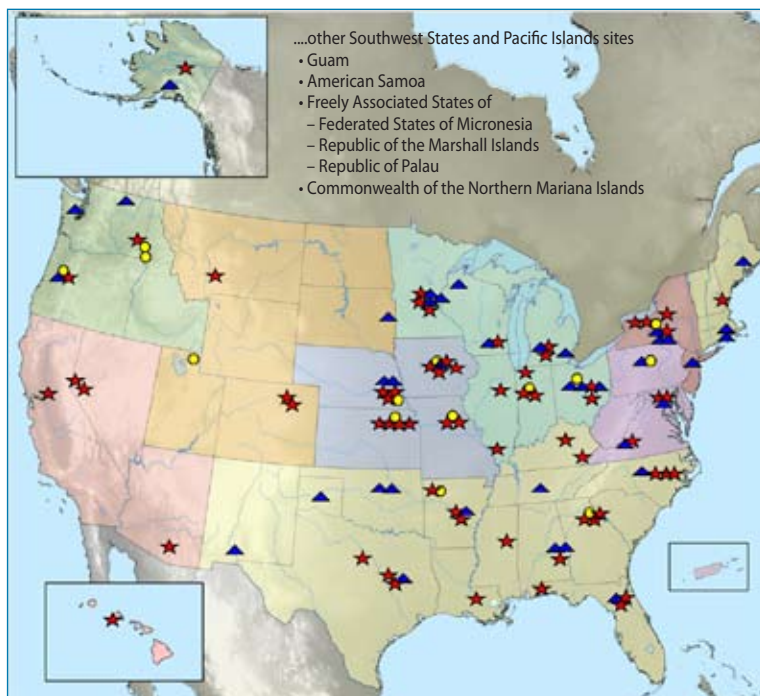
In 2007-2008, the CSREES National Water Program improved water resources through four types of projects addressing eight water resource themes. Four themes are featured in this Outcome Report:

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

Regional Coordination Projects synthesize water resource efforts within each region and make research, education and extension resources of the university system more accessible to Federal, State, and local water resources improvement efforts. In addition to Coordination Projects, three other types of projects were supported by the Agricultural Research, Extension, and Education Reform Act (AREERA) Section 406 competitive grants in 2007:

Integrated Research, Education and Extension Projects integrate water research, education, and extension to solve water resource problems at the watershed level. These projects target a specific watershed and use an integrated approach to address an existing problem. Integrated projects awarded in 2000-2007 are indicated on the map by red stars. Conservation Effects Assessment Projects (CEAP) awarded in 2004-2007 are indicated on the map by yellow circles.

Extension Education Projects provide leadership and effective partnership for water resource education to help people, industry, and governments prevent and solve current and emerging water resource problems. Extension Education Projects focus on outreach to affect changes in



Integrated Research, Education and Extension Projects (★) Conservation Effects Assessment Projects (●) and Extension Education Projects (▲) awarded in 2000-2007.

knowledge and management which enhance and protect the Nation's water resources. Projects awarded in 2000-2007 are indicated on the map by blue triangles.

National Facilitation Projects develop and initiate nationally coordinated programs that contribute to an increase in public understanding and involvement in community decision-making, that facilitate the development of recommendations and tools to inform public policy, and evaluate impacts on water resources (e.g., decisions about land use, land management practices, and waste water management alternatives). The result is more citizen involvement, wider dispersal of information, and more rational analysis of environmental decisions in communities and across the nation.

The following outcome reports are key examples of these important project types.

Nutrient and Pesticide Management

Overview:

Nutrient pollution is the leading cause of water quality impairment in U.S. lakes and estuaries, and the third leading cause of impairment in rivers. While important for growth and development of all organisms, nitrogen and phosphorus can be serious water pollutants. High levels can lead to excessive growth of algae and aquatic plants, decreased water clarity, depletion of dissolved oxygen, and human health concerns in drinking water. Nutrient contamination of water resources can result from agricultural, urban and homeowner fertilizer use, animal waste, septic systems, and atmospheric deposition. To address these concerns, important nutrient management strategies are being developed and implemented across the United States through the CSREES National Water Program. Key examples are shown on the next pages.

Regional Efforts – Examples from:

- Northeast States and Caribbean Islands Regional Water Program
- Southern Regional Water Program
- Heartland Regional Water Coordination Initiative
- Mid-Atlantic Regional Water Program

Nutrient management is addressed through research, education and Extension programs for agricultural producers and residents in the **Northeast States and Caribbean Islands Regional Water Program**.

- ▶ Organic dairy forage and grain cropping system trials have yielded research results and educated growers on eliminating pesticides, reducing nutrient losses and improving soil health. Funding for these efforts has totaled more than \$975,000 from the University of Maine, U.S. Department of Agriculture (USDA) Northeast Sustainable Agriculture Research and

Farmers saved \$6 to \$50 per acre implementing these practices for a total savings of \$300,000 to \$2.6 million.

Education (SARE) and USDA CSREES Integrated Organic Program.

- ▶ Participants in the annual Regional Inservice Training for Agricultural Service Providers and Certified Crop Advisors have assisted 328 farmers in implementing pesticide management on 53,000 acres. Thirty-three percent of the farmers saved \$6 to \$50 per acre implementing these practices for a total savings of \$300,000 to \$2.6 million. More than 400 farmers now use nutrient management practices on 70,000 acres. Participants have assisted farmers to reduce the overall amounts of nitrogen and phosphorus applied. Summer field trainings and tours, held in partnership with USDA's Northeast SARE Professional Development Program, complement these programs.
- ▶ A pilot course developed at the University of Vermont demonstrated that enabling farmers to create their own nutrient management plans meeting the Natural Resources Conservation Service (NRCS) 590 standard has led to increased plan implementation. Thirty farms have taken the five-week course and 28 farms have developed plans on 14,342 acres. Fifty percent of the farmers expect to apply less nitrogen and phosphorus, and 67% expect to save money. This curriculum, which fosters research-based education and cost-effectiveness, is available to all states in the region and is now being offered in Rhode Island with additional support from NRCS.
- ▶ An effort to apply environmental and behavioral research results to Extension efforts to reduce the application of excess nutrients by homeowners in targeted, urbanizing

neighborhoods throughout the region integrates research, education and Extension. Results of social science research are used to drive Extension efforts. Environmental research is testing two types of nitrogen soil tests on turf, both of

which have the potential to provide site-specific information. Turf nutrient management recommendations specific to northern and southern New England have been compiled. Extension is incorporating the nutrient application recommendations from the environmental research into messages and delivery methods that have been determined to be compelling to neighborhood residents based on social science research results. Students involved in the project range from undergraduate to graduate levels. The program's advisory team partners with and leverages the interests of state agency and municipal staff, agricultural extension programs and representatives from area garden centers.

In the **Southern Region**, intensive education and training programs reduced nitrogen and phosphorus fertilizer application on agricultural land by more than 6.4 million pounds.

- ▶ Events conducted across the region's 13 states have targeted all major crops including corn, cotton, grain sorghum, rice, soybeans, vegetables, wheat and forage grasses. These programs helped farmers determine proper sources and rates of fertilizer, as well as correct methods and timing of fertilizer application to optimize nutrient uptake efficiency and minimize losses.

Intensive education and training programs reduced nitrogen and phosphorus fertilizer application on agricultural land by more than 6.4 million pounds.

- ▶ Survey results show that adoption of soil testing as a routine best management practice has increased by as much as 60% in project target areas. Furthermore, reduced nutrient loading has resulted in an estimated economic



impact of more than \$2.24 million in direct fertilizer cost savings for agricultural producers.

- ▶ To implement the program, the Southern Region Nutrient Management Team developed new resources, including a regional soil testing video (<http://aesl.ces.uga.edu/soil/Georgia.htm>) that teaches proper sampling technique and provides easy access to public or private testing laboratories. In addition, a nutrient management publications database (<http://srwqis.tamu.edu/media/432/pbc.pdf>) containing all major information resources available through the region's land grant universities was compiled.
- ▶ The team also has leveraged more than \$450,000 in external funding to support program implementation efforts.

The team has strengthened partnerships with key federal and state agencies, including the Environmental Protection Agency, state Departments of Environmental Quality, and Soil and Water Conservation Districts. Working with the USDA's Natural Resources Conservation Service, the team completed a national assessment of soil test recommendations (<http://srwqis.tamu.edu/media/442/lgu.nmrecommendation.summary.8.05.pdf>) that is being used to improve management consistency across state and regional boundaries. A position paper titled, "Soil Test Calibration Work in the Southern USA," summarizes resources directed to soil test calibration across the South and provides guidance for state and federal decision-makers regarding the future of nutrient management programs (<http://srwqis.tamu.edu/media/11361/summary-soil-test-calibration-survey.pdf>).

Nonpoint source nutrients from intensive livestock and crop agriculture in Iowa, Missouri, Kansas and Nebraska are significant contributors to water impairment both locally and in the Lower Mississippi River Basin.



The **Heartland Region** Nutrient and Pesticide Management (NPM) Issue Team organizes regional collaboration among land-grant universities and state and federal agencies to respond to the needs of the agricultural industry for research, publications and outreach on nutrient management for environmental improvement.

Two water quality modules were used by more than 16,500 attendees in Iowa's 2007-2008 pesticide applicator recertification program.

- ▶ The NPM team annually conducts an issue-based research roundtable followed by a regional workshop. These events are archived online at www.oznet.ksu.edu/waterquality/W&E.htm.
- ▶ Numerous CSREES-funded water projects and other multi-state collaborations have resulted from partnerships established by the workshops, and four regional extension publications involving 37 co-authors have been produced including the new “Targeting of Watershed Management Practices for Water Quality Protection” www.ianrpubs.unl.edu/epublic/live/rp195/build/rp195.pdf.
- ▶ The targeting critical source areas workshop, held in June 2007, also led to leveraging of regional resources when the Environmental Protection Agency (EPA) Region VII Nonpoint Source Program Coordinator allocated funds to provide all Heartland states with computer programs and training for stream assessment. The Region VII investment will improve watershed management planning throughout the region.
- ▶ The NPM program also served as a source of information for two water quality modules used by more than 16,500 attendees in Iowa's 2007-2008 pesticide applicator recertification program.
- ▶ Early NPM work on regional Phosphorus Indexes also continues to generate further outcomes. Nebraska refined its

P Index as a result of Heartland work beginning in 2004. In 2008, the Nebraska group estimated that large animal feeding operations—cattle, dairy, swine and poultry—result in 79,400 tons excreted P/year applied to nearly 1 million acres. All of this acreage will have been assessed with the Nebraska P Index by December 2010 and every five years thereafter to safeguard against excessive P runoff due to manure application.

Watersheds in the **Mid-Atlantic Region** are particularly impaired by nutrient loads. To control nutrient losses, this region has promoted the implementation of specific practices in animal and crop production systems through research and Extension. In 2008, scientists from the Mid-Atlantic Water Program focused on two burgeoning areas of concern: no-till practices and precision feed management.

While no-till practices have been actively researched and implemented for a number of years, there is still a need to improve manure application in reduced tillage or pasture systems and to coordinate evaluation of these technologies for varying farm, soil and manure types. To address these concerns, scientists from the Mid-Atlantic Water Program brought together a team

While no-till practices have been actively researched and implemented for a number of years, there is still a need to improve manure application.



of experts from across the region and have initiated the development of three publications that, for the first time, will provide information on:

1. The current state of the science for managing manure application in reduced tillage and pasture systems
2. Barriers to implementation and how to overcome them
3. A standardized protocol for assessing implementation when comparing studies that are using different methodologies

Precision feed management is another best management practice that the region has been promoting. Scientists from the Mid-Atlantic Water Program

developed a training course based on the National Feed Management Education Project and offered three trainings from late 2007 to early 2008. Nearly 60 people are now certified as Feed Management specialists through the American Registry of Professional Animal Scientists (ARPAS), with more than 80% of these people residing in the Mid-Atlantic region. Through ARPAS, these trainings are just starting to be offered elsewhere in the nation. NRCS, the Chesapeake Bay Foundation, and Washington State University supported the development and delivery of these trainings through staff time and financial support. These partnerships will continue as more trainings are developed and offered throughout the region.

Extension Education Project

Amish and Anabaptist Education on Water Quality, Nutrient Management and Best Management Practices

The Amish and Anabaptist are religious groups who live on small farms with numerous nutrient management and water quality issues. About 66% of the Amish live in three states—Ohio, Pennsylvania and Indiana—with many smaller Midwest settlements. There are more than 210,000 Amish and 850,000 Anabaptist—Amish, Hutterites, Brethren and Mennonites—in the United States (2002).

The Amish and Anabaptists separate themselves from the “English” world by avoiding certain modern technologies, such as electricity, telephones, computers, the Internet and automobiles. They have limited access to educational materials and current knowledge on Best Management Practices (BMPs). Amish/Anabaptist water quality issues include:

1) contaminated drinking water, 2) misapplication of manure, fertilizer and pesticides, 3) over-grazing permanent pastures, 4) a lack of livestock exclusion from streams and 5) stream bank erosion.

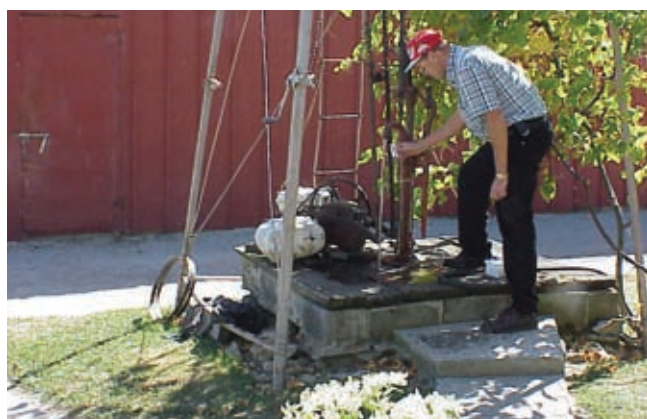
Ohio State University Extension has adapted educational programs to teach Amish clientele about water quality issues BMPs. Accomplishments include:

A monthly full-page advertisement in *The Budget*, a national Amish publication, which is reaching 20,000 Amish/Anabaptist families. Twenty-three monthly ads have been written with articles on well testing and remediation; soil testing; nutrient recycling; managing fertilizer, manure and chemicals; rotational grazing; excluding livestock from streams; and preventing soil erosion.

Education of 500 Amish families on BMPs through on-farm visits, meetings, and workshops. Educational programs include well testing, developing nutrient management plans, establishing demonstration plots and calibration clinics, using Management Intensive Grazing (MIG) to decrease soil erosion, pesticide training, and practicing Integrated Pest Management (IPM).

Adoption rates of 75% to 90% on selected BMPs—rotational grazing, well testing and remediation, soil testing.

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Jim Hoorman, Water Quality Extension Educator testing an Amish well for total coliform bacteria and Escherichia coli.

Watershed Restoration

Overview:

Our watershed restoration efforts focus on developing and demonstrating innovative strategies for enhancing ecosystem functions and improving quality of life. We emphasize the need for a balanced approach to environmental management while working toward long-term goals of safe water supplies, healthy recreation areas, high-quality habitats, protection from floods and ecological sustainability. Watershed restoration is a holistic program that applies science and engineering to meet community needs for a better natural environment.

Regional Efforts – Examples from:

- Southern Regional Water Program
- Northern Plains and Mountains Regional Water Program
- Great Lakes Regional Water Program

Regional and multi-agency collaboration by the **Southern Region Watershed Education and Restoration Team** has improved the technical understanding and

practice of ecosystem restoration by developing, evaluating, demonstrating and teaching effective techniques for restoring wetlands, streams, riparian buffers, floodplains and ecological functions.

- ▶ The team has implemented demonstration projects on 24,000 wetland acres and 120 stream miles.
- ▶ Riparian buffer restoration projects have been implemented on 45,000 acres.
- ▶ Team members coordinated the training of more than 2,400 natural resource professionals through delivery of 32 workshops at 18 locations in eight southern region states.
- ▶ More than 32 demonstration projects have been completed in cooperation with USDA, EPA, state agencies and local watershed organizations. These educational programs have resulted in changes in state and federal

Team members coordinated the training of more than 2,400 natural resource professionals through delivery of 32 workshops at 18 locations in eight southern region states.



policy regarding stream mitigation to emphasize a more effective natural channel design approach. Mitigation projects are being designed and permitted to result in stable functioning streams based on the increased professional understanding of stream restoration techniques.

- ▶ More than \$3 million, including funding provided by EPA, state agencies and local watershed organizations to design and construct demonstration projects, has been leveraged by Section 406 funding.
- ▶ The most recent biennial Regional Stream Restoration Conference (www.ncsu.edu/srp) brought together over 500 government, consulting and academic professionals

working in stream restoration planning, design, construction and evaluation. Impacts included enhanced understanding of restoration technologies and programs, functional networks of restoration professionals, and improved restoration projects and programs.

- ▶ **Student Training:** New courses in stream restoration have been developed and taught at North Carolina State University and Clemson University using field demonstrations for hands-on learning. More than 100 students have participated in undergraduate and graduate courses. Graduate students have been involved in more than 30 projects to evaluate watershed restoration techniques.

Developing and Delivering New Tools for Integrated Watershed Management and Restoration

To address impacts caused by grazing, irrigated agriculture, fire suppression, introduced plants, rapid growth and urban pressures, the **Northern Plains and Mountain**

(NPM) Region has focused on developing better watershed management tools, improving monitoring techniques and increasing attention to human behavior change. Regional team members have been active in educational outreach through development of watershed science curriculum tools for high school, Land-Grant and tribal college partners. Stream Side Science high school curriculum is a set of 11 water related activities and lesson plans correlated to the ninth-grade Earth Systems Science Core. Activities have been tested in the classroom and modified according to teacher feedback. To further this mission of watershed science education,

Non-point source pollution educational programs have reached 12,000 youth and 1,500 teachers.



Utah State University has collaborated with Montana State University in development of two online graduate courses entitled “Water Quality” and “Stream Side Science —An Online Approach to Field-based Education.” Overall, these programs help students and teachers in Land-Grant and tribal colleges and high school science teachers understand how streams and lakes function within watersheds and how activities and changes in the watershed affect the health of water bodies. Significant outcomes of integrated watershed management and restoration include:

- ▶ Improved monitoring strategies and training materials to detect and quantify real changes in water quality following stream and upland restoration activities.
- ▶ Increased knowledge about human dimensions of watershed management, including how to motivate and



- monitor changes in behavior. This was funded primarily from a CSREES Conservation Effects Assessment Project (CEAP).
- ▶ A fully integrated watershed management system (www.bear-riverinfo.org), and a pilot pollutant trading program that was funded primarily from an EPA Watershed Initiative grant.
- ▶ Stream monitoring techniques have been used by Utah State University, Montana State University and the University of Wyoming Water Quality Extension for several years to teach about non-point source pollution and watershed functions, reaching approximately 5,000 youth and 200 adults and volunteer monitors annually. In the past four years, these programs have reached more than 12,000 youth, 1,500 teachers have learned about water quality and watershed functions, and 150 science teachers have completed on-line graduate curriculum addressing water quality and watershed restoration.
- ▶ More than \$1.7 million has been leveraged to develop online watershed information and outreach programs, research changes in water quality and sediment transport, develop environmental observatory tools, and enhance water quality Extension efforts.

Protection and Cultivation of Wild Rice and Creation of a Freshwater Estuary NERR Site

Wild rice (*Zizania* spp.) is a native aquatic plant being restored to parts of the Upper **Great Lakes Region** through the efforts of the Regional Water Program. This shallow water plant is of great importance to the ecology of many lakes and streams, wildlife and water quality. This native grain also has had an important cultural value to the indigenous people of the Upper Great Lakes Region for thousands of years. Unfortunately, wild rice populations have declined throughout much of the plant's historic range, due in large part to human impacts.

In the fall of 2007, White Earth Tribal and Community College faculty developed a model of "regional sharing and transferring of the Minnesota traditional wild rice camp." A post-camp evaluation survey indicated that Traditional Ecological Knowledge

(TEK) related to wild rice increased significantly for most participants. In addition, this knowledge is now being used by the tribal community's school system.

Great Lakes freshwater estuaries are unique coastal landforms that occur where river and Great Lakes water mix in shallow wetlands near the mouth of a river. The National Estuarine Research Reserve (NERR) System is a nationwide network of protected coastal estuaries



designated and supported through the National Oceanic and Atmospheric Administration (NOAA).

The Great Lakes Regional Water Program has participated in an ongoing effort to designate a NERR site on Wisconsin's Lake Superior shoreline. The development will create a platform for future regional collaborative research and outreach related to freshwater estuary systems, the Great Lakes, and coastal resources.

In May 2008, Wisconsin's Governor James Doyle announced the nomination of the St. Louis River freshwater estuary for NERR designation. The nomination was widely covered in the media, including national news sources, and was the result of an extensive public participation campaign. The river represents the largest U.S. tributary to one of the world's largest freshwater resources.

Integrated Research, Education and Extension Project

Landscape Scale Disturbances in an Agroecosystem: Impacts on Aquatic and Riparian Environments in the Sugar Creek Watershed, Ohio

The Sugar Creek watershed in northeast Ohio is the second most degraded watershed in Ohio, and agriculture is the major source of impairment. The goals of the Sugar Creek project are to:

1. Quantify the structure and function of aquatic food webs in headwaters that represent the range of geographic and land management conditions.
2. Relate the function of aquatic ecosystems to land use as a framework for headwaters restoration.
3. Expand education and Extension activities using headwaters restoration as a focal point.

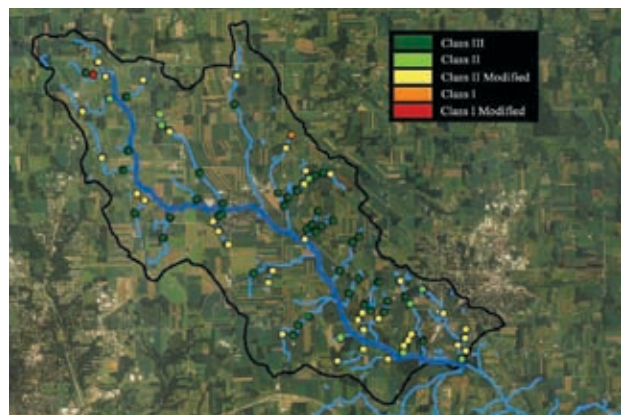
Headwater tributaries were sampled for habitat and stream biota in three subwatersheds, which differ in farming practices and geomorphology. Organic matter, riparian vegetation and stable isotope analyses were used to examine cycling of carbon in food webs. These data will enable establishment of important linkages between stream ecosystem function, riparian corridors and adjacent agricultural land use, and can be used to set priorities for site-specific restoration practices to improve water quality.

Outcomes and results are:

- ▶ Stream biota that showed configuration of the landscape—the degree of fragmentation and the location of woodlots—can be more critical than local habitat in improving water quality. Restoration should focus more on connecting high quality habitat patches than on site-specific restoration of local habitat.
- ▶ Quantification of ecological status of 81 sites in the Upper Sugar Creek subwatershed that will be used by Sugar Creek Partners (landowner partnership) to prioritize impaired stream miles for restoration or BMP implementation.
- ▶ Stable isotope analysis that showed a disconnect between organic matter dynamics and stream food webs, indicating restoration should focus more on floodplain development.



- ▶ Alpine Cheese Factory, in the Middle Fork subwatershed, will fund BMPs and monitoring to the more degraded South Fork of Sugar Creek in a nutrient-trading plan as part of its 5-year National Pollutant Discharge Elimination System (NPDES) permit to reduce phosphorus.
- ▶ Establishment of partnerships with every school district in the watershed; mobile classroom units in watershed ecology were developed and used in elementary and high schools, and Smithville High School Environmental Science class won a regional science fair; efforts were instrumental in developing a winning proposal to the National Science Foundation GK-12 program.



On the Web at: <http://sugarcreekmethod.osu.edu/>

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Watershed Management

Overview:

Watershed management recognizes that the water quality of streams, lakes and estuaries results from the interaction of land use practices in the watershed. A watershed is the area of land that contributes water to a particular surface water drainage system such as a stream or river. Effective planning and long-term change in impaired watersheds requires citizen participation in many stages of the process. CSREES and the Land-Grant Colleges and Universities with its system of community-based educators carrying out public outreach education are uniquely poised to direct programming to increase community involvement in watershed management.

Regional Efforts – Examples from:

- Northeast States and Caribbean Islands Regional Water Program
- Southwest States and Pacific Islands Regional Water Program
- Northern Plains and Mountains Regional Water Program
- Great Lakes Regional Water Program
- Pacific Northwest Regional Water Program

The **Northeast States and Caribbean Islands Regional Water Program** has a strong commitment to volunteer water quality monitoring, research and development, sustained outreach, training and technical assistance, and development of expanded graduate and undergraduate education. The program improves watershed management by developing long-term monitoring databases, conducting research and developing management tools that incorporate quantitative computer simulation techniques. Sustained and strengthened partners ensure that stakeholders from federal, state and local

More than 3,500 volunteers monitor about 850 waterbodies throughout the region contributing 40,000 hours worth \$750,000 per year.



agencies—at public and private levels—work as one unit to capitalize on the enormous number of volunteer hours and services that support program efforts. Programs obtain additional funding from University Sea Grant programs, Water Resources Research Centers, watershed associations, Trout Unlimited, and Native American communities and guidance from national partners, including EPA and the U.S. Geological Survey (USGS). Since 2000, these efforts have leveraged more than \$1 million in additional funding from partnering agencies and organizations.

More than 3,500 volunteers monitor about 850 waterbodies throughout the region. These data support local management and state efforts in 305(b) assessments and development of 303(d) reports, resource inventories, BMP and restoration evaluations, and Total Maximum Daily Loads (TMDLs). The leveraging of volunteer hours throughout the

region is substantial—more than 40,000 hours worth \$750,000 per year.

The Maine Shore Stewards contributed important data and information to Maine’s decision-makers to help solve pollution problems, restore clam flats and encourage the ethic of caring for Maine coastal communities. Simply by providing data for areas where none had previously been available, volunteer monitors enabled the State to open 100,000 acres of clam flats.

Experiential learning opportunities for undergraduates are incorporated into classroom and laboratory courses and internships including programs at Rutgers, University of Rhode Island’s (URI) Coastal Fellows Program, University of New Hampshire’s (UNH) Center for Freshwater Biology, and University of Vermont’s (UVM) Watershed Alliance.

A regional effort piloted by Rutgers, with leveraged support from New Jersey Sea Grant, involved community-delivered Extension education about stormwater management to homeowners and farmers. In addition, a USDA CSREES 406 Extension Education grant program was secured to launch the program in New York and Virginia.



This study provides some of the first data to characterize the water quality impacts of feral pigs in the region.

Recognizing that information could be shared among other Pacific Islands and California, where feral pigs present a problem, the **Southwest States and Pacific Islands Regional Water Program** is supporting research to identify the effects of feral pig activity on watershed attributes.

Few studies have attempted to quantify the effects of feral pig activity on runoff and nutrient transport in forested watersheds. Pig activities such as rooting, browsing, digging and trampling lead to a loss of biodiversity, propagation of invasive plants and increased erosion. As a result of these activities, feral pigs are considered a major threat to native biota, and minimizing their impact is a top priority of Hawai’i’s parks and reserves.

Preliminary results indicate that activities of feral pigs increase sediment, nutrients, bacteria and total runoff. As the relationship between pigs and watershed damage becomes clearer, values can be assigned to management practices such as fencing and eradication in terms of avoided damages. This





Focus on Watershed Management as Domestic Energy Development Expands

Attention to domestic energy development within the United States, as well as focus on independence from global energy supply and price volatilization, has led to aggressive energy resource extraction throughout the **Northern Plains and Mountains (NPM)**. This activity has brought about need for research addressing potential impacts from surface disposal of coal bed natural gas (methane) product water on watersheds, as well as needs for education and outreach tools to disseminate pertinent information about watershed management to targeted audiences. The following are examples of program outcomes focused on watershed management with respect to domestic energy development:

- ▶ NPM regional team members have responded to stakeholder and clientele needs by assisting with development, evaluation and dissemination of tribal, state and federally-adopted water quality standards and/or approaches to authorization of discharges specific to salinity and sodicity as related to irrigation suitability (MT, WY, Northern Cheyenne Tribe, U.S. EPA) (<http://yosemite.epa.gov/opa/admpress.nsf/b1ab9f485b098972852562e7004dc686/3cb7386d0ba08a66852571c700609a79!OpenDocument>). Farmers act voluntarily on personal environmental goals when they can measure their progress.

study provides some of the first data to characterize the water quality impacts of feral pigs in the region.

The results of this study are being closely followed by the U.S. military, watershed management groups, the Nature Conservancy, public health agencies and many others in Hawai'i, to guide future fencing and pig control activities. It is expected that results will apply directly to all Pacific Islands in the region and will be of interest throughout the continental United States, where feral pigs also are widely distributed.



- ▶ Research has expanded understanding of saline and sodic water impacts and management alternatives on semi-arid landscapes (http://www.deq.state.mt.us/CoalBedMethane/Muggli_Final_Report_with_outline.pdf).
- ▶ Regional partners collaborated to develop and distribute the EPA-sponsored Land and Water Inventory Guide for Landowners in Areas of Coal Bed Methane Development to over 1,000 regional partners, landowners, and land managers throughout the NPM Region (http://wsprod.colostate.edu/cwis435/northern_plains_mountains/PDFs/Wave_Papers/guide_pr_sheet_7.pdf).
- ▶ The regional team hosted five multi-state landowner-industry workshops and organized three national science and technology symposia, two in conjunction with the American Society of Agronomy meetings, focusing on saline and sodic water management, produced water management, and impaired water quality management.
- ▶ Development of a 30-minute, award-winning, “made for public television” documentary broadcast; *Prairies and Pipelines*, including contributions from Bureau of Land Management, private land owners, industry representatives, regional team scientists and policy-makers (<http://www.msuxextension.org/Publications/ESCatalog/ALLPublicCatalogALLlistasp?pssearch=pipelines&Submit=Search+%28+%29&pssearchtype>).
- ▶ Collectively, this regional effort has resulted in publication of 11 peer-reviewed science journal manuscripts, two media-press articles published, two book chapters, six Web-based, on-line curriculum modules, a salt-tolerant plant identification and water management manual for landowners, and ten electronically accessible fact sheets.

Focused Efforts on Watershed Management through an Initiative on “Social Indicators” and a Number of Efforts Related to Stormwater Management

In cooperation with EPA and state water quality agencies, the **Great Lakes Regional Water Program** “social indicators” initiative focuses on helping resource managers understand and address factors that influence individual decisions affecting critical areas in watersheds. The social indicators provide information about awareness, attitudes, constraints, capacity and behaviors that are expected to lead to water quality improvement and protection.

During the past year, the regional project team has published and distributed a revised handbook, “The Social Indicator Planning and Evaluation System (SIPES) for Nonpoint Source Management.” The handbook explains social indicators

and their application to watershed management projects. The regional team is testing SIPES with numerous pilot projects throughout the Great Lakes Region. The team has continued to develop an online support tool that enables pilot projects to create survey questionnaires consistent with the regional social indicators, input data from returned questionnaires, analyze responses and repeat the process at a later date to compare results. Two articles from the project have been accepted for publication in peer-reviewed journals. The handbook and related materials are available at the project Web site: <http://www.uwex.edu/ces/regionalwaterquality/Flagships/Indicators.htm>

Stormwater runoff from urban and residential developments has been shown to impact water quality and quantity in receiving streams, often leading to significant degradation of water resources. In an effort to mitigate these impacts, stormwater managers, engineers and researchers have developed a suite of structural and non-structural BMPs.

Through the Great Lakes Regional Water Program, a BMP Database was created for stormwater managers to share with others their experiences implementing innovative stormwater BMPs. Early adopters of BMP technologies populate the BMP Database by



filling out an online questionnaire which guides them to enter important information regarding their projects. Individuals seeking to learn about

innovative BMPs can search the database several ways, including the interactive mapping platforms Google Maps and Google Earth. The BMP

Database tools and a User's Manual can be accessed at: <http://www.uwex.edu/ces/regionalwaterquality/flagships/stormwater/>.

To Better Deliver Educational Programming on Watersheds, Targeted Programs are Delivered on an Eco-Region Basis

To better deliver educational programming on watersheds, the **Pacific Northwest Regional Water Program (PNW)** delivers targeted programs on an eco-region basis (http://www.pnwwaterweb.com/WQFlyers_PNW141.pdf), rather than observing state boundaries. The regional program has divided the Pacific Northwest into three eco-regions. Eco-region I consists of Washington and Oregon west of the Cascades and southeastern Alaska. About 7 million people live in this wet eco-region that is characterized by high annual precipitation of more than 35 inches, cool, wet winters and mild summers. Eco-region II consists of Idaho and all of Washington state and Oregon east of the Cascades. This eco-region is relatively dry as

annual precipitation ranges from 8 to 30 inches. About 3 million people call this region home, and it has cool or cold winters and hot, dry summers. Alaska, excluding the southeastern panhandle, is eco-region III. This region is relatively dry and has cool summers and cold winters.

More than 1,000 people view each produced conference on a live basis. In addition, several thousand people have viewed the archived materials.

Water resource programming by eco-region is an efficient use of land-grant institution resources. For instance, when the PNW Regional Water Program develops a programming effort on the use of rain gardens to reduce storm water runoff, the program can be delivered throughout the wet eco-region I. All the costs and infrastructure involved in the development and delivery of a single program effectively meets the needs in parts of three states—Washington, Alaska and Oregon. In addition, a Web page on effective irrigation management in agriculture can be targeted to people in eco-region II. Thus, the regional program simultaneously delivers educational information to people managing the 6 million irrigated acres of



farmland in Idaho, Oregon and Washington. Programming on an eco-region basis allows the regional program to more effectively reach a larger percentage of the public in Alaska, Idaho, Oregon and Washington state without increasing the need for additional resources.

Every year since 2002, the regional team has developed and delivered a regional satellite-delivered watershed issues

conference to support watershed groups in Alaska, Idaho, Oregon and Washington state. Most people initially viewed these educational conferences via satellite downlinks; however, in the last two years, most people have been reached using video streaming technology. More than 1,000 people view each produced conference on a live basis. In addition, several thousand people have viewed the archived materials.

Integrated Research, Education and Extension Project

A New Approach to Sediment TMDL Watersheds

Implementing best management practices for erosion control at the watershed scale should consider the sources of erosion and their relative contribution. For watersheds in the Piedmont eco-region, it is important to know the relative contribution of “legacy” sediment deposited in flood plains during the period of intensive cotton farming from about 1830-1930 versus the current upland erosion sources, such as agricultural fields, forestry practices, road ditches and construction sites, to the total sediment loading.

In this study, a four-tiered approach is being used to determine target sediment loads for a Piedmont stream:

- ▶ Geomorphic assessment of stream channels to determine channel stability and stage of channel evolution
- ▶ Comparison of the current sediment load with the regional median values for stable and unstable streams
- ▶ Sediment fingerprinting to determine the primary source of erosion
- ▶ Computer simulation modeling to determine target loads and scenarios to achieve target loads taking into account the stage of channel evolution

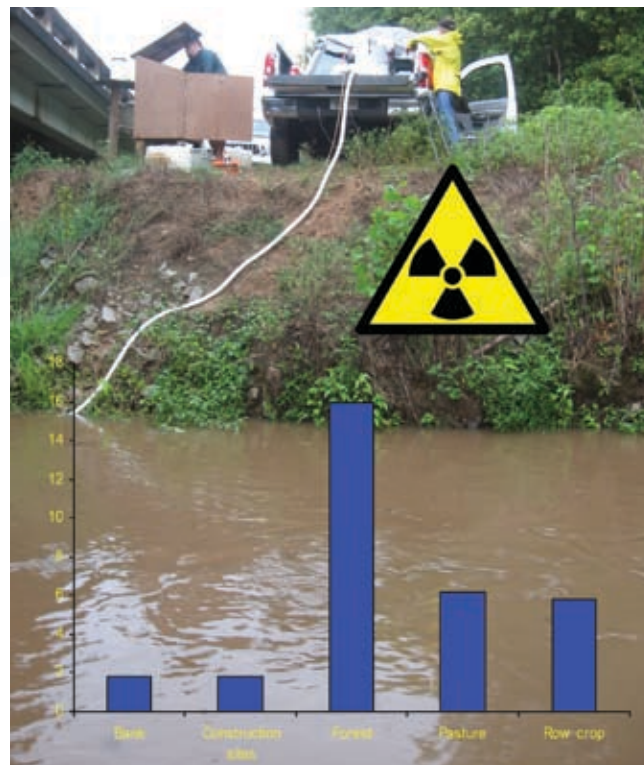
The project utilizes a multi-disciplinary, multi-institutional collaborative approach to address sediment problem in a southern Piedmont stream.

Outcomes:

- ▶ Geomorphic assessment indicates that the stream channels in the study watershed are relatively unstable.
- ▶ Preliminary sediment fingerprinting results point towards stream banks as the primary source of suspended sediment in the streams.
- ▶ National experts in fluvial geomorphic assessment, modeling and sediment fingerprinting provided a 2-day

seminar/field visit for the water resources faculty and students at the University of Georgia.

- ▶ The project was the research highlight of the Spring 2008 issue of Southscapes — A magazine published semi-annually by the College of Agricultural and Environmental Sciences, University of Georgia (<http://www.caes.uga.edu/alumni/southscapes/sp08/research.html>).
- ▶ Preliminary results on geomorphic assessment of stream channels and sediment fingerprinting will be presented at the National Water Conference 2009 at St. Louis, MO.
- ▶ The project introduces a new approach to sediment TMDL practitioners by incorporating geomorphic analysis of fluvial systems, sediment fingerprinting, use of long term sediment loads rather than concentrations (that varies over space and time) for setting targets and determining viable load-reduction scenarios.



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Water Policy and Economics

Overview:

Implementation of water policy is an extremely important factor in determining how states meet the challenges of environmental water needs, land development, drought management, and interstate or inter-basin exchanges. Water availability affects development of industries, population centers, recreation and other resources, and availability is often a function of public policy and the implementation of that policy through water law and water rights. Drought, floods and development of population centers, water-consuming industries and agriculture introduce new areas of conflict in which water policy and economics become paramount.

Regional Efforts – Examples from:

- Heartland Regional Water Coordination Initiative
- Mid-Atlantic Regional Water Program
- Pacific Northwest Regional Water Program
- Southwest States and Pacific Islands Regional Water Program

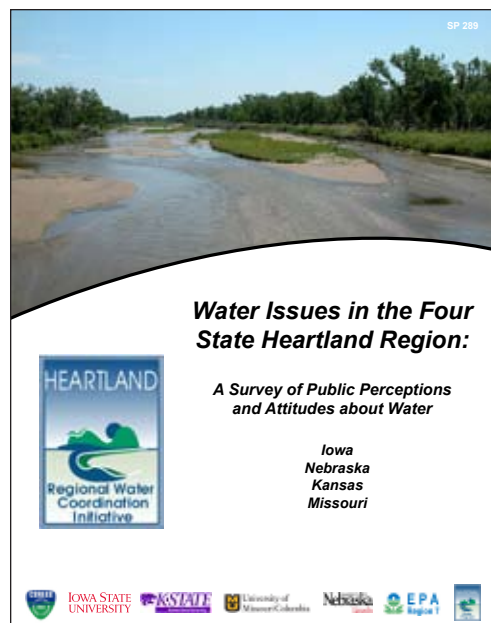
The **Heartland Region** Community Involvement in Watershed Management Issue Team (CIWM) is building capacity for community/agency partnerships for watershed management and conducting research on the citizen effect on watershed outcomes. The regional coordination structure has also allowed this team to integrate human dimensions elements into the efforts of technical issue teams.

- ▶ Technical reports published in 2007 on a regional survey of public perceptions and attitudes about water, [www.extension.iastate.edu/store/ListItems.aspx?Keyword=water issues](http://www.extension.iastate.edu/store/ListItems.aspx?Keyword=water+issues), have created opportunities to influence policy in partner agencies and programs.
- ▶ The Iowa Surface Water Protection Act, passed in April 2008, creates a water resources coordinating council within the office of the governor and provides for various

types of community-based support. Legislative findings for this bill were derived in part from the Heartland Iowa survey. The Iowa DNR has awarded a grant to study Revolving Loan Fund Programs for Agricultural Best Practices as a direct result of state decision makers' interest in the survey. Survey results also influenced development of the Iowa State University Extension 2008-2012 Plan of Work, which places greater emphasis on natural resources and environmental stewardship education for Iowans.

Legislative findings for the Iowa Surface Water Protection Act of 2008 were derived in part from the Heartland Iowa Survey.

- ▶ In 2008, to increase regional coordination of watershed planning and TMDL implementation, EPA Region VII and state 319 program managers were brought together to discuss EPA's "Nine Element" framework. The opportunity for a regional dialog brought out marked differences



among states in how this program is interpreted and implemented. Open-ended comments from the post-event survey found that both EPA Region VII and state managers value Heartland as facilitator of this dialog, which will impact the participating states, EPA and land-grant universities as they support watershed planning in the future.

- ▶ Also in 2008, the Iowa Learning Farm and Leopold Center for Sustainable Agriculture are partnering with Heartland Community Involvement in Watershed Management leaders on a 406-funded state-wide educational program that leverages both personnel and financial support for performance-based environmental management.

Translate and Provide Scientific Findings to Program-Level Staff

After meeting with several state and federal government agencies, the **Mid-Atlantic Water Program (MAWP)** addressed a consistent need across all organizations to translate and provide scientific findings to program-level staff. To support the efforts of these agencies and programs, the Mid-Atlantic Water Program identified specific efforts that could help build capacity of regional organizations and facilitate tangible policy and programmatic changes in the future.

- ▶ The EPA Chesapeake Bay Program (CBP) relies on models to achieve nutrient and sediment reduction goals by helping managers track allocations, caps and loads. The effectiveness of the model in developing policies, regulations and programs, however, is limited to the quality of the input. To ensure that this model accurately reflects practical, operational conditions over the Chesapeake Bay watershed, the MAWP began working with the CBP in 2006 to develop science-based definitions and efficiencies for agricultural and urban Best Management Practices (BMPs). During 2008, the MAWP assessed BMPs that have not been implemented or previously reported to the CBP. These practices include ammonia emission reduction, dairy feed management, infiltration and filtration of stormwater, and others.
- ▶ The Potomac River Basin Drinking Water Source Protection Partnership, a regional partnership of federal and state government agencies, recently source-tracked a high level of *Cryptosporidium* in the river to cattle. Since *Cryptosporidium* cannot currently be removed at treatment facilities, the partnership has sought the MAWP's assistance in preparing them to engage the agricultural community. The MAWP drafted and initiated a strategy to educate the partnership on farm operations and BMPs to reduce pollution. To date, one Ag 101 training was provided for the partnership. Surveys show that before the training, participants averaged a 2.08 level of understanding, on a scale of 4.0, regarding the financial and political pressures that drive operational decision-making. After the training, the average level of understanding increased to 3.42.



Photo courtesy of Jerry Knight.

Merging Water Science and Policy to Promote Interactive Collaboration on Complex Water-Policy Decisions

In November 2007, the **Pacific Northwest Region** hosted a major regional research and Extension conference titled “Moving Science into Policy and Action” in Stevenson, WA (<http://www.pnwwaterweb.com/WQ>

[Flyers_PNW125.pdf](#)).

The conference explored ways of merging water science and policy to promote interactive collaboration on complex water-policy decisions—an important goal for all

environmental and water resources professionals in the Pacific Northwest. The two-day conference included a unique mix of presentations, featured speakers, panel discussions, networking opportunities and a poster session packed with information relating to a broad array of interesting regional topics presented by water organizations, policy makers, scientists and researchers with experience in the Pacific Northwest. There were over 240 registrants in attendance. Based on feedback, the conference was an enormous success. This event incorporated and highlighted regional solutions to complex environmental and water resources problems faced by federal, state, tribal and local agencies, as well as practitioners, non-governmental organizations and stakeholders. Moreover, the conference provided a forum for people to form professional networks and begin to understand the multidisciplinary nature of many regional challenges.



As part of the Pacific Northwest Regional Water Issues Survey, the public in Alaska, Idaho, Oregon and Washington was asked about water use in their yards (http://www.pnwwaterweb.com/WQFlyers_PNW137.pdf). Based on the survey results, more than 83% of Pacific Northwest residents water some part of their yards in the summer. Of the respondents who indicated that they water their yards, almost two-thirds (66%) water their lawns, more

than half (53%) water their gardens, and almost half (48%) water their landscaping. The survey found that the majority of homeowners used at least three water conservation practices in their yards. The most frequently used water conservation practice was watering only in the evening or early morning (71%), followed by sweeping sidewalks, driveways, and decks instead of washing them down with water (57%), and less lawn watering (53%).



New Practices Being Accepted for Cost-Share Under the USDA-NRCS Environmental Quality Incentives Program (EQIP)

Work that began with an emphasis on providing management options for small-scale swine operations (1–10 pigs) to control waste has led to new practices being accepted on a trial basis for cost-share under the USDA-NRCS Environmental Quality

Incentives Program (EQIP). Working in small communities across the Pacific Islands, the **Southwest States and Pacific Islands Regional Water Program** (Region 9) has promoted research on and demonstrations of a dry litter waste management system.

With initial benefits focused on keeping waste out of streams and other local water resources, the system has developed into one that also benefits farmers through reduced water usage and operational costs. Savings reported from a single farm have been



about 4,000 gallons of water per month and an associated 75% reduction in labor costs due to eliminating time required for daily spray-out of the piggery.

As more farmers learn of the dry litter system, demand for technical information on how to renovate existing piggeries has continued to rise. With enthusiastic support from some early adopters, the Region 9 Animal Waste Management Team has begun work with NRCS agents to develop standard specifications for construction and/or retrofitting of piggeries. Even as design specifications are developed, farmers wishing to modify their piggeries to enhance their ability to manage animal waste have applied to NRCS for cost-share funding. Compelled by the growing interest, Pacific Basin NRCS has allowed EQIP funds to be used for these projects. With the successful completion of these sites, Region 9 is hopeful that the policy for allowing these projects to be funded under EQIP becomes standard and available for small-scale operations across the Pacific, and nation-wide.



Extension Education Project

Wetland Enhancement Decision-Making Tools and Training for Landowners and Technical Service Providers

Despite state regulations regarding best management practices (BMPs) to reduce phosphorus from entering Lake Okeechobee, FL, few landowners in the basin took advantage of wetland enhancement cost-share programs. The creation, restoration or enhancement of isolated wetlands are considered to be among the most effective phosphorus-reduction practices. However, many landowners were confused with program eligibility requirements and cost-share options presented by both private and government programs.

The project developed three forms of unbiased wetland enhancement decision-making tools: (1) a printed, “matrix” formatted table

comparing all cost-share programs available to landowners in the Lake Okeechobee basin, (2) a printed dichotomous, decision-making key that allows landowners to eliminate cost-share programs based on eligibility and compatibility with their preferred land uses, and (3) an interactive, Web-



based decision-making tool that offers lists to landowners from which to choose their preferred land-use options. In addition to these three decision-making tools, a printed Natural Resource Pocket Record Book and BMP Guide were developed. The shirt-pocket-sized booklet was distributed to

Educational materials, presentations and decision-making tools resulted in 42 wetlands being created, enhanced or restored in the Lake Okeechobee watershed.

landowners in the basin who have property that could qualify for wetland enhancement activities; it serves as a ready source of information about best management practices that relate to wetland enhancement. The decision-making tools were also featured during educational activities delivered to groups and one-on-one settings. In addition, the team used newspaper articles, journal articles and newsletters to disseminate information about wetland enhancement cost-share and other assistance programs for landowners and technical service providers.

Educational materials, presentations and decision-making tools resulted in 42 wetlands being created, enhanced or restored in the Lake Okeechobee watershed. These totaled about 6,747 hectares in wet-season surface area. The new wetlands range in size from 1.2 hectares to 506 hectares in wet-season surface area and which dramatically reduce the amount of phosphorus entering Lake Okeechobee.



On the Web at: <http://wer.ifas.ufl.edu/>

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National Facilitation Projects



Photo courtesy of NRCS

Changing Public Behavior: Increase Citizen Involvement Using Target Audience Information

Situation:

Community involvement and education have been identified as key components for successfully implementing state and federal agency water management plans. Research indicates that when educators focus on specific audiences, their work is more likely to be successful.

Extension's water professionals want to know when and how to use target audience information and social science tools in community-based outreach efforts.

The Water Outreach Education NFP (2000-2004) connects natural resource professionals with information and best education practices to help citizens improve their understanding of water issues and develop water stewardship skills. Project resources help educators to:

- ▶ Connect the situation with the people
- ▶ Choose achievable goals
- ▶ Select relevant outreach techniques
- ▶ Get measurable results

Actions:

The second phase of this work, the Changing Public Behavior National Facilitation Project (2006-2008) trains scientists, natural resource professionals, and educators to develop and use target audience information to improve citizen understanding and involvement in community decision-making for water resources.

Project materials are developed with the advice of national leaders in education, social sciences, and training. We have:

- ▶ Translated research-based, target audience information into findings that include audience studied, and outreach practices and best education practices employed. We've created an online searchable database for accessing the findings.
- ▶ Collected information on easy to use, cost-effective community analysis tools that are "doable" for natural resource professionals.

- ▶ Developed a self-study module that provides a step-by-step process for learning new skills. This on-line training resource (<http://wateroutreach.uwex.edu/SSModuleIntro.cfm>) provides background information and practice opportunities.
- ▶ Pilot tested an in-person training curriculum with Extension natural resource professionals and with agency administrators, receiving feedback from 150 educators.
- ▶ Identified measures for participants to evaluate their skills.

Outcomes:

- ▶ Launched a Website resource with education and social assessment tools including a self-study training module and a searchable target audience database.
- ▶ Collaborated with federal agency (USDA/CSREES, U.S. Fish & Wildlife Service (USFWS), EPA) and university partners to build education and social assessment skills for natural resource professionals.
- ▶ Created interest among Extension natural resource professionals for in-person trainings and for use of the self-study module.
- ▶ Increased educator confidence in using target audience information to plan outreach strategies.
- ▶ Supported activities for a Community of Practice that improves participant skills and resources for assessing target audiences.

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On the web at:
<http://wateroutreach.uwex.edu/CPBhomepage1.cfm>

Livestock and Poultry Environmental Learning Center

Situation:

The Livestock and Poultry Environmental Learning Center is committed to:

- ▶ Implementing a customer-driven outreach initiative
- ▶ Assembling the best science-based information
- ▶ Connecting those who create new knowledge with the end users of that knowledge

Actions:

eXtension Web Launch: The Learning Center launched the eXtension Animal Manure Management Web presence. Nine work groups involving more than 100 representatives of land-grant universities, USDA Agricultural Research Service (ARS) and USDA NRCS have contributed more than 120 content-oriented Web pages plus additional pages for Webcasts, newsletters, continuing education units, and the Livestock and Poultry Environmental Stewardship curriculum.

Webcast Seminars: As of the end of 2008, the center has hosted 26 Web cast seminars using more than 58 experts from 19 universities, the US EPA, USDA (ARS, CSREES,

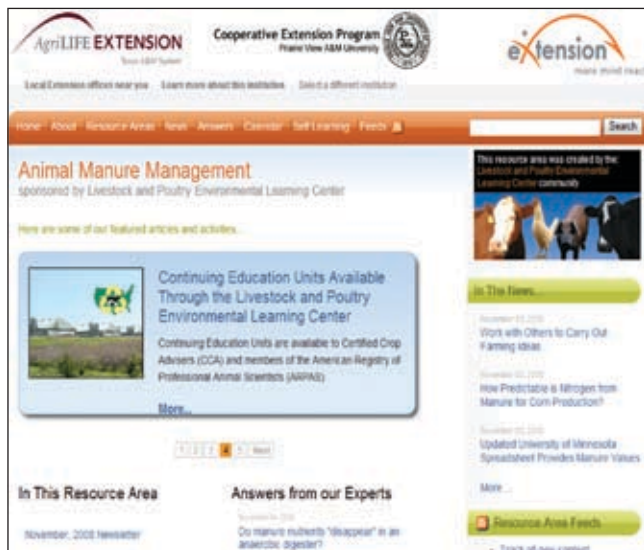
and NRCS), USGS, and the private sector. When EPA announced its Concentrated Animal Feeding Operations (CAFO) regulations in early November, the Learning Center responded with two Webcasts within 6 weeks of the new regulations and implementation of the nutrient management rules presented by the primary EPA authors and other key national representatives.

Newsletter: The Learning Center published a monthly newsletter in 2008 distributed to more than 1500 subscribers.

Outcomes:

eXtension: Between March and September 2008, more than 132,000 web pages have been viewed. About 80% of the visitors arrive via Web search engine referrals. The team has been approached by several research programs including ARS and two CSREES National Research Initiative (NRI) projects to provide access to their science. Developing mutually beneficial models and adding this emerging science to the eXtension Web site is a primary 2009 initiative.

Webcast Seminars: Typically, about 100 individuals participate in the Webcasts live each month and archived Webcasts are viewed about 1,100 times each month. The average individual viewing a Webcast reports that he or she interacts with 198 producers annually. Participants shared that the Learning Center resources have contributed to significant or moderate improvements in a) application of emerging technologies (65%), b) increased value from manure utilization (57%), c) policy development (49%), and d) advice to animal producers (69%).



To access, go to <http://www.eXtension.org>, then click on animal manure management

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Volunteer Water Quality Monitoring

The Volunteer Water Quality Monitoring National Facilitation Project supports volunteer water quality monitoring efforts across the country.

Situation:

Volunteer water quality monitoring programs engage people in watershed stewardship. These programs improve understanding of local water resources, encourage individual and community involvement, and help communities make informed decisions in protection and restoration efforts. We need to support and expand volunteer monitoring in order to understand, protect and restore our waters.

Actions:

We help new programs get started and build capacity of existing ones. We integrate our efforts with other regional and national facilitation projects to expand our collective impact. We have:

- ▶ Located and linked numerous Extension-affiliated volunteer monitoring programs throughout the country
- ▶ Used our flagship Website www.usawaterquality.org/volunteer to provide a virtual hub for our efforts
- ▶ Produced a series of factsheet learning modules to provide one-stop comprehensive information for those just getting started or interested in growing their programs
- ▶ Created the listserv CSREESVolMon@lists.uwex.edu to reach more than 350 members for questions, suggestions and advice, information and news
- ▶ Created a topical online archive for the listserv discussions to retain these information exchanges
- ▶ Conducted workshops at statewide, regional and national conferences. Presentations are archived on the Website
- ▶ Presented an EPA webcast on “Getting Started in Volunteer Monitoring,” reaching more than 200 participants in 34 states and several foreign countries.

Outcomes:

- ▶ Trained national service provider leaders for volunteer water quality monitoring,
- ▶ Enhanced communication among Extension volunteer monitoring programs,
- ▶ Reduced effort to start or expand volunteer monitoring programs,
- ▶ Expanded volunteer opportunities due to enhanced local and state acceptance,
- ▶ Strengthened partnerships within and between CSREES programs and other agencies, and
- ▶ Enhanced recognition of volunteer monitoring efforts across the country.



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Nonpoint Education for Municipal Officials (NEMO)

The National NEMO (Nonpoint Education for Municipal Officials) Network is a confederation of programs around the country that educate local land use decision makers about the relationship of land use to water resource protection.

Situation:

Land use is decided not only by individual property owners, but by community officials sitting on local land use boards and commissions. These officials need information, tools and education to help them do a better job of protecting their water resources as their communities grow.

The 32 programs of the NEMO Network educate local officials about the link between land use and water resource protection. The Network is coordinated by the University of Connecticut Cooperative Extension, which leverages CSREES funding with other support to help develop new NEMO programs and strengthen existing programs through trainings and the exchange of methods, publications and resources.

Actions:

- ▶ Conducted more than 100 “scoping workshops” to assist multi-organizational collaborations in other states adapt NEMO to their natural resource and land use challenges.
- ▶ Provide new programs with a startup kit that includes sample presentations, publications and tips.
- ▶ Provide technical (GIS) and topical (land use planning) trainings for Network members.
- ▶ Created the National NEMO Network Website (<http://nemonet.uconn.edu>), which allows programs to share educational materials, report successes and impacts, and connect with a variety of resources.
- ▶ Issue a semiannual newsletter that profiles member programs, announces upcoming events and conferences, reports on national policy developments, and provides a status update on the network.
- ▶ Manage the National NEMO Network listserv, an interactive forum for NEMO coordinators to share experiences, seek advice and discuss educational approaches.
- ▶ Organize the NEMO University (or NEMO U) National Network conference, an opportunity for Network members to develop new

educational strategies, collaborate, and share methodologies and research. The sixth conference was held in October 2008 in California.

- ▶ Issue a biennial Network Progress Report, encapsulating both Network-wide progress and individual NEMO project impacts.

Outcomes:

- ▶ Creation of 32 NEMO programs in 30 states.
- ▶ Enhanced communication between member projects, resulting in multi-state educational efforts and adapted educational materials and programs.
- ▶ Innovative, new educational products, such as the CT NEMO’s Online Community Resource Inventory (CRI), which is now being adapted in four other states.
- ▶ Expanded educational tools for Network programs, including open space planning education, forest resource protection education, geospatial tools, and low impact development/site design research.
- ▶ Increased awareness of Extension’s leadership role in assisting community decision makers.

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The Environmental Pathogens Information Network (EPI-net)

EPI-net aims to empower stakeholders and policy-makers with the knowledge to make sound decisions about issues associated with the presence of pathogens in the environment.

Situation:

The challenges associated with managing microbial contamination of water resources and the roles that science plays in addressing those challenges are at the forefront of water policy discussions across the country. To maximize the effectiveness of information exchange regarding this issue, a National Facilitation Project titled: The Environmental Pathogens Information Network (EPI-net) is being developed and managed at Purdue University.

Actions:

The creation of EPI-net.org as a keystone web-based organization provides a stable, centralized resource of water-related environmental microbiological contamination information; encourages information sharing; connects a network of stakeholders, regulatory officials, and technical experts; provides a reliable point of reference (methods and data interpretation); and increases our ability to develop a coherent national research agenda and good public policy. We developed a nationally representative advisory structure consisting of members from government, academia, and the private sector. The website hosts a wealth of existing environmental microbiology (e.g., *E. coli*) data and information available from both the refereed literature and state and federal sources in an on-line information repository

to facilitate data sharing to produce a level of common knowledge that lays the foundation for discussions between the science and stakeholder groups. EPI-net also organizes a series of small workshops on topics related to pathogens in the environment and is writing mini reviews on pathogens-related topics as part of the website.

Outcomes:

The project establishes a foundation for collaborative education and outreach efforts to facilitate a widespread understanding behavior of pathogenic microorganisms in the environment.

The workshops have had a great impact on the attendees. In particular our hands-on workshops which are set up as a laboratory class and the attendees participate in actual laboratory exercises have been well received.

Other topics discussed have included: Pathogens in the environment, Emerging pathogens including Cyanobacteria, and Microbial Source Tracking. We had participants from different government agencies (EPA, USGS, State Governments), universities and nonprofit environmental organizations.

Evaluations were great; participants found these workshops useful for their research and professional careers. EPI-net is developing another workshop series for the upcoming year.



On the web at: <http://epi-net.org>

EPI-NET

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Committee for Shared Leadership Members

The Committee for Shared Leadership for Water Quality is an internal working group created to foster development of the National Water Quality Program. Members include the 10 Regional Coordinators from Regional Projects funded through the Section 406 Integrated Water Quality Grants Program, an 1890 and a 1994 Representative, and the CSREES National Program Leader for Water Quality.

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A regional map is shown on page 3.

CSREES National Water Conference

The CSREES National Water Program's annual conference held in Sparks, NV in February, 2008 enabled water resource professionals engaged in research, Extension, and education to share knowledge and resources, identify emerging issues, and strengthen the network of the CSREES National Water Program.

More than 120 technical presentations and 180 posters addressing key water resource issues were presented to about 500 participants attending the conference.

Participants at the National Water Conferences include state Extension water quality coordinators; university scientists, instructors, and Extension educators who focus their efforts on water resource issues; USDA-CSREES staff members who work directly or indirectly with state water quality specialists; EPA staff members involved with water resource issues; and others who work with or for public or private institutions involved with water resource management.

Proceedings for the 2003 - 2008 conferences are posted to <http://www.usawaterquality.org/conferences/>.

The next conferences are scheduled for Feb. 8-12, 2009 in St. Louis, MO and Feb. 21-26, 2010, Hilton Head, SC. The 2010 conference will focus on climate change, water resources, and ecosystem services. Mark your calendars!

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