

## Water Supply Forecasting

### New Tools and Technology Gauge Available Water Supplies

by Judi Buehrer, American Water Works Association

As drought and growth across the country shrink local water supplies, utility managers are examining various options to solve water supply issues.

Many water managers—especially those in areas affected by three to five years of drought—are paying closer attention to forecasts and drought-modeling technology.

Water utility managers in the West and Northwest tend to use the relatively new climatology tools more than their counterparts in the rest of the country, said Richard Palmer, water resources management specialist at the University of Washington. He said that models developed to calculate precipitation from snowpack tend to be more accurate than models dealing with rainwater.

Three years ago, a study of how 31 water utility managers in the Midwest used weather forecasts that predicted droughts found that 22 of the utilities imposed water restrictions or sought additional water supplies based on the forecasts.

The study by Stanley Changnon, a University of Illinois climatologist, and Donald Vonnahme, director of the Illinois Office of Water Resources, also found that 70 percent of state agency water managers had warned of water shortages.

Researchers Anne Steinemann, a hydrologist and associate professor at the Georgia Institute of Technology, and Greg Carbone, a University of South Carolina climatology professor, surveyed water managers about forecasting tools. Steinemann found in a recent survey that 25 water utilities in the Atlanta area use forecast information, but do not use long-lead forecasts from the Climate Prediction Center (CPC), a National Oceanic and Atmospheric Administration (NOAA) service that generates the U.S. drought outlook ([www.cpc.ncep.noaa.gov](http://www.cpc.ncep.noaa.gov)).

“Right now there are no incentives to use them,” she said. “Water utilities don’t want to make mistakes or take risks. They need strong incentives and a high level of accuracy in the



▲ Forecasting allows managers to plan alternative solutions to potential water shortage issues.

forecasts to justify using them to make decisions.”

“But we did find that the worse the drought became, the more they used long-lead forecasting,” Carbone said.

Drought coordinators in Harford County, Maryland, and Denver are among water utility professionals who use forecasting technology. John DiFonzo, director of engineering of the Harford County Water Works and environmental specialist Nancy Hausrath, said they use NOAA data of a nearby well to monitor groundwater base flows. “During 2002, we used it to predict groundwater recharge and to develop our drought contingency and conservation plans,” Hausrath said.

“Today the lakes are spilling,” DiFonzo said, “but Nancy cautions us that the recharge rate in the groundwater is a more accurate indicator.”

Bob Steger, Denver Water resource specialist, primarily uses Natural Resources Conservation Service data. Steger analyzes runoff forecasts, soil moisture data, historical records, and hydrographs to develop water supply predictions.

Douglas LeComte, drought specialist at the CPC says “We’re in the process of improving forecasting techniques, but there is a lot of randomness in the atmosphere.”♦

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# Groundwater Shorts

## Environmental Education Course Offered Online

The “Fundamentals of Environmental Education” online course will be offered again this fall. The course is ten weeks long, beginning September 15 and ending November 23. Participants may obtain two or three undergraduate or graduate credits from the University of Wisconsin-Stevens Point. The course is also offered at a reduced cost for those that are not interested in obtaining college credit. Enrollment began in June 2003.

This course provides educators with the knowledge and skills to incorporate quality environmental education into their instruction. Participants discuss the history, definition, and goals of environmental education, develop an understanding of the professional roles and methods of environmental educators, and have the opportunity to interact with other educators from across the country.

A variety of assignments and readings are associated with the course. These include brief writing assignments in conjunction with each unit, group discussion board postings, and a culminating assignment. There are no text books or exams.

This course was developed in collaboration with national environmental education experts, using materials produced by organizations such as the North American Association for Environmental Education, World Wildlife Fund, Project Learning Tree, Project WILD and Project WET.

The development of this course was funded by Environmental Education and Training Partnership (EETAP), the national training program of the EPA's Office of Environmental Education. The University of Wisconsin-Stevens Point administers EETAP through a cooperative agreement with the EPA.

For more information, please log on to [www.eetap.org/eecourse](http://www.eetap.org/eecourse) or call 715-346-4957.♦



## EPA Provides Tools for Septic System Management

Stressing the environmental importance of proper septic tank management to prevent pollution from entering the nation's rivers, lakes, coasts, and groundwater, the U.S. EPA is providing materials to city and county public health officials to continue efforts to educate citizens about proper septic system management. Failing and improperly managed septic systems are a significant source of water pollution, potentially causing contamination of drinking water wells. Septic systems serve approximately 25 percent of U.S. households, and one in every three new homes built today uses these systems, making proper maintenance essential for protecting America's waters.

“Public education is the key to improving septic system management. Citizens need to better understand the potential harm improperly managed septic systems can have on the environment and public health and what they can do to help,” said EPA Assistant Administrator for Water, G. Tracy Mehan, III.

As part of EPA's celebration of the 30th anniversary of the Clean Water Act, the Agency has developed a CD-based kit for communities to reach out to citizens. Using the CD, communities can inexpensively produce customized versions of brochures, utility bill inserts, and other useful information. Each document contains space where communities can add local information, so citizens will know how to obtain additional information.

To order copies of the Wastewater Month CD or hard copies of these materials, visit the Wastewater Month website at [www.epa.gov/npdes/wastewatermonth](http://www.epa.gov/npdes/wastewatermonth).♦

## Mandatory Restrictions Help Save Water

Mandatory water restrictions are the best way to reduce water use during droughts, concludes a study by the University of Colorado (CU).

Voluntary restrictions alone do not compel customers to cut water consumption by much if at all, says Doug Kenney, a researcher with CU's Natural Resources Law Center, and Roberta Klein of the Center for Science and Technology Policy Research.

Last summer, “Utilities that used voluntary restrictions didn't see much in savings,” Kenney said.

The study of eight Colorado Front Range cities that implemented voluntary and/or mandatory restrictions during 2002's severe drought showed that water use dropped by as much as 56 percent when customers in Lafayette faced a mandatory once a week lawn-watering schedule.

Cities going to mandatory, twice-weekly watering schedules reduced water consumption by about 30 percent, as was the case in Fort Collins, Boulder, and Louisville. Denver, Westminster, and Aurora—which allowed watering once every three days—saved 14 percent.

When cities implemented voluntary restrictions, they reduced their usage by less than ten percent. Two cities saved only three percent, while two others actually increased water use.

Kenney said the study did not determine why mandatory restrictions saved more water, but researchers did note that each city used a different method to calculate water savings.

“The real value of the study is that it precisely quantified how much water could be saved by the different programs of water restrictions,” Kenney said.

This year, most of the Front Range cities are restricting water use despite more encouraging precipitation in the spring.♦

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# Drought Policies, Water Restrictions, and Conservation

## Cities Across America Try To Persuade Citizens To Use Water Wisely

As spring and summer are upon us, water utilities throughout America are faced with the enormous task of convincing citizens to value water through conservation and efficiency.

Historically, most water utilities have promoted water conservation in a variety of ways. However, the severe drought conditions that have impacted the Southeast and Western regions of the United States have seen water utilities enacting a variety of new policies and restrictions designed to persuade citizens to change their water use behavior.

According to a recent sampling of municipal water utilities, citizens are faced with strict water use surcharges as well as steep fines if caught blatantly wasting water. Many utilities have enacted grass, garden and tree planting and watering restrictions. Others are enforcing lawn watering and car washing bans. Some new policies restrict the washing of hotel laundry if a guest stays more than one day, while other cities are forbidding restaurants to automatically serve diners a glass of water with their meal.

This summer, the National Oceanic and Atmospheric Administration scientists predict the American West will suffer the worst drought conditions in more than 108 years. In 2002, Colorado measured its driest year since records began in 1895 and at the same time dealt with devastating forest fires. Nebraska, Wyoming, and Nevada also recorded their third driest year. While recent rain and snow have improved drought conditions in parts of the West, this winter's precipitation totals have done little to ease the drought, as snow pack

has been below normal in every western state and reservoirs have reached record lows in those locations.

This unprecedented drought has left much of the American West high and dry and citizens, who used to take what seemed like an unlimited water supply for granted, are now being forced to rethink how they use and conserve water.

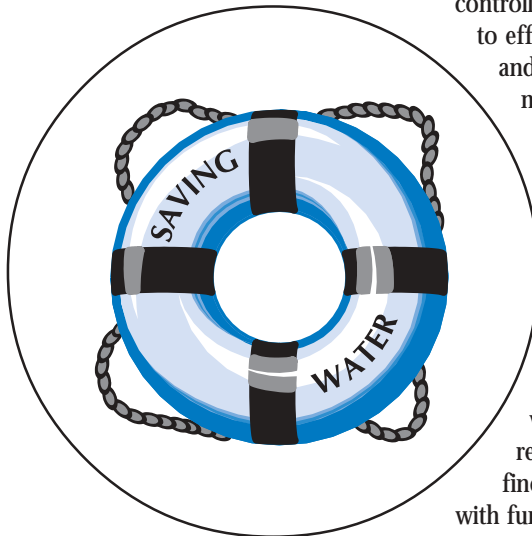
"These necessary water restrictions are a critical reminder that water is one of our most important and valued natural resources," said Jack Hoffbuhr, Executive Director of the American Water Works Association (AWWA). "No longer can citizens expect lush lawns and cheap access to an unlimited supply of water. The message utilities are sending to their customers is use water more efficiently, conserve where you can, and approach your day-to-day water use with a clearer understanding of the water shortage created by drought."

AWWA's sampling of various community water utilities throughout the West identified several common drought restrictions:

- Higher rates in the form of conservation surcharges are being used as incentives for citizens to conserve water.
- Most utilities are involved in massive public education campaigns to teach consumers basic water conservation tips for around the home. Simple steps, such as repairing leaky faucets, turning off the water during tooth brushing or shaving and other common sense measures collectively make

a big difference. Utility websites have been updated with water conservation tips and water bill inserts to remind water customers about conservation practices and new restrictions.

- Most communities have implemented strict lawn watering schedules and, in



some cases, have completely banned lawn watering. Many have restricted home car washing or passed prohibitions on using the hose to clean driveways, sidewalks and decks. Other communities have put a ban on filling swimming pools or spas.

- Some cities will not allow restaurants to offer water to diners unless specifically asked, while some are restricting hotels from laundering bed sheets of guests that stay more than one night.
- Others are offering rebates to consumers who purchase water efficient appliances such as washing machines, low flow toilets and water

saving dishwashers. Denver Water is handing out buckets to capture run-off shower water and timers to encourage shorter showers.

- Some cities have been forced to close or limit the usage of recreation fields due to lack of water while other cities are updating to state-of-the-art, computer controlled sprinkler systems to efficiently water parks and ball fields with minimum amounts of water.

Most utilities have beefed up water patrols by cruising neighborhoods and monitoring meters. Water wasting scofflaws who violate drought restrictions might pay fines from \$50-\$1,000 with funds going to water conservation programs or forest fire prevention programs.

- As an alternative to lush, water-thirsty Kentucky bluegrass lawns, most utilities are encouraging homeowners to create beautiful xeriscape gardens with drought-tolerant plants and foliage.

AWWA has a tremendous amount of resources including publications and training materials that can help people learn about the science of drought. Please visit [www.awwa.org](http://www.awwa.org) for more information.♦

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# Crossing Boundaries for Groundwater

## The Hamilton to New Baltimore Groundwater Consortium

### Groundwater Guardian Featured Result Oriented Activity

By Tim McLelland, Hamilton to New Baltimore Groundwater Guardians



The Hamilton to New Baltimore Groundwater Consortium includes six public and industrial groundwater producers/users serving over 300,000 people in southwest Ohio. Members include the City of Hamilton, Greater Cincinnati Water Works, City of Fairfield, Southwest Regional Water District, Smart Papers LLC and Southwestern Ohio Water Company. The Consortium has been a Groundwater Guardian community since 1997 and is one of Ohio's first multi-jurisdictional Wellhead Protection (WHP) programs.

The Consortium's goals include tracking groundwater quantity and quality, educating local residents and businesses about the importance of source water, maintaining open communication between area water suppliers and users, and continued implementation of the WHP program. Some of the most important aspects of the program include potential contaminant source updates, overlay zoning development, public education and outreach, contingency planning, and well installation and monitoring.

Members of the Consortium derive their water from the Great Miami Buried Valley Aquifer, a Sole Source Aquifer. Cooperation in drinking water supply planning and protection has been an important issue for these water systems for over 30 years. After determining the one, five and ten year time-of-travel zones for area wells, the Consortium conducted a potential contaminant source inventory. The inventory identified over 700 potential pollution sources at 394 sites in

the area. Although it is not an Ohio state requirement to have a ten year time-of-travel zone, the Consortium includes this because of the many potential pollution sources located just outside the five-year time-of-travel zone.

Based on these figures, the Consortium developed and has worked to put in place an ordinance that prohibits certain activities throughout the protection area and requires the



registration of facilities that store or use regulated materials. Because the Consortium does not have the authority to enact the ordinance, it works with the cities, townships, and counties within the Consortium to enact it. The Consortium members of the cities of Hamilton and Fairfield have already enacted the ordinance. Although Ross Township and St. Clair Township are not members of the Consortium, they have enacted zoning resolutions that mirror the Consortium municipalities, recognizing that time-of-travel zones do not stop at jurisdictional boundaries.

The Consortium has also conducted an extensive education and outreach program through its committed Groundwater Guardian Team, made up of the Consortium's Public Education

Committee (PEC) that has been active since 1993. The PEC began its efforts with the potential contaminant source inventory in 1994 and since then has developed fact sheets and brochures, staffed booths at local festivals and fairs, and passed out groundwater protection information. The team also developed a groundwater curriculum for school teachers, developed and maintains

[www.gwconsortium.org](http://www.gwconsortium.org), and

organizes and sponsors the Butler County Children's Water Festival.

The PEC developed a video on groundwater and surface water protection to educate the

public about the area's source water. The video has been used to demonstrate the impact people may have on water resources. Conversations with area educators indicate that the use of this video is highly effective in educating school children, teachers, community decision makers, and area business leaders about what groundwater is, how it moves, and how human activities can impact its quality. The goal in creating this video is to further educate the public and improve the understanding of various groundwater concepts.

Evaluation of the project's success involved developing and administering pre and posttests to students to determine the effectiveness of the factual

content of the video. A benchmark of 80% improved knowledge after viewing the video is the targeted measure of success. A second survey will be conducted to determine frequency of video use among local schools, public libraries, economic development agencies, nonprofit organizations and governmental offices.

The Consortium's contingency plan addresses both incident-related releases (i.e., hazardous materials releases associated with an accident), and releases detected through a monitoring well. The primary objective of the plan is to ensure that the Consortium is kept up to date on the status of regulated materials releases in the WHP areas. Secondary objectives include tracking the occurrence of regulated substance releases in the WHP areas, spill prevention awareness, and general groundwater education for area fire departments.

The Consortium utilizes the strengths of each of its members. One entity oversees the monitoring program, another overall management, and all participate in public education and pay for the installation and sampling of monitoring wells. Twenty-four monitoring wells around the Consortium's well fields are monitored monthly for water levels and semi-annually for various water quality parameters. Installation of additional monitoring wells is planned in the future.

The Consortium believes in the importance of partnering with and utilizing the assistance of other agencies, and has partnered with local agencies to assist with updates to the program. ♦

# Projects in the Field

**S**everal Groundwater Foundation programs have entailed working directly with communities. While many of these projects involve solely Nebraska communities, lessons learned will impact future national projects of the Foundation and further support its educational mission. For more information about these field projects, call The Groundwater Foundation at 1-800-858-4844.

## Field Staff

The Field Staff project works with small Nebraska communities to develop educational opportunities as the starting point for implementing groundwater protection activities on the local level. The Foundation has worked with various Nebraska communities to conduct public meetings to discuss options for the protection of local drinking water supplies. This effort is sponsored by the Nebraska Department of Environmental Quality (NDEQ).

## Septic System Education Project

For over a year and a half, the Foundation has worked to provide septic system education and to actively engage residents in taking voluntary steps towards addressing on-site wastewater treatment issues at Lake McConaughy, Nebraska's largest reservoir. A group of area residents recently formed a Groundwater Guardian team with plans to provide lake residents with septic system information and perform free nitrate tests for drinking water. Future plans include continuing education efforts through a septic system inspection demonstration and developing plans for effective septic management. This project is sponsored by NDEQ.

## Mid-High Plains Education Initiative (MHPEI)

This five-year project provides water education and encourages collaboration among citizens in the Republican River Basin in Nebraska, Kansas, and Colorado. The Foundation has conducted educational seminars in communities throughout the basin in Nebraska, and will expand into Kansas and Colorado. The Foundation is a co-sponsor of a Water and Natural Resources tour of the Republican Basin, responding to the Kansas v. Nebraska settlement and coping with drought in 2003. MHPEI is sponsored by the Nebraska-Kansas Area Office of the Bureau of Reclamation.

## Partners for Protection (P4P)

P4P, sponsored by the Nebraska Environmental Trust, focuses on Nebraska communities with populations under 1,500. P4P provides training and services on topics such as team building, source water protection, youth education, and community involvement. Ten P4P training sessions were held, including Albion, Holdrege, McCook, Arapahoe, Firth, Trenton, Ogallala, and sessions at the League of Nebraska Municipalities Conference and the Groundwater University workshop.

## Source Water Protection

The Groundwater Foundation has revised its workshop guide, *An Introduction to Drinking Water Source Assessment and Protection*, and is now testing the draft. Workshops have been held in Nebraska, Idaho, Oregon, Arizona, Georgia, Alabama, Mississippi, Minnesota, and Virginia. Support for this project is provided by the United States Environmental Protection Agency. ♦



# Water Conservation

## For Your Lawn

*By Don Wilhite, University of Nebraska-Lincoln School of Natural Resource Sciences; the City of Lincoln Mayor's Water Conservation Task Force; and the Lincoln Water System*

**M**ore than half the water used in the summer goes to lawns and other thirsty plants. By watering efficiently, you can help keep water use within your system's capacity and reduce your water bill.

Water during the cool of the day to reduce evaporation. The best time is early morning. Deep-water shrubs in evening hours. Avoid watering on windy days.

Lawns seldom need to be watered in April. Start watering in mid-May to early June. A healthy bluegrass lawn will require about one-half inch of water per week in early May and one to two inches per week during the mid-summer months. Adjust watering to include rainfall.

Measure sprinkler output by placing three or more cans throughout the sprinkler pattern. The average depth of water in the cans will tell you how much water the sprinkler has applied.

Adjust automatic sprinkler systems to accommodate changes in seasonal water demand. Adjust the clock as the temperature changes to give your plants only the water they need to stay healthy. If you have a manual system, set a timer.

Know your soils. When water runs off your lawn, the soil is not absorbing water as fast as it is being applied. Clay soils require slow watering; they dry out slowly and need infrequent watering

Sandy soils dry out quickly and require more frequent watering.

Water deeply once or twice a week, allowing the moisture to soak six to eight inches down to the roots. Frequent light watering encourages shallow root growth, which is not drought tolerant.

Aeration loosens soil, reduces compaction and allows for more water to reach the roots, resulting in less runoff. Aerate your lawn once or twice a year.

Don't water every day. Poke a screwdriver into the soil, if it offers little resistance to a depth of six inches the soil has adequate moisture. Another simple test is to step on the grass. Grass will lie flat if the moisture is low. If it bounces back quickly, wait a day or two to water. Pay attention to the color of your lawn. When it is under stress, it will change color, becoming more blue-green.

You can save water outdoors by planting a water-conserving landscape. There are hundreds of low-water-use/drought-tolerant plants, including turf grasses. Call your local Cooperative Extension Office or nursery for more information.

**Author's Note:** These conservation tips are appropriate for lawns that are predominately Kentucky bluegrass. If you have another lawn type, consult your nursery or local Cooperative Extension Office for advice. ♦

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## "Jump Into It: How to Organize a Groundwater Education Camp"

Order a copy of The  
Groundwater Foundation's  
newest publication!

# Water Supply Scarcity:

## Who Gets the Last Drop?

By Cindy Kreifels, *The Groundwater Foundation*

**F**rom Florida to Nevada, Washington to New York, citizens everywhere are gaining a growing awareness of the water shortages facing this country. Weekly in newspapers across the country, the National Drought Mitigation Center provides a map showing the severity of the drought state-by-state.

In response to the drought facing many parts of the country and the conservation measures being taken to alleviate the problem, "Water Supply Scarcity: Who Gets the Last Drop?" is the theme for The Groundwater Foundation's National Conference. Join us November 12-15, 2003 at the Treasure

Island Hotel in Las Vegas, Nevada to explore this intriguing question as we address competing uses, examine innovative techniques, and explore existing and future policies for our water resources.

Dr. Robert Glennon, University of Arizona law professor and author of *Water Follies: Groundwater Pumping and the Fate of America's Fresh Waters* will be the keynote speaker. Dr. Glennon will explore the worth of water and its use and misuse across various regions of the United States. Following Dr. Glennon will be Dr. Michael Hayes, Assistant Professor and Climate Impacts Specialist with the National Drought

Mitigation Center located at the University of Nebraska – Lincoln. Dr. Hayes will share his perspectives on drought mitigation and groundwater protection. In addition, the conference will explore water conservation education programs, demand vs. supply, regulation and policy, water quality/quantity links, tools to help stretch water supplies, and sustainability.

On Friday evening, the Groundwater Foundation will designate the 2003 Groundwater Guardian Communities, Affiliates, and National Partners



and recognize them for their efforts on behalf of groundwater during the past year. In addition to the many conference presenters who will speak on water quantity issues, many Groundwater Guardian community representatives will be on hand during the

conference to share one-on-one the many programs they have implemented to address local quantity issues.

Plan now to join us in Las Vegas this fall as we explore the timely and provocative question of who gets the last drop? For more information, contact The Groundwater Foundation at 1-800-858-4844 or email [info@groundwater.org](mailto:info@groundwater.org).