A network that responds to water resource issues by advancing knowledge through research, education and Extension projects.
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Front cover: Poudre Lake, Rocky Mountain National Park, CO. Photo by Steve Polly.


Written by Water Quality Coordinators and other Section 406 National Water Program Principal Investigators. Developed by Dr. Lisa Kordos and Dr. Mark McFarland, Department of Soil and Crop Sciences, the Texas AgriLife Extension Service, Texas A&M University. Production management by AgriLife Communications; Linda Anderson, editor, and Melissa Smith, designer, the Texas AgriLife Extension Service.

Note: Please submit all errors, omissions, or suggestions to lkordos@ag.tamu.edu.
The goal of the National Institute of Food and Agriculture (NIFA) National Water Program is to protect or improve water resources throughout the United States, particularly in agricultural, rural and urbanizing watersheds.

The NIFA 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 regions, representatives from the 1890 and 1994 Land Grant institutions and the NIFA National Program Leader for Water Quality. This group is called the NIFA Committee for Shared Leadership for Water Quality (CSL-WQ).

The NIFA National Water Program Web site (http://www.usawaterquality.org/) enhances communication and coordination within the NIFA/Land Grant network and with its national and regional partners. The Web site 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 NIFA, are working with citizens, communities and partner agencies to address critical water resource problems across the United States.

For more information about the NIFA National Water Program, please contact the National Program Leader, Dr. Michael P. O’Neill at moneill@nifa.usda.gov, 202-205-5952; Dewell Paez Delgado, Program Specialist, at dpaez@nifa.usda.gov, 202-401-4141; or Brian Gates, Program Specialist, at bgates@nifa.usda.gov, 202-401-6020.
In 2008-2009, the NIFA improved water resources through four types of projects addressing eight water resource themes.

The first four themes are highlighted in this Outcome Report:

- **Animal Waste Management**
- **Drinking Water and Human Health**
- **Pollution Assessment and Prevention**
- **Water Conservation and Agricultural Water Management**
- **Nutrient and Pesticide Management**
- **Watershed Restoration**
- **Watershed 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 are supported by the Agricultural Research, Extension, and Education Reform Act (AREERA) Section 406 competitive grants:

**Integrated Research, Education and Extension Projects** coordinate 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 concern.

**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 knowledge and management which enhance and protect the nation’s water resources.

**National Water Resources Projects** develop and initiate nationally coordinated programs that contribute to an increase in public understanding and involvement in community decision-making, 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.
Regional Efforts – Examples from:
- Heartland
- Mid-Atlantic

Overview:
Pathogens, nutrients, and oxygen-depleting substances associated with livestock and poultry manure are three of the top five surface water contaminants, according to the Environmental Protection Agency. State and local regulatory agencies have expanded their authority to include these issues. Producers, environmental groups, commodity organizations, and decision makers need accurate information about animal waste management. The NIFA National Water Program coordinates state and regional animal manure management efforts to reduce the effects of animal production on water resources.

According to U.S. Environmental Protection Agency, the Heartland Region states of Iowa, Kansas, Missouri, and Nebraska contain more than 20 percent of all Concentrated Animal Feeding Operations (CAFOs) and 56 percent of beef CAFOs in the nation. Iowa alone has the most open feedlots of any state. Since 2004 a priority of the Animal Manure Management (AMM) issue team of the Heartland Regional Water Coordination Initiative has been a nutrient management plan (NMP) that will allow livestock operations to comply with conservation and regulatory mandates for environmental manure management while remaining flexible and profitable. Regional interagency working groups created by AMM are having an impact in Heartland states by taking advantage of coordination opportunities with common livestock and poultry enterprises across state lines. These efforts have led to educational programs and material development to implement the recently revised CAFO and other manure management regulations within EPA and Natural Resources Conservation Service (NRCS). Heartland’s impact on NMP regulation has been an evolutionary process over most of the decade. Joint interagency/university discussions in Nebraska first recognized the practical importance of...
focusing the permit more on the producer’s decision process in determining application rates than on prescribing specific rates. In 2007, a Heartland multi-agency NMP working group designed a “narrative” approach placing methodologies and protocols in a strategic and tactical (annual) outline. This format is intended to be useful for standard regulatory purposes and also allow flexibility for a farm’s operational management. A Heartland written response to the CAFO proposal during the EPA 2006 comment period triggered the narrative approach to be incorporated as an NMP option in the final revised CAFO rule. In 2008, Heartland published a model narrative NPDES Nutrient Plan online. In 2009, the Heartland working group, through the Region 7 CAFO specialist, was asked to provide decision makers in the national CAFO program a “real” narrative example using data from case study farms. The case study and an accompanying white paper, which were presented by the Region 7 CAFO specialist to national EPA in September 2009, demonstrate a General Permit for a hog farm that includes the terms of an NMP drawn from the Missouri Nutrient Management Technical Standard. This study has been drafted with regionally-developed Manure Management Planning software. EPA acceptance of the case study essentially documents national approval for this entire planning process, as envisioned and brought forward by Heartland partners.

The team continues to provide training, information exchange, and networking within the region. In 2009, for the first time the AMM team’s annual workshop/review of NMP issues targeted legislators. Twenty-five state legislators participated in a July forum to discuss current and future livestock environmental issues that require action by state regulatory agencies, state legislatures, or both. As a result, leaders of the AMM team were invited to attend the Midwest Legislators Conference to share information from the Heartland event. In 2009, the Heartland evaluation specialist studied the impact of Heartland AMM and Nutrient Management efforts from 2004-2008. Stakeholders’ strongly voiced support for continued work on Animal Manure Management issues was one notable outcome.

The Mid-Atlantic Water Program has been working to reduce the nutrient loading of animal wastes through both feed and waste management. Leading animal nutrition specialists in the region, in partnership with Natural Resources Conservation Service (NRCS) and the American Registry of Animal Scientists, have developed a feed management certification for nutritionists and planners that meets NRCS Feed Management Standard 592. With few areas working with the dairy industry and NRCS on this topic, the Mid-Atlantic provides a potential standard for how other states can certify nutritionists in feed management. As of October 1, 2009, 71 percent of the 76 certified feed management specialists are from Region 3. Additional courses have been developed to further the
education of certified planners, including a review of how nutrients move through the soils and the economics of feed management. Monthly newsletters and other resources are available at http://www.das.psu.edu/dairy-alliance/resources/feed-management-planners.

Other members of the Mid-Atlantic Water Program have partnered with CLEANeast to assess livestock and poultry operations in sensitive watersheds across Pennsylvania, Maryland, and Virginia through an Environmental Management Systems (EMS) model. Four farms have volunteered to participate in this pilot assessment. The MAWP and CLEANeast’s recruited service providers will evaluate and monitor the farms to demonstrate how an EMS can reduce pollution while increasing operating efficiency, achieving public acceptance without regulatory oversight, and assuring residents that the wastes are handled in an environmentally sound manner.

Extension Education Project

Large Animals on Small Acreages: 4-H Extension Education Program Protects Drinking Water, Families and Livestock

Throughout Rhode Island and New England, small acreage livestock owners often “slip through the cracks” when it comes to receiving education and assistance on Best Management Practices (BMPs). These livestock owners often are ineligible for traditional agricultural assistance programs, and their goals and resources may be different from those of large scale livestock operations. Properties usually are small residential lots that are close to neighbors and rely on private drinking water wells—factors that can challenge manure management and BMPs.

The University of Rhode Island Cooperative Extension (URI CE) has developed and conducted a Rhode Island 4-H volunteer training program for this target audience. A needs assessment identified barriers and incentives for adopting BMPs and served as a basis for developing the program. A fact sheet and self-assessment series is updated based on program evaluation. Visit the program Web site, www.uri.edu/ce/healthylandscapes, for more information.

Education and Outreach as of September 2009

- Fifteen 4-H volunteers participated in the training program and have conducted more than 46 hours of education and outreach.

- More than 150 freshman animal and veterinary science students and Northern Rhode Island Conservation District (NRICD) staff received similar training.

- Direct outreach was conducted with 270 4-H families and 400 livestock owners through a statewide livestock inventory program (NRICD). Newsletter articles with two Rhode Island livestock associations reached more than 150 members.

- Direct education was conducted with 50 4-H members who attended 14 events with poster displays.

Outcomes as of September 2009

- One hundred percent of adult trained volunteers and program participants and 89-93 percent of teens learned about pollution and health risks associated with livestock and BMPs.

- One hundred percent of trained volunteers and program participants are considering adopting at least one BMP.

- A study of Web site usage indicates 54 percent of visits to the home page and 34 percent to the fact sheet page are from Rhode Island with about 25 percent occurring through direct connection. Spikes in this activity occurred during key periods of public outreach.

Trained 4-H volunteers conduct outreach and education through 4-H clinics, fairs, and other livestock association events.
Regional Efforts – Examples from:

- Northern Plains and Mountains
- Southwest States and Pacific Islands
- Mid-Atlantic
- Northeast States and Caribbean Islands

Overview:
Americans’ health and livelihoods depend on the availability of a safe drinking water supply. To avoid harmful effects to this water supply caused by land use practices, the public—both rural and urban—must be provided with information about both on-site and off-site consequences. The NIFA National Water Program supports regional planning, collaboration, and information-sharing to improve drinking water and environmental management by providing landowners with the information needed to protect water resources.

The Northern Plains and Mountains (NPM) Regional Water Program has developed and implemented a multi-state, multi-faceted toolbox of resources to help rural water users assess the quality of their private drinking water supplies, make appropriate uses of water supplies, and adopt practices that will minimize water quality impairment.

The Well Educated program guides private well owners through the process of collecting a water sample, submitting the sample to a laboratory, and interpreting test results. The program provides affordable, objective testing services while providing useful water quality data. Parts of the program have been adapted in Montana, Wyoming, Colorado, and North Dakota with more than 2,500 private well owners participating in the program this past year. Recently, Colorado partners piloted the program with the San Luis Valley Ecosystem Council and provided 400 program participants with well water testing and related take-home resources. This effort was funded by the NPM Regional Water Program, U.S. Environmental Protection Agency, and Colorado Department of Agriculture.

Adam Sigler, Montana State University, demonstrating shock chlorination for “Taking Care of your Ground Water” DVD. Photo courtesy of: Suzanna Carrithers
“Taking Care of Your Ground Water” is an educational DVD focused on private well and septic system function, operation, and maintenance. The product was a collaborative effort with all regional partners and numerous professionals reviewing the material during development. About 1,900 copies were distributed in 2009, with recipients including Well Educated program participants, tribal education programs, realtors, and Extension personnel.

An on-line water quality interpretation tool allows users to obtain information on drinking, livestock, and irrigation waters, along with recommendations for water treatment practices. During the first four months of operation, more than 1,100 pages of text were viewed, with average visit time exceeding six minutes. To date, information on livestock water quality is the most frequently sought-after.

All of these programs can be accessed at: www.region8water.org

The Southwest States and Pacific Islands Regional Water Program supports research of leptospirosis, a bacterial disease common in Hawai‘i and other Pacific islands. This zoonotic disease can be transmitted via several pathways, but water contaminated with the urine of infected domestic and wild animals is a major concern. Because this human health issue is important in a significant part of the region and across the world, preliminary joint research was initiated at the universities of Hawai‘i and Nevada, in cooperation with the Northern Marianas College. The researchers hope to develop a method to sample environmental waters and detect specific pathogenic serovars of Leptospira. Additional studies in Hawai‘i and Nevada focus on identifying composting conditions (temperature and pH) that result in a significant reduction of viable Leptospira spirochetes.

Leptospira are very difficult to detect in water, and efforts to minimize the risk of contracting leptospirosis from contaminated surface waters are hindered by the lack of information about occurrence of pathogenic spirochetes. Without reliable methods of detection, efforts to control potential sources of these pathogens might not have a beneficial effect on water quality. While research led by the University of Nevada has developed promising filtering protocols, further study is needed to optimize sensitivity of polymerase chain reaction (PCR) or other detection methods.

Initial laboratory results on composting specifications have identified pH and temperature ranges lethal to common variants of Leptospira. Field research is now under way throughout the Pacific islands to confirm the compost temperature and pH conditions in the field and to advise producers on optimal management. Progress has been reported to the Natural Resources Conservation Service Pacific Basin office, as they consider composting standards to reduce the risk of off-site transport of spirochetes from infected pigs.

The Mid-Atlantic Water Program (MAWP) has been working to educate the public about drinking water by targeting two main audiences: well owners and schools. Private water systems supply drinking water to more than 2 million homes in Region 3. Well owners are responsible...
for maintaining their drinking water quality, but few receive instructions on how to do so. To teach residents how to maintain their water quality, the MAWP offers the Master Well Owner Network (MWON), a free educational program and volunteer network based on a train-the-trainer model. Follow-up evaluations have shown that 76 percent of well owners educated by a Master Well Owner volunteer have taken action to better manage their water supplies. Members across the region are building on MWON’s success by offering water clinics that educate well owners but do not require them to volunteer their time with future outreach.

To further educate the public on the need to protect drinking water, members of the MAWP have devised a curriculum for middle- and high school teachers and their classes. MAWP members developed the curriculum to meet Standard of Learning requirements for science and social studies courses. By working with administrations and teachers of targeted schools in Virginia, Washington, D.C., and Maryland, this program will increase teacher and student understanding about water resource management, especially the source, treatment, and protection of drinking water. This effort builds on the recent success of a pilot 4-H program for middle school students in Virginia, as well as widely available educational materials produced through National Project WET, Healthy Water/Healthy People, Project Underground, Home Assist, and many others.

The Northeast States and Caribbean Islands Regional Water Program integrates research, education, and Extension in the area of private drinking water well protection and management throughout the region.

The third biennial Northeast Private Well Water Symposium was held November 16-17, 2009, in Portland, ME. Attending were more than 100 private well protection professionals from across the country who wished to learn current research, programs, and educational approaches that reduce risks associated with use of private wells. This event is a successful partnership between the regional project, the U.S. Environmental Protection Agency, the U.S. Geological Survey, the American Groundwater Trust, the Water Systems Council, state drinking water agencies, and local groundwater associations. The 2009 event featured keynote addresses from USGS and the Maine Geological Survey, workshops on risk communication and social marketing, a poster session, exhibits, and 10 concurrent sessions addressing: Land Use Impacts, Public Health Issues, Treatment Issues, Legal and Regulatory Aspects, and Naturally Occurring Contaminants.

Regional and interregional communication, cooperation, collaboration, and joint programming activities in research, education, and Extension resulted from this event. An assessment conducted with participants of the 2005 and 2007 New England Private Well Water Symposiums concluded that the event was achieving a number of its logic model outcomes. Among them are:

- Using information and approaches to inform the process of developing state policies for private well testing
- Enhancing collaboration with partners and providing new opportunities to address water quality and watershed protection regionally
- Developing new content and communicating water quality and safety techniques to private well owners
- Increasing networking opportunities that are resulting in collaborative grant proposals and projects for both research and Extension projects

Situation:
Approximately 43 million people, particularly in rural areas of the United States, consume drinking water from private wells exempt from the Safe Drinking Water Act (SDWA). In several aquifer systems throughout the country, levels of naturally occurring contaminants such as arsenic, radium, and radon exceed the Environmental Protection Agency’s Maximum Contaminant Level (MCL). This poses health risks for anyone who consumes water directly from private wells.

Actions:
This interdisciplinary project sought to establish reliable scientific tools for understanding how natural contaminants affect groundwater in North Carolina; to assess technological solutions for adequate remediation; to evaluate information disclosure programs on residents' behavior and willingness-to-pay for improvements in drinking water quality; and to investigate policy options for addressing private well water contamination. The three-year research project focused on arsenic, radium, and radon levels in 250 private homes in Wake, Orange, and Union counties in North Carolina. Wells were sampled and tested and well owners were interviewed about their drinking water consumption habits, use of treatment technologies, understanding of the health hazards of these three contaminants as well as their willingness-to-pay for water quality improvements.

Outcomes:
The research showed that scientifically evaluating the origin of naturally occurring contaminants in groundwater is essential for monitoring or predicting “hot spots” with high levels of contaminants. The integration of physical and social sciences is critical for adequate evaluation of the problem. In spite of the efforts of some state agencies to provide information on water quality, very often they do little to remedy the problem. Because private wells are exempt from the SDWA and not monitored by federal or state agencies, the problem is left to the individual well owners. Yet most homeowners are not aware of the levels of contaminants in their well water, nor are they prepared to invest in remediation even when they are provided with that information and possible consequences. The study provides clear indications of the long-term health risks to anyone who consumes well waters with high levels of naturally occurring contaminants. The policy analysis section thus concluded, after taking into account the other parts of the project, that government action is necessary to protect that population outside of the protections of the SDWA.

More details on the project and private wells issues in North Carolina are available at the project Web site: http://dukewater.cee.duke.edu/.

Contact:
Professor Avner Vengosh
Division of Earth and Ocean Sciences
Nicholas School of the Environment
Box 90227, Duke University
Durham, NC 27708
919-681-8050
vengosh@duke.edu
http://www.nicholas.duke.edu/people/faculty/vengosh.html
Pollution Assessment and Prevention

Regional Efforts – Examples from:
- Great Lakes
- Pacific Northwest
- Southern
- Heartland
- Northeast States and Caribbean Islands

Overview:
Water is polluted when contaminants wash into streams, lakes, and wetlands, or infiltrate groundwater. Nonpoint source pollution—from water running off paved surfaces in urban areas and agricultural operations—is the primary source of water quality problems nationwide. To help protect and restore water quality, the NIFA National Water Program facilitates Extension, research, and education projects that enhance voluntary water pollution assessment and prevention programs.

Bacterial contamination of surface waters is a common public health concern, but laboratory analyses can be expensive. Because such monitoring helps ensure safe recreational opportunities and effective watershed management, the Great Lakes Regional Water Program focused on volunteers using “home test kits” to evaluate local streams using *E. coli* as an indicator of stream health. Six states—Iowa, Indiana, Michigan, Minnesota, Ohio, and Wisconsin—participated in the study, which was conducted by university Extension, state regulatory agencies, and volunteers.

A training manual was produced and used by the 151 volunteers in 35 training sessions during the three-year study. Since then, project staff has hosted *E. coli* monitoring workshops at state, regional, and national conferences, and the monitoring has been adopted in at least two other states. An on-line database that holds all project research data is now available for other states’ use.

Reliability results from this three-year investigation will provide crucial information for state agencies considering using volunteer monitoring data in watershed planning and perhaps Total Maximum Daily Loads development.

Final conclusions included:
- Of six test kits used in this study, four were found to be more reliable than the other two. The following two researchers collect a water sample for *E. coli* from the Red Cedar River, Michigan State University.
conclusions pertain to Coliscan Easygel® incubated, 3M™ Petrifilm™, IDEXX Colisure®, and IDEXX Colilert®.

- The test kit results compared fairly well with certified lab analysis. Regression analyses yielded $R^2$ values ranging from $.51$ to $.60$ for all samples from all states combined.

- 3M™ Petrifilm™ and the IDEXX methods were essentially equal in performance followed closely by Coliscan Easygel®, when data from states were combined, based on regression and analysis of covariance. Two out of three volunteers preferred 3M™ Petrifilm™ over Coliscan Easygel®.

- The test kits are good tools for screening and for justifying additional monitoring.

On September 15, 2009, more than 1,000 people at more than 100 Pacific Northwest sites participated in a video workshop called “Stormwater Management: One Backyard at a Time.” This was the seventh in a series of video workshops designed and delivered by the Pacific Northwest Regional Water Resources Team; participation in the first workshop in 2003 was 300. The workshop was designed to help prevent pollution in developing areas. This workshop included video segments filmed in Ketchum and Sun Valley, ID; Bend, OR; and Whidbey Island, WA. These segments included interviews with six home/business owners who had chosen to prevent pollution by using Low Impact Development (LID) or Leader in Energy and Efficient Design (LEED) concepts to manage stormwater.

Three regionally filmed video segments, a panel discussion led by experts from Washington State University and Oregon State University, and an open forum call-in session were included in the workshop. This two-and-a-half-hour video workshop is available online at: http://eces.wsu.edu/video/stream.html

City and county planners, engineers, students, members of watershed groups, county/city/federal co-hosts, Extension personnel, members and staff of soil and water conservation districts (SWCDs), Master Gardeners, policy makers, and other interested people attended the workshop. Viewers came from Alaska, Idaho, Oregon, and Washington. This workshop provided environmental regulators and users of natural resources with information on local pollution prevention strategies. Several participants attended a brown-bag lunch and open discussion with local experts as moderators.

The panel discussion and open forum in the last hour of the workshop was packed with phoned-in and e-mailed questions from around and beyond the Pacific Northwest. Because of the number of questions submitted, the panel was not able to respond to all questions on the air.

Attendees completed several hundred evaluations. In general, the reviews...
were very good to excellent. In addition, the increasing number of attendees at this annual regional video conference series suggests that the regional program is successfully meeting an educational need for a high priority water issue.

Extension faculty in the **Southern Regional Water Program** conducted a three-day regional training workshop in November 2008 for 33 Extension agents from six states—Alabama, Georgia, Kentucky, Florida, Tennessee, and North Carolina. Training objectives were to: (1) increase understanding of land use impacts on water quality; (2) improve participants’ abilities to address water quality concerns related to urbanization; (3) increase knowledge of how to implement on-the-ground projects that address water quality impairment related to land use change/urbanization; (4) enhance communication skills related to watershed management, watershed planning, and watershed restoration; and (5) enhance partnerships and awareness of funding opportunities. The workshop included presentations
by several faculty with expertise in watershed management, field site tours, and interactive discussions on how to effectively protect water resources in developing watersheds.

Pre-training assessments and post-training evaluations were conducted to determine change in knowledge and involvement/behavior intention. Results indicate a significant amount of knowledge was gained in watershed hydrology and geography, land use effect on water quality/quality, land use planning, GIS, low impact development, stream restoration, stormwater BMPs, erosion and sediment control, watershed management plan development, and watershed issues at other Extension agencies. Furthermore, data illustrated an increase in agents’ intentions to change behavior in the areas of incorporating land use planning tools into watershed projects, applying stream restoration principles and stormwater best management practices, seeking funding to assist in implementing water quality projects, and engaging in regional communication on watershed issues and Extension’s roles. Follow-up communications with the workshop participants indicate that agents are using this training to more effectively provide education that helps improve and protect water quality.

In the **Heartland Regional Water Coordination Initiative**, the Human Dimensions (HD) issue team is responsible for increasing the use of social science with the work of the technical priority issue teams. The Human Dimensions effort, led by Dr. Lois Wright Morton, Iowa State University Department of Sociology, builds the research base for understanding citizen involvement, including how individuals’ beliefs and social identities support environmental management goals. While strong science is behind most Extension water programming, social scientists are still researching effective groups and adoption behavior. Since 2004, Heartland has conducted sociological surveys, key informant interviews, and focus groups in watersheds throughout the region. Their results

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**Bioassessment, South Carolina Coastal Watershed Academy**

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*Upper North Fork Maquoketa watershed council meeting.*
are used both for research and in planning responses to the needs of stakeholders, from community watershed groups to agency programs. Random response surveys have been conducted in 150 HUC 12 watersheds in Iowa and Missouri. Heartland HD research has involved seven graduate students at three institutions and produced master’s theses, doctoral dissertations, refereed publications, and other research reports. Support for survey and focus group research in the region has been provided by U.S. Environmental Protection Agency Region 7, the Iowa Department of Agriculture and Land Stewardship and Department of Natural Resources, and Extension Education and CEAP projects of the U.S. Department of Agriculture National Institute of Food and Agriculture’s National Integrated Water Program.

In 2005, Heartland conducted a regional survey of residents’ attitudes and practices around water quality. This survey, in collaboration with Dr. Robert Mahler, University of Idaho, was sponsored by the NIFA National Water Program. Heartland published five technical reports—one for each state and a regional summary. The template developed for these reports, which has been adopted by states in the Southern Region, is the basis for a nationally consistent presentation of results. Dr. Morton also is conducting a national analysis of the regional surveys. Preliminary results were reported in a poster at the 2009 National Water Conference, “Water Quality Perception in the U.S.: Similarities and Differences Across States” by Zhihua Hu and Lois Wright Morton. Final results will be published in Ms. Hu’s doctoral dissertation and submitted to professional journals.

Heartland Human Dimensions is building a national network of social scientists working in water issues. A principal result is a multi-authored book, The Citizen Effect: Pathways for Getting to Better Water Quality Outcomes, which will be published by Penn State Press. The book’s 19 chapters include contributions by social scientists from 10 universities in eight states. In May 2009, the authors and others attended a Social Science Roundtable funded by the Heartland Nutrient Management and Human Dimensions teams. Fourteen scientists with social, political, and economic research on citizen participation in water issues outlined their current findings and discussed collaborative research. Six researchers attending the roundtable were from the Heartland Region but had not previously worked with Heartland teams. Others represented universities in the Great Lakes Region, the Mid-Atlantic Region, and the Northeast States Region.

Post-roundtable feedback produced comments such as: “An impressive group of like-minded researchers,” “A great time to network,” and “The thing that was ‘most useful’ I would say (was) getting connected to other social scientists in a positive community that is seeking to advance knowledge in a non-competitive way.” As a result, a multi-state research technical committee, “Causes and Consequences of Individual and Collective Actions to Protect Water Resources,” NCDC 221, has been proposed and approved.

For the Northeast States and Caribbean Islands Regional Water Program, major advances in design and management of conventional and alternative treatment technologies overcome many problems associated with onsite wastewater treatment. However, proper selection, installation, use, and maintenance of these technologies require new levels of sophistication among homeowners, designers, installers, service providers, and regulatory and public health officials. The program’s New England Onsite Wastewater Training Program Focus Area became the key regional center that provides this training and expertise. Working with a national network of Land/Sea Grant institutions in the Consortium of Institutes.
for Decentralized Wastewater Treatment (CIDWT), it delivers a state of the science / engineering portfolio of standardized peer reviewed training materials. The program trains stakeholders and evaluates appropriate alternative and innovative onsite wastewater systems for conditions throughout the region.

NEOWTC program staff, working with fellow CIDWT project writing team members, completed work on the Installation of Onsite Wastewater Treatment Systems training manual. The authors conducted a train-the-trainer event held in August 2009 in St. Louis, MO. After completing this training, 26 individuals were qualified to teach the curriculum.

The NEOWTC is working with partners at the University of the Virgin Islands, the U.S. Virgin Island Department of Planning and Natural Resources, and U.S. Environmental Protection Agency to develop a four-year onsite wastewater training plan for the islands that will help support regulatory licensing programs. The program is designed to develop the capacity within the islands to manage onsite wastewater systems. This program will focus on conventional wastewater treatment system inspections, training for system designers and installers of these systems, and training to conduct proper system operation and maintenance. Train-the-trainer events held in conjunction with each training class will help build capacity to conduct future classes within the U.S. Virgin Islands and Puerto Rico.

In the last year, the Center has conducted more than 30 regional and national training programs for more than 800 professionals involved in management, design, and installation of conventional and alternative onsite wastewater treatment systems. Training programs have been held in partnership with EPA, state departments of environmental protection, the Green Valley Institute, the Missouri Small Flows Organization, the Yankee Onsite Wastewater Association, lake associations, the National Estuarine Research Reserve Programs, state and national environmental health associations, and the National Onsite Wastewater Recycling Association.

Local land use officials learn how advanced treatment septic systems work and their proper maintenance on educational field tours.
Regional Efforts – Examples from:

- Northern Plains and Mountains
- Great Lakes
- Pacific Northwest
- Southwest States and Pacific Islands
- Southern

Overview:
The expanding population is triggering a growing demand for safe, reliable sources of water. Drought and the water needs of agriculture and rural communities now have caused a national crisis. In many areas, water supplies necessary for irrigated agriculture are being allocated to expanding urban locations. The NIFA National Water Program promotes efficient water use and adequate water supplies to meet the needs of both rural and urban areas.

The World Wide Web has become the medium of choice for distributing information in much of the agricultural industry and the natural resource management profession. Because of this, the Northern Plains and Mountains (NPM) Regional Water Program has developed a number of Web-based tools available to several audiences.

A nationally recognized “Agricultural Water Conservation Clearinghouse” offers instant agricultural water conservation information throughout the NPM Region and the nation. By compiling and assembling the latest information on agricultural water conservation, the Clearinghouse increases access to research-based information, builds relationships between land-grant universities and action agencies, provides technical expertise, and offers detailed information on management, policies, and laws.

The Clearinghouse’s library contains contributions from regional partners, Extension specialists, research scientists, and educators, and provides a review of water conservation literature such as books, reports, and other resources. A visit to the Clearinghouse at www.agwaterconservation.colostate.edu will provide access to a wide range of information on water conservation and management.

Senninger spray head on a center pivot irrigation system.
journal articles, and conference proceedings. Additional resources include Web sites for national research centers, an agricultural water conservation glossary, frequently asked questions, manuals and guides, global agricultural water news, and an interactive blog. To date, more than 700 entries have been added to the library and more than 3,700 visitors—3,400 for the first time—have made use of the Web site. For more information, visit www.agwaterconservation.colostate.edu.

In addition, the NPM Regional Water Program partners are developing and publishing a six-part on-line, self-study professional Certified Crop Advisor recertification and proficiency program, focused primarily on agricultural water management and conservation. The modules are being developed through collaboration with research scientists, university faculty from throughout the region, and from neighboring regions in cooperation with the International Certified Crop Advisors Program.

To date, 16 Certified Crop Advisors have completed the first two modules. Further information on this program can be accessed through the NPM Regional Web site at www.region8water.org.

Since its inception in 2006, the Midwest Cover Crops Council (MCCC) has strived to facilitate the widespread adoption of cover crops throughout the Midwest. The MCCC is a diverse group from academia, production agriculture, NGOs, commodity interests and federal and state agencies collaborating to address soil, water, air and agricultural quality concerns in the Great Lakes and Mississippi river basins (including Indiana, Michigan, Ohio, Ontario, Illinois, Wisconsin, Minnesota, Iowa and North Dakota). Cover crops are an effective tool to reduce soil erosion and increase nutrient recycling on farmlands, thereby decreasing soil and nutrient loads entering lakes and waterways. Cover crops have numerous other benefits including soil quality improvements, pest and fertility management, water availability and wildlife habitat. While the benefits of cover crops are well documented, their adoption has been hampered by a lack of regional coordination and information.

Support from the Great Lakes Regional Water Program has been leveraged over six to one from other sources. Through a series of annual workshops/meetings, the MCCC has identified strategic priorities for policy, communications, research, education/outreach and fundraising. The most recent meeting included day one of researcher/farmer presentations, farmer panels and posters attended by 70 participants, including 40 farmers. The MCCC working group met day two to review research priorities and
funding opportunities. A Web site (www.mccc.msu.edu) has been established to share regional, state and provincial cover crop information including events, publications and technical information. The MCCC Web site visits have increased to 300 per month and the listserv subscribers to 130. A prototype Cover Crop Decision Tool has been developed to help farmers make cover crop species and timing selections based on their location, crop rotation, field information and performance goals. This tool is currently being refined and validated for Indiana and Ohio with input from researchers, NRCS personnel, crop advisors and farmers.

The Pacific Northwest is often thought of as a water-rich region. However, more than half the area of Idaho, Oregon, and Washington receives less than 25 inches of annual rainfall. In the last 100 years, the use of irrigation technology has transformed much of this arid landscape into highly productive farmland. Consequently, today more than 6 million irrigated acres are being farmed in the arid Inland Pacific Northwest. In this dry area farmers are highly dependent on the annual mountain snowpack to supply adequate amounts of irrigation water. With increasing demands for the region’s limited water resources, increasing irrigation efficiency in this region is vital.

A regional Web site, Irrigation in the Pacific Northwest, was developed by Extension irrigation specialists from the land-grant institutions in Washington, Idaho, and Oregon under the leadership of Dr. Troy Peters, an irrigation engineer and Extension irrigation specialist at Washington State University. Dr. Howard Neibling, an irrigation specialist at the University of Idaho, and Dr. Marshall English, an irrigation specialist at Oregon State University, were on the Web site’s development team. The Web site is dedicated to improving the understanding of irrigation planning and management, with an emphasis on water use efficiency. The Web site address is: http://irrigation.wsu.edu.

Web site highlights include: (1) sprinkler, chemigation, general and water measurement calculators; (2) irrigation scheduling tools and aids; (3) sprinkler and drip irrigation equipment; and (4) irrigation strategies for regionally important crops. Sprinkler irrigation management is emphasized because 80 percent of the region’s agricultural land is irrigated with sprinklers. Based on clientele use, the Web site has received more than 150,000 hits from 16,000 unique users in the last 12 months.

Reclaimed wastewater can provide both a resource and an economic alternative to unnecessary use of freshwater supplies. Although no federal regulations directly govern water reuse, many states and municipalities have developed regulations and guidelines pertaining to reclaimed water quality. The Southwest States and Pacific Islands Regional Water Program supported development of a technical bulletin to summarize regulations in Arizona, California, and Nevada, and to address concerns related to reclaimed water used in agriculture and landscapes. The bulletin is available online through the University of California Division of Agricultural and Natural Resources at http://anrcatalog.ucdavis.edu/Items/8357.aspx.

Aerial view of irrigated farmland in the arid Pacific Northwest.

Effluent collection bottles and outlet tubings from the lysimeters in a water reuse study.

Experimental site at the University of California, Riverside Turf Research Facility used to conduct leaching studies in turfgrass systems.
In addition to the bulletin, the regional project helped develop an integrated model to evaluate the effects of contaminants on the environment and agricultural production. The work conducted at the University of California, Riverside resulted in a model that will be useful anywhere reclaimed water is used for irrigation. The model allows simulation of water, salt, and nitrogen movement in soil and their effect on relative crop yield, which is influenced by water pressure, salinity, and nitrogen stresses. Model outputs include relative crop yield, mass balance tables about water flow, nitrogen and selected elements, the temporal as well as profile distributions of soil water, salts, and nitrogen. The model will be expanded to simulate the fate and transport of other elements in soil and water. It can be used as a planning tool to assess the risks related to reclaimed water application. Specifically, the model will help in selecting appropriate management practices to sustain crop production and environmental quality in soils irrigated with reclaimed wastewater.

The Southern Regional Water Program has been active in developing the knowledge base of Cooperative Extension Master Gardeners. These volunteers answer residents’ questions on water quality and gardening, and help them apply what they learn in their homes, neighborhoods, and communities.

A three-part training for Master Gardener Volunteers covers waterSmartSM Landscape design, transportation and treatment of landscape pollution, the role of impervious surfaces, irrigation audits, rain gardens and rain harvesting. Participants learned to identify healthy streams via visual, chemical, physical, and biological assessment.

Training was hosted by local county agents in four states—Alabama, Georgia, Tennessee, and South Carolina. The program was team-taught using Internet information and hands-on activities coordinated by local agents to complement the online presentations. Individual Master Gardener groups designed rain gardens and waterSmartSM landscape retrofits, did irrigation audits, made rain barrels, assessed stream health, and conducted other activities.

A total of 293 Master Gardener volunteers were trained in the four states. Pre- and post-training exams documented that the groups were more knowledgeable about the subject matter after training, increasing evaluation scores by 14 percent to 22 percent. The web-based training saved an estimated $6,000 in travel costs.

Participating Master Gardener volunteers estimated they worked with a total 16,135 home gardeners each year, and that 12,021 of these individuals would benefit from this training. The training also affected the volunteers, with 53 percent saying they had changed an aspect of their home landscapes as a result of their participation in the training, 91 percent planning to make changes as a result of the training, 84 percent reported sharing what they learned with others, and 74 percent changing their recommendations, considerations, or activities.

Master Gardeners study the impact of their landscape on water quality.

Master Gardeners learn about stream health.
Facilitating the Development of Stakeholder-driven Performance-based Policies for Agricultural Nonpoint Source Pollution Control

This project is focused on the use of performance-based incentives, where the payments are triggered by a designated environmental outcome and not associated with any specific practice. This gives farmers the flexibility and incentive to operate their farms in the most cost-effective and appropriate way.

**Situation:**
Agriculture remains the leading contributor of nonpoint source (NPS) pollution to ground and surface waters in the United States. Current programs for controlling NPS pollution are focused on cost-sharing best management practices and compensation for farmers who idle selected tracts of land. These programs, while important and valuable, often do not (1) fully utilize farmers’ knowledge of their land and operations, (2) encourage farmers to take the most cost-effective actions, or (3) inspire new and innovative solutions to reduce NPS pollution from their farming operations.

**Actions:**
- Distributed more than 1,300 project brochures explaining the concept of performance-based incentives.
- Created a step-by-step guide titled “Developing Performance-based Incentives for Agricultural Pollution Control: Incorporating Recommendations into Your Watershed Plan” and distributed it to stakeholders throughout the United States.
- Initiated an electronic newsletter titled “PEPA e-News” to update and inform interested stakeholders. Distributed it to more than 600 people on an on-going basis.
- Hosted a series of symposia on identifying performance measures for agricultural pollution control.

**Impacts/Outcomes:**
- Outreach presentations have reached more than 500 people across the United States.
- An Extension training program was launched in Florida on the use of performance-based incentives.
- A multi-disciplinary team has formed to publish a white paper on identifying performance measures for agricultural pollution control.
- Continued to facilitate development of recommendations with groups in Missouri, Maryland, Oregon, Florida, and other states.
- Published a feature article in the May/June issue of the Journal of Soil and Water Conservation.

**Contact:**
Jonathan Winsten, PhD
60 University Terrace
Burlington, VT 05401
802-343-3037
jwinsten@winrock.org
www.flexincentives.com
Moving the Extension Volunteer Monitoring Network to the Next Level

Situation:
Volunteer water quality monitoring 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 collective impact. We also:

- Located and linked numerous Extension-affiliated volunteer monitoring programs throughout the country, now including Master Naturalist programs
- Use our Web site www.usawaterquality.org/volunteer to provide a virtual hub for our efforts
- Produced a series of on-line factsheets, with links to more than 300 external Web sites, to provide comprehensive program support
- Used our listserv CSREESVolMon@lists.uwex.edu to exchange questions, suggestions and advice, information, and news with more than 375 members
- Increased our topical online archive for listserv discussions to more than 80 topics, to retain these informative exchanges

- Conducted workshops at statewide, regional, and national venues, training service provider leaders for volunteer water quality monitoring
- Initiated efforts to reach out to Native American tribal colleges and universities to learn of their interest and capacity for volunteer monitoring

Outcomes:

- Improved communication, information sharing, and coordination among Extension volunteer monitoring programs, researchers, and partners within states, across regions, and nationally
- Established stronger and more strategic partnerships within and external to Extension
- Expanded volunteer opportunities due to enhanced local and state acceptance
- Strengthened partnerships within and between NIFA programs and other agencies
- Reduced efforts to start or expand volunteer monitoring programs
- Enhanced recognition of volunteer monitoring efforts across the country
- Gained recognition as a principal resource for volunteer monitoring

Contact: Linda Green
University of Rhode Island
401-874-2905
lgreen@uri.edu
www.usawaterquality.org/volunteer

Kris Stepenuck checks her net for stream critters. Photo by Elizabeth Herron.

Wisconsin Water Action Volunteers stream training. Photo by Kris Stepenuck.
Public Attitudes Toward Water Use in the West

Situation:
Rapid population growth is driving a need to reallocate water use from rural to urban areas, but reallocation strategies often trigger highly contentious public debates. Water issues are complex, and public understanding and perceptions of water management issues are limited. A better understanding of residents’ preferences, attitudes, and values of water resources will improve the water supply planning efforts and increase public involvement in community decision-making.

Actions:
Two-staged research identified general values, attitudes, preferences, and knowledge related to water resource management in 17 western states. In stage 1, focus groups made up of residents and water management professionals met in Denver, CO and Reno, NV. Information collected from these groups was the basis for the development of a public survey. In stage 2, an Internet survey of randomly sampled households throughout the 17-state study region collected information about public perceptions of water management issues. Results were synthesized into a summary document and presented to stakeholders.

Outcomes:
A multistate approach provides a significant improvement in public involvement by providing a broader, more accurate generalization of results across a region, recognizing commonalities that exist in each state. Further, values and attitudes have been collected for traditional and non-traditional stakeholders in the public involvement process. Outcomes include:

▶ Stakeholders have an increased awareness of western residents’ preferences for water allocation and use. Several state agencies have requested survey results and data.
▶ A Web site at http://westernwatersurvey.colostate.edu provides state-specific data of public values, attitudes, and perceptions of water management issues.
▶ Presentations were given to stakeholders at the Colorado Watershed Assembly’s annual meeting, the Colorado Water Congress, Western Governors’ Forum, Rocky Mountain Agribusiness Association, Western Agriculture Economics Association and the U.S. Committee on Irrigation and Drainage.
▶ Refereed journal articles are in progress.

Contact: Alan Bright
Colorado State University
970-491-5487
abright@warnercnr.colostate.edu
Contact the NIFA National Water Program

National Program Leader
Dr. Michael P. O’Neill
USDA-NIFA, Mail Stop 2210
1400 Independence Avenue, SW
Washington, D.C. 20250-2210
202-205-5952 Phone
202-401-1706 Fax
moneill@nifa.usda.gov

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 NIFA National Program Leader for Water Quality.

Region 1
Dr. Art Gold
University of Rhode Island
Natural Resources Science Dept.
1 Greenhouse Road
Kingston, RI 02881
401-874-2903 Phone
401-874-4561 Fax
agold@uri.edu

Region 2
Dr. Chris Obropta
Rutgers University
Dept. of Environmental Science
14 College Farm Rd., Rm. 232
New Brunswick, NJ 08901-8551
732-932-9800 ext. 6209 Phone
732-932-8644 Fax
obropta@envsci.rutgers.edu

Region 3
Dr. Doug Parker
University of Maryland
Dept. of Agricultural & Resource Economics
2200 Symons Hall
College Park, MD 20742
301-405-8042 Phone
301-314-9091 Fax
dparker@arec.umd.edu

Region 4
Dr. Greg Jennings
North Carolina State University
Biological and Ag Engineering
Box 7625
Raleigh, NC 27695-7625
919-515-6791 Phone
919-515-6772 Fax
jennings@ncsu.edu

Region 5
Dr. Thomas Blewett
University of Wisconsin - Madison
432 N. Lake Street
Madison, WI 53706
608-262-1748 Phone
608-262-9166 Fax
thomas.blewett@ces.uwex.edu

Region 6
Dr. Mark L. McFarland
Texas A&M University
Texas AgriLife Extension Service
Soil & Crop Sciences Department
348 Heep Center
College Station, TX 77843-2474
979-845-5366 Phone
979-845-0604 Fax
MMcFarla@ag.tamu.edu

Region 7
Dr. Gerald A. Miller
Iowa State University
College of Agriculture and Life Sciences
132 Curtiss Hall
Ames, IA 50011-1050
515-294-4333 Phone
515-294-5745 Fax
soil@iastate.edu

Region 8
Dr. Reagan Waskom
Colorado State University
CSU Water Institute
1033 Campus Delivery
Fort Collins, CO 80523-1033
970-491-6308 Phone
970-491-1636 Fax
reagan.waskom@colostate.edu

Region 9
Dr. Kitt Farrell-Poe
University of Arizona
Yuma Agricultural & Biosystems Engineering
Shantz Bldg. #38, Room 5047
1177 E. Fourth St.
Tuscon, AZ 85721-0038
520-621-7221 Phone
520-621-3963 Fax
kittfp@ag.arizona.edu

Region 10
Dr. Bob Mahler
University of Idaho
Soil & Environmental Sciences
P.O. Box 442339
Moscow, ID 83844-2339
208-885-7025 Phone
208-885-7760 Fax
bmahler@uidaho.edu

1890 Representative
Dr. Cassel (Cass) Gardner
Florida A&M University
Cooperative Extension
202-J Perry-Paige Bldg., S.
Tallahassee, FL 32307
850-599-3546 Phone
850-561-2151 Fax
soil@famu.edu

1994 Representative
Mr. Virgil Dupuis
Salish Kootenai College
Salish Kootenai College Extension
PO Box 70 (shipping 52000 Hwy 93)
Pablo, MT 59855
406-275-4899 Phone
406-275-4809 Fax
virgil_dupuis@skc.edu

A regional map is shown on page 3.
The NIFA National Water Program’s annual conference held in February 2009 in St. Louis, MO, enabled water resource professionals engaged in research, Extension, and education to share knowledge and resources, identify emerging issues, and strengthen the network of the NIFA National Water Program.

More than 160 technical presentations and 170 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-NIFA 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 2008-2009 conferences are posted to http://www.usawaterquality.org/conferences.

The next conferences are scheduled for February 21-25, 2010, in Hilton Head Island, SC, and January 30-February 1, 2011, in Washington, DC. Mark your calendars!

For more information, contact:
Dr. Greg Jennings
North Carolina State University
Box 7625
Raleigh, NC 27695-7625
Phone: 919-515-6791
jennings@ncsu.edu