

On tap

Drinking Water News

For America's Small Communities

Published by the
National Environmental Services Center

Fall 2007, Volume 7, Issue 3

Controlling

CROSS CONNECTIONS

and Preventing

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Also in this issue:

Putting Your Watershed Plan to Work

How to Set Up a Basic Cross-Connection Control Program

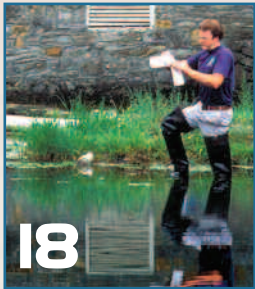
Are You Ready for Winter?



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Drinking Water News & Information for America's Small Communities

Fall 2007, Vol. 7, Issue 3



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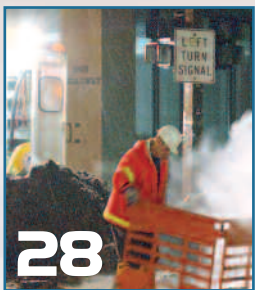
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Tech Brief

➤ Cross Connection and Backflow Prevention Poster

Plumbing cross connections can link a potable water supply to a contamination source, causing a serious public health hazard. Cross connections can be controlled, but it takes vigilance and knowledge to carry out a good cross-connection control program. This poster illustrates some mechanical devices and methods used to control cross connections in commercial and industrial applications as well as for homeowners.

Controlling CROSS CONNECTIONS

by Caigan McKenzie

and Preventing BACKFLOW

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On Tap

Drinking Water News and Information
for America's Small Communities

Fall 2007 • Volume 7 • Issue 3

Sponsored by USDA Rural Development

James Andrew, Administrator

Lorrie Davis, RUS Loan Specialist

Rural Development

USDA's Rural Development Utilities Service strives to serve a leading role in improving the quality of life in rural America by administering its electric, telecommunications, and water and waste programs in a service-oriented, forward-looking, and financially responsible manner. Founded in 1947 as the Farmer's Home Administration, Rural Development has provided more than \$35 billion for water and wastewater projects. For more information, visit their Web site at www.usda.gov/rus/.

The National Environmental Services Center

The National Environmental Services Center (NESC) is a nonprofit organization providing technical assistance and information about drinking water, wastewater, infrastructure security, utility system management, solid waste, and environmental training to communities serving fewer than 10,000 people.

To achieve this mission, NESC offers a toll-free technical assistance hotline, hundreds of low-cost or free products, magazines and newsletters, and several searchable databases. We also sponsor conferences, workshops, and seminars. Visit the NESC Web site at www.nesc.wvu.edu or call toll-free (800) 624-8301 and request an information packet.

NESC is located at West Virginia University, one of the nation's major doctoral-granting, research institutions.

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As a teenager, one of my guilty pleasures was staying up late to watch horror movies on television. (Readers who grew up between the 1960s and 1980s within about a 100-mile radius of Pittsburgh will no doubt recall "Chilly Billy" Cardille and the show "Chiller Theater" on Saturday nights.) I still remember the nervous sensation I'd get in the pit of my stomach when watching an especially scary flick.

When I hear or read stories about backflow and cross connections gone wrong—human blood from a funeral home entering a building's water supply, heating system chemicals found in a school's water supply, agricultural herbicides in a town's water system—I get that horror-movie feeling in my gut. I believe this visceral reaction is due to an instinctual awareness about how vital water is to human survival.

In this issue of *On Tap*, you'll find several pieces of information related to cross connection control and backflow prevention. The cover story, "Controlling Cross Connections and Preventing Backflow" by NESC Staff Writer **Caigan McKenzie**, provides an overview of the topic, while **Glenn Tillman's** piece "How to Set Up a Basic Cross-Connection Control Program" provides concrete suggestions about how to address this important issue. In place of our usual *Tech Brief*, we've developed a poster showing various types of cross connections and ways to prevent backflow.



Chilly Billy cover image of myweb.wvnet.edu/le-gar/

Who We Are

A number of people are responsible for putting *On Tap* magazine together each quarter. We encourage our readers to contact us with ideas and suggestions. An e-mail address is provided for each staff member below, as well as their phone extension. Call our main number toll free at (800) 624-8301 and enter the appropriate extension at the prompt.

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Although we may not want to face it, winter is on its way (or, in some parts of the country, already here). If you live in an area that gets cold weather, winterizing your system is a good idea and **Rick Dennison** with the West Virginia Rural Water Association shows how you can do just that.

The final installment of our watershed planning series begins on page 18. Here, I examine the steps needed to put a watershed plan together and, then, into action. All four parts of this series are available on our Web site at www.nesc.wvu.edu. Finally, on pages 33 to 36, you'll find a products listing with items related to the topics in this *On Tap* highlighted. A complete listing of water- and waste-water-related products may be found on our Web site.

Whatever drinking water problem you may be facing, chances are that our technical staff knows something about it. Call them at (800) 624-8301 option 3 and give them a chance to help you.

Regards,



Mark Kemp-Rye
On tap Editor

MARCH

American Society of Civil Engineers/Infrastructure Security Partnership Annual Infrastructure Security Conference

March 12–14, 2008
The Buttes Marriott Resort
Tempe, AZ
Phone: (703) 295-6408
www.tisp.org

Water Quality Association Annual Convention and Exhibition

March 25–28, 2008
Mandalay Bay Convention Center
Las Vegas, NV
Phone: (630) 505-0160
Fax: (630) 505-9637
www.wqa.org

National Association of Environmental Professionals Annual Conference

March 25–28, 2008
The Omni Hotel
San Diego, CA
Phone: (863) 679-3852
Fax: (501) 423-1701
Email: conference@naep.org
www.naep.org



Photo courtesy of PDPhoto.org

MAY

American Backflow Prevention Association International Conference and Trade Show

May 19–21
Sheraton Indianapolis
Indianapolis, IN
Phone: (979) 846-7606
Fax: (979) 846-7607
Email: shane@abpa.org
www.abpa.org

Sponsoring an event?

If you are sponsoring a water-related event and want to have it listed in this calendar, please send information to Mark Kemp-Rye, National Environmental Services Center, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. You also may call Mark at (800) 624-8301 or (304) 293-4191 ext. 5523 or e-mail him at mkemp@mail.wvu.edu.

JUNE

American Water Works Association Annual Conference and Exposition

June 8–12, 2008
Georgia World Congress Center
Atlanta, GA
Phone: (800) 926-7337 or (303) 794-7711
Fax: (303) 347-0804
www.awwa.org/ace08/



National Environmental Health Association Annual Educational Conference and Exhibition

June 22–24, 2008
Tuscon, AZ
Phone: (303) 756-9090
Fax: (303) 691-9490
www.neha.org

JULY

National Association of Counties Annual Conference and Exhibition

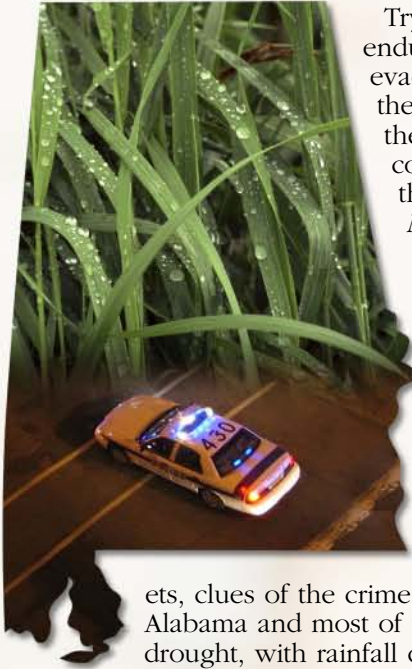
July 11–15, 2008
Kansas City, MO
Phone: (202) 393-6226
Fax: (202) 393-2630
www.naco.org

AUGUST

American Public Works Association Annual Conference

August 17–20, 2008
Ernest N. Morial Convention Center
New Orleans, LA
Phone: (800) 848-2792 or (816) 595-5241
Fax: (816) 472-1610
Email: dpriddy@apwa.net
www.apwa.net

Water Cops in Alabama Seek Midnight Irrigators



Trying to avoid as much as a \$400 fine, citizens enduring a severe drought in Calera, Alabama, can't evade the law by sneaking out after dark to water their lawns or to rinse the constant red dust off their vehicles. The local police have become "water cops" and are working day and night to enforce the water use bans, according to a *U.S. Water News* report.

Water use for such frivolous activities as watering flowers may be banned when water supplies fall below critical levels. Dusty cars and crispy lawns are becoming the norm. Calera city officials say although some citizens think it is harsh and seem to be working really hard to get around the restrictions, the ban has helped the city keep water in its storage tanks.

Similar patrols are underway in other drought-stricken places like Atlanta, Florida and Texas—looking for wet grass and wash buckets, clues of the crime of illegal water use. This past summer, all of Alabama and most of the southeastern states experienced a severe drought, with rainfall deficits as much as 20 inches for the year. Forecasters say a drought of such intensity occurs once every 50 to 100 years.

For more information about drought, visit the National Drought Mitigation Center Web site at drought.unl.edu. You may also write to the center at P.O. Box 830749, Lincoln, NE, 68583-0749 or call (402) 472-6707.

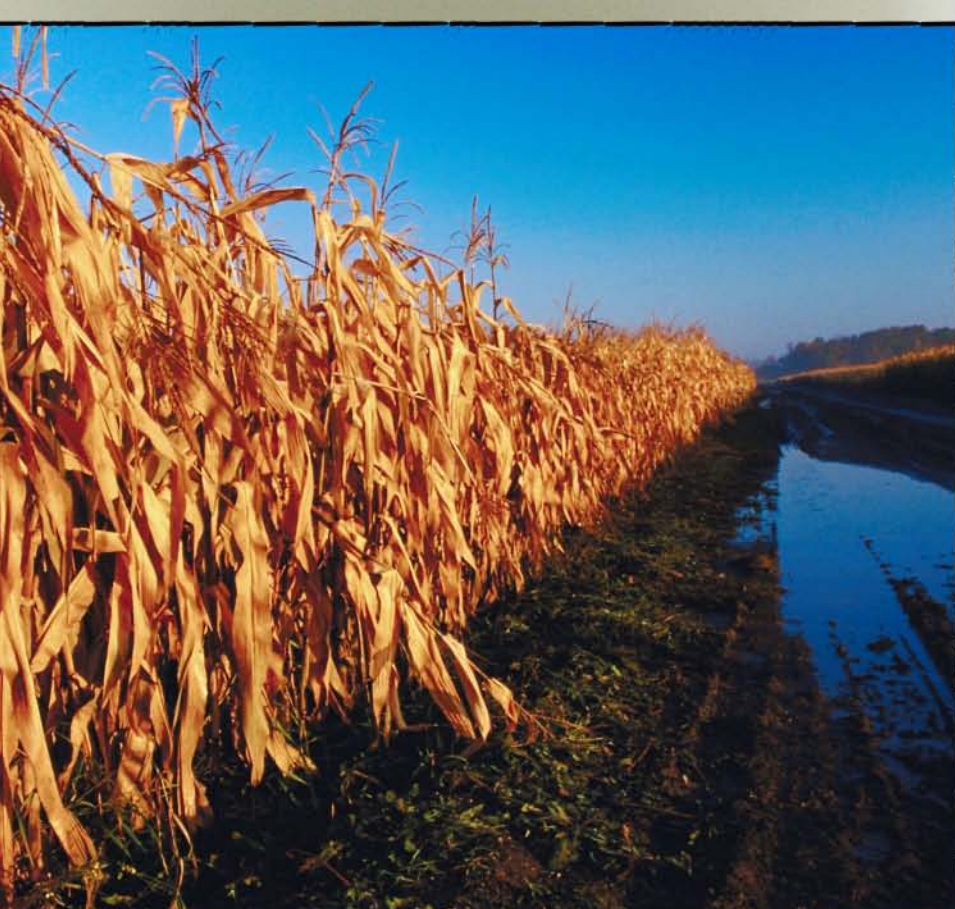


Whiskey and Water

Drought conditions can be felt across our country and while everyone pities the poor farmer, consider the plight of the poor whiskey distiller.

In the mountains of Lynchburg, Tennessee, the spring from which Jack Daniel's Distillery gets its water is threatened by a recent drought. For more than 140 years, Cave Spring has supplied the special iron-free water that is an essential components of the whiskey's recipe. While the spring hasn't dried up yet, company officials said in a June 2007 MSNBC story that the water is being conserved now to make whiskey and nothing else.





Demand for Ethanol Equals Increased Water Pollution

American farmers are planting more corn this year than they have since the food-shortage years of World War II—an estimated 90.5 million acres, according to the U.S. Department of Agriculture (USDA). And with the demands from the ethanol industry and support from Washington politicians for biofuels, USDA predicts that that amount of acreage in corn will double by 2010.

But this huge demand for corn comes at a cost of more oxygen-stealing chemicals (nitrates and phosphates) running off farms to choke the nation's rivers and lakes with algae, reports the *St. Louis Post-Dispatch*.

Corn plants are greedy things, requiring huge inputs of fertilizer in order to maintain their luxuriant growth. And with increased plantings, our already damaged waterways could be additionally harmed.

Fertilizer pollution kills aquatic life by suffocation. With oxygen diminished, the aquatic food chain is upset, fish become scarce, and the algae, which loves the added nitrogen, flourishes. This algae can clog water intake pipes and filters and even promote dangerous bacteria.

To learn more about biofuel production and water pollution, visit the World Resources Institute's Web site at www.wri.org/climate/project_description2.cfm?pid=7.

Saying No to Bottled Water

More and more, U.S. communities are cutting out the water cooler in local government offices and returning to tap water, while saving money in the process.

In San Francisco, California, Mayor Gavin Newsom, has issued an executive order banning city departments from buying bottled water, even for water coolers. The mayor's stated intent was to stem global warming and save the taxpayers money, noting that more than a billion of the empty polycarbonate bottles end up in California's landfills annually.

In Charlottesville, Virginia, Mayor David Brown has made a similar proposal and Chicago officials are considering a 25-cent tax on bottled water. These moves are part of the Mayors Climate Protection Agreement developed by the U.S. Conference of Mayors.

To learn more about the Mayors Climate Protection Agreement, visit the U.S. Conference of Mayors Web site at www.usmayors.org/climateprotection/



We need your opinion

To improve *On Tap* and other National Environmental Services Center products and services, we would like to hear from our readers. Please take a moment to complete the Online Readership Questionnaire at www.nesc.wvu.edu (look for the purple tab toward the top of the page.) Your comments, suggestions, and article ideas are welcome. We look forward to hearing from you!

RDUS Loans: Poverty Rate Unchanged; Others Up

Interest rates for Rural Development Utilities Service (RDUS) water and wastewater loans have been announced. The market and intermediate rates are up slightly, while the poverty rate is unchanged.

RDUS interest rates are issued quarterly at three different levels: the poverty line rate, the intermediate rate, and the market rate. The rate applied to a particular project depends on community income and the type of project being funded.

To qualify for the poverty line rate, two criteria must be met. First, the loan must primarily be used for facilities required to meet health and sanitary standards. Second, the median household income of the area being served must be below 80 percent of the state's non-metropolitan median income or fall below the federal poverty level. As of April 1, 2007, the federal poverty level was \$20,650 for a family of four.

To qualify for the intermediate rate, the service area's median household income cannot exceed 100 percent of the state's non-metropolitan median income.

The market rate is applied to projects that don't qualify for either the poverty or intermediate rates. The market rate is based on the average of the Bond Buyer index.

The rates, which apply to all loans issued from October 1 through December 31, 2007, are:

▷ **poverty line: 4.5 percent** (unchanged from the previous quarter);

△ **intermediate: 4.5 percent** (up 0.125 from the previous quarter); and

△ **market: 4.625 percent** (up 0.375 from the previous quarter).

RDUS loans are administered through state Rural Development offices, which can provide specific information concerning RDUS loan requirements and applications procedures.

For the phone number of your state Rural Development office, contact the National Environmental Services Center at (800) 624-8301 or (304) 293-4191. The list is also available on the Rural Development Web site at www.rurdev.usda.gov/recd_map.html.

Could Desalination Aggravate Climate Change?

With more than 1,000 desalination plants in operation around the world and becoming a growing trend in drier regions of the world such as the Middle East and Australia, it bears consideration that the highly concentrated saline water that results from the process is sent back to the sea, increasing the salinity of that water and posing a threat to sea life, disrupting neighboring ecosystems.

Some scientists say that extracting salt from water to make it drinkable is the wrong way to handle water shortages around the world and could exacerbate climate change.

In the report *Making Water: Desalination—Option or Distraction for a Thirsty World*, the World Wide Fund for Nature (WWFN) recently examined this trend and found that desalination also uses large amounts of energy and emits tremendous amounts of greenhouse gasses. Jamie Pittock, who heads WWFN's freshwater program, states that continued growth of this industry will produce enough greenhouse gas emissions to change the climate dramatically.

Making more drinking water with the help of desalination plants "creates a wasteful attitude to water use," Pittock says, adding that in most cities vast amounts of water are wasted. Instead he would encourage more water-efficient technologies in houses and businesses, reducing leaks and increasing the recycling of wastewater.

Read more about desalination and download the WWFN report at www.panda.org/news_facts/newsroom/index.cfm?uNewsID=106660

Waste from a water desalination plant, Kuwait

Photo courtesy of
www.engineering.uiowa.edu/fluidslab/



Foundation for Cross Connection Control and Hydraulic Research

www.usc.edu/dept/fccchr/

Based at the University of Southern California, the Foundation for Cross Connection Control and Hydraulic Research provides information via their Web site. Their "Introduction to Cross Connection Control" (click on Backflow Introduction under Topics) provides an excellent overview of topics such as back-siphonage, backpressure, and backflow prevention techniques.



American Backflow Prevention Association

www.abpa.org

The American Backflow Prevention Association (ABPA) is devoted to protecting drinking water from contamination through cross-connections and is committed to advancing all aspects of backflow prevention for the continued protection of all water users.

The ABPA Web site has information about cross connections and backflow prevention, as well as details about certification, training, and organizational meetings. The *ABPA Certification Committee Operations & Procedure Manual* may also be downloaded from the site.



U.S. Drought Portal

www.drought.gov/portal/server.pt

The U.S. Drought Portal, launched on November 1, 2007, was created to provide comprehensive information on emerging and ongoing droughts and to enhance the nation's drought preparedness. The Drought Portal is part of the National Integrated Drought Information System (NIDIS), which was enacted into law in 2006. The project is part of

the National Drought Policy Commission, established under the National Drought Policy Act of 1998 to ensure collaboration between different government agencies on drought-related issues

The U.S. Drought Portal is part of the interactive system designed to:

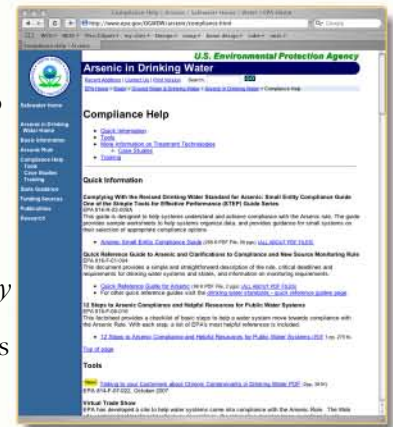
- provide early warning about emerging and anticipated droughts;
- assimilate data about droughts and models;
- provide information about risks and impacts of droughts to different agencies and stakeholders;
- provide information about past droughts for comparison and to understand current conditions;
- explain how to plan for and manage the impacts of droughts; and
- establish a forum for different stakeholders to discuss drought-related issues.

EPA Has Arsenic Help

www.epa.gov/OGWDW/arsenic/compliance.html

The U.S. Environmental Protection Agency (EPA) has set up a comprehensive Web site to help drinking water systems become and stay compliant with the new arsenic rulings. Factsheets and guidebooks produced by the EPA are listed here, free for the reader to download in pdf format.

Special training workshops and videos on the various arsenic treatment removal technologies can be ordered here. Of particular interest are the *Arsenic Treatment Technology Evaluation Handbook for Small Systems* and *Point-of-Use or Point-of-Entry Treatment Opinions for Small Drinking Water Systems* that are available for free download. Fifteen case studies from across the country highlighting the ways systems have dealt with their arsenic removal challenges are also available.



EPA Develops Financing Comparison Tool

www.epa.gov/owm/cwfinance/cwsrf/fact.htm

The Financing Alternatives Comparison Tool (FACT) is designed to conduct a comparison of financing options to be used by non-financial people. Funded through the Clean Water State Revolving Fund Program, FACT shows a project being financed by multiple funding sources and allows the user to include customized or unique costs. The site provides a summary about how to use FACT, as well as more detailed help.



EFC at Boise State Has Watershed Tools

efc.boisestate.edu

Creating a watershed restoration plan and implementing the plan are different, yet related processes. The Environmental Finance Center at Boise State University has worked with watershed groups and the Environmental Protection Agency to design tools that help with the planning to implementation process. Three specific tools: (1) Plan2Fund, (2) Plan2Fund OPT (Objective Prioritization Tools), and (3) the Directory of Watershed Resources are useful for creating comprehensive plans and multiple-year budgets, determining priority projects, and finding funding for implementation.

Plan2Fund converts your comprehensive plan into a multi-year funding report that shows the levels of resources needed to accomplish goals, objectives and tasks. The *Objective Prioritization Tools* can be used to determine which of the objectives in your implementation plan are the most important. This helps groups focus on fund-raising for top priorities. The *Directory of Watershed Resources* is a searchable database of resources available for environmental projects – a one-stop shop for finding the resources to implement your top priorities.

These tools can be accessed at no charge by registering at the Environmental Finance Center Web site.



Each issue, we ask members of the *On Tap* Editorial Advisory Board to answer a drinking water-related question. We then print as many responses as space permits. The opinions expressed are not necessarily those of NESCA.



In January 2007, the EPA hosted a stakeholders meeting to discuss cross connections and backflow prevention. In July 2007, the agency established a Total Coliform Rule Distribution System Advisory Committee.

Q: *Do you believe that cross connections pose a serious threat to public health?*

If so, should cross connections be addressed in a revised Total Coliform Rule?

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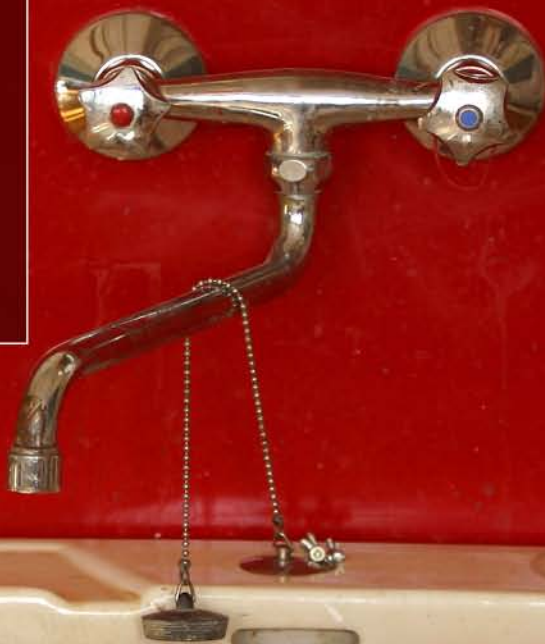
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Leave Regulations to States



All public water systems have cross connections and they can pose health hazards. There are documented cases of cross connection/backflow incidents that have contaminated potable water supplies, and, in some cases, caused illnesses and deaths.

Some states require mandatory backflow protection on certain facilities where high health hazard-type cross connections are normally found, such as:

- car washes;
- food and beverage processing centers;
- hospitals, mortuaries, clinics;
- laboratories;
- metal plating and chemical plants;
- petroleum processing and storage plants;
- piers and docks; and
- sewage treatment plants.

Although all water systems should have a cross-connection control program, I do not believe cross-connection regulations should be specifically addressed in the Total Coliform Rule. Cross-connection control is not just for protecting against bacteriological contamination.

Plumbing codes and Washington State drinking water regulations require cross connections to be controlled by approved methods (physical air gap) or approved mechanical backflow prevention devices or assemblies. In Washington, cross-connection program requirements fall under the drinking water regulations for Group A public water systems (i.e., systems that fall under the Federal Safe Drinking Water Act Requirements). All Group A public water systems are required to have a state-certified cross-connection specialist to implement the cross-connection control program. A state-certified backflow assembly tester must inspect and test all backflow prevention assemblies at the time they are installed and annually thereafter.

The EPA has a cross-connection control manual designed as a tool to be used for educational, administrative, and technical reference in conducting cross-connection control programs. The American Water Works Association is another good resource for implementing a cross-connection control programs.

Is the cost worth the benefit?

As a former drinking water program manager, I am aware that unprotected cross connections can present a serious public health threat. The concern used to be that an unintentional cross connection would contaminate the water supply, resulting in sickness and even death. Today, the concern is that terrorists (international and domestic) could use cross connections to intentionally contaminate water supplies, also resulting in illness, death, and instilling a total lack of confidence in the purity of the water supply that we work so hard to provide.

On the other hand, this is an area in which over-regulation can be just as detrimental to public health. At one time, the EPA considered the possibility of requiring cross-connection control on every tap and every water system, across the country. A preliminary analysis done by the National Rural Water Association came up with costs in the range of \$5 billion (yes, billion with a “b”) to install the necessary devices, and another \$3 billion per year to test each device. Bankrupting water systems over this issue would be a far greater threat than leaving things as they are.

Currently, every state has statutes that cover cross connections. Mostly, they cover the higher threats such as commercial and industrial users where chemical usage, boilers, etc. can threaten a potable water supply. However, such statutes are not all under the drinking water program purview. The requirements may be under plumbing codes, building codes, or other state statutes. Most cross connection horror stories come from many years ago when water systems did not realize the threat.

With residential services, it is not just the issue of putting a device on a service line. The device must be accessible to a tester, so an existing meter pit is not big enough. A new meter pit may be required. Then there is the issue of thermal expansion. When the water in the plumbing in a residence heats up on a summer day, it expands. If it cannot relieve the pressure back down the service line, it usually blows the pressure relief valve on the water heater. This results in not just the addition of a cross-connection control device, but the addition of thermal expansion controls on every service line in the country. No wonder the costs become astronomical.

Like operator certification, federal regulation of existing state programs can be a plus, or a minus, from the standpoint of what to do with limited available resources. If state statutes already make cross connections illegal, why do we need another federal mandate on water systems? A federal mandate on cross-connection control would result in new state programs (at a time when state programs cannot keep up with all the other new federal rules and mandates), and create a new federally mandated cross-connection control device testing and certified tester program.

These requirements are already in place in many states, but another federally mandated program is just another straw on the camel's back. With billions of dollars of infrastructure involved, the argument is a very high pressure one. Is there a threat? Definitely. Do we need more federal regulations to deal with it? That has yet to be proven.

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by **Caigan McKenzie**
NESC Staff Writer



In May 2000, a city employee in Pineville, Louisiana, mistakenly connected a business' sewerage pipe to a six-inch water pipe. When company employees used the toilet, sewage was forced into the water line. It took officials two months to locate the source of contamination and to fix the problem. In the meantime, families from

60 residences in the area found toilet paper clogging their icemakers, washing machines, and dishwashers, and excrement flowing through their water heaters. This incident occurred because of an unprotected cross connection in the water distribution system and a backflow.

A cross connection is a physical link, such as a jumper connection or swivel arrangement, between a potable water supply and a source of contamination. A backflow is a change of pressure in a water pipe that forces water to flow opposite its intended direction, allowing contaminants to enter the potable water system through unprotected cross connections. Cross connections occur around the home as well as in municipal water systems and can involve low- or high-hazard contaminants.

Hazards of Cross Connections

"We have a long list of backflow contaminants that have been documented," says Ken Rotert, a microbiologist with the U.S. Environmental Protection Agency's (EPA) Office of Ground Water and Drinking Water. "Anything that is used in a commercial or industrial setting can enter the system as well as sewage." Contaminants that have entered the water system through unprotected cross connections have caused poisonings, chemical burns, illnesses, and even death. (Examples of these incidents may be found on American Backflow Prevention Association (APBA) Web site and EPA's Web site. See the end of the article for URLs.)

Types of Backflows

There are two types of backflow: backpressure and backsiphonage. Backpressure occurs when downstream pressure is greater than the potable water supply pressure. Some causes of backpressure are booster pumps and elevated plumbing.

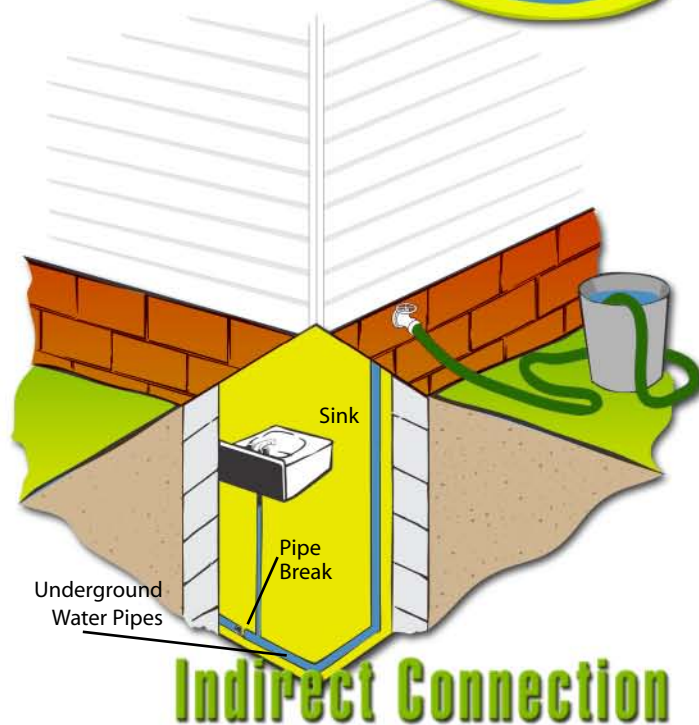
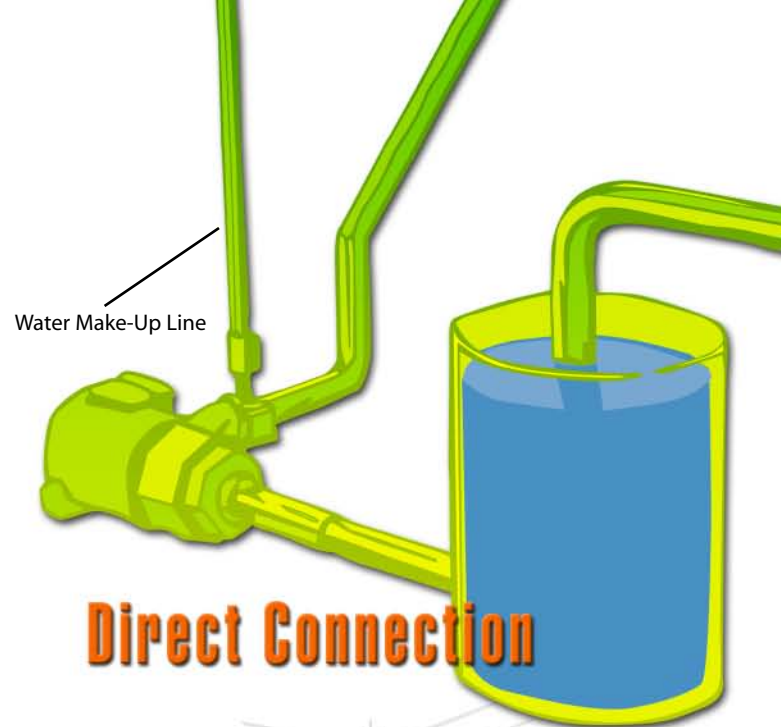
Backsiphonage is caused by a negative pressure or vacuum in a water system, just like when you suck a beverage through a straw. Some causes of backsiphonage are water line breaks and low pressure in a water distribution system because of fire fighting.



For more information, see the *Tech Brief "Cross Connection and Backflow Prevention"* on the National Environmental Services Center Web site at www.ndwc.wvu.edu

Types of Cross Connections

There are two basic types of cross connections: direct and indirect. A direct cross connection can be affected by both backpressure and backsiphonage; an indirect cross connection is affected only by backsiphonage.



An example of a direct cross connection is the make-up water line feeding a recirculating system. This setup creates a direct pathway between the two separate systems, making it possible for backflow to enter the potable water system.

An example of an indirect cross connection is a garden hose connected to a water supply line and submerged in a bucket of soapy water. Other examples of direct and indirect cross connections are lawn irrigation systems, hot tubs, swimming pools, boilers, fire protection systems, film processors, and service wash basins.

Backflow Prevention Devices

While public health officials say it is best to avoid using cross connections altogether, they recognize that there are cases where cross connections are necessary, for example, in boilers and injector units. However,

cross connections often are installed by people who are unaware of the potential health hazards from this type of plumbing connection and who are unfamiliar with the correct procedure for choosing and installing backflow prevention devices. When cross connections are used, correctly installed backflow prevention devices stop contaminated water from flowing back into the potable water supply.

There are five basic types of backflow control methods and prevention devices:

- air gaps,
- reduced-pressure-zone backflow preventors,
- double check valves,
- vacuum breakers, and
- barometric loops.

(See the sidebar on page 31 for more information.)

The method or device used to reduce the contamination risks of a cross connection depends on whether the backflow is caused by backpressure or backsiphonage and on the degree of hazard, as defined by the industry, to public health. With the exception of the air gap, backflow prevention devices are mechanical and need to be periodically tested to ensure that the internal check valves and mechanics are properly working.

Prevalence of Cross Connections

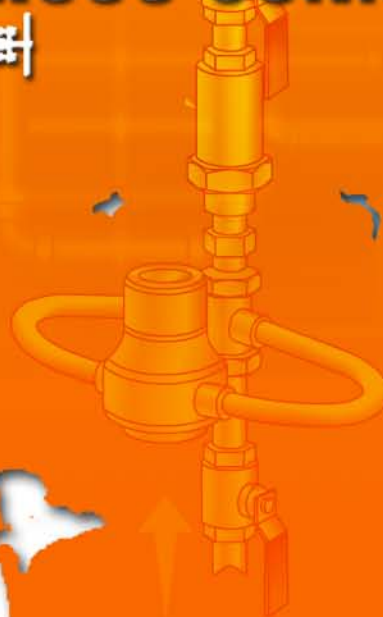
Cross connections can be found in all plumbing systems, because they are convenient for altering and extending those systems. In January 2002, EPA funded a study to determine the prevalence of cross connections in household plumbing. The study encompassed 200 homes in Iowa that shared the same water distribution system and was conducted by the Foundation for Cross-Connection Control and Hydraulic Research (FCCCHR) at the University of Southern California. The FCCCHR was founded in 1944 specifically to work on problems of cross connections.

Results of the study showed that:

- 9.6 percent of all direct cross connections were a health hazard,
- 73 percent of all water uses were unprotected,
- 4.3 percent of all cross connections were a non-health hazard,
- 95.7 percent of direct or indirect cross connections were a health hazard,
- 91 percent were unprotected hose bibs at the residence,
- 61 percent were unprotected cross connections involving toilets,
- 5.9 percent of homes had cross connections to tanks, vats, or water softeners,
- 18.2 percent of the cross connections to tanks, vats, or water softeners were direct connections, and
- 43.6 percent of homes had heating and cooling system cross connections. *Continued on page 31.*



One State's Journey Through Regulating CROSS CONNECTIONS



Washington State has long been a leader in water and wastewater issues, so it is no surprise that the state drinking water program has had cross-connection regulations for public water systems since 1970. "For a long time, our office had placed emphasis on the development of written cross-connection control program plans, but a survey of water systems in the mid-90s showed that while these plans had been developed, they had not been successfully implemented," says Terri Holderman-Notestine, cross-connection program manager with the Washington State Department of Health (DOH). "They were merely 'bookshelf' plans, because they sat on the bookshelves in purveyors' offices, but systems weren't doing anything that the plans said."

In 1996, DOH examined the cross-connection control regulations to identify their deficiencies. DOH made major revisions to the regulations and clarified jurisdictional issues between water purveyors and city or county building/plumbing officials that implement the state's uniform plumbing code. The revised regulations became effective in 1999. "Along with this effort, DOH shifted emphasis from systems developing written program plans to monitoring how well the water systems were implementing the written plans," Holderman-Notestine says.

Each water system must develop and implement a cross-connection program to protect the public water system from contamination. Water systems must incorporate their written program plans into their comprehensive water system plans or small water system management programs. Each plan must include the following 10 minimum program elements:

- legal authority,
- hazard surveys,
- approved backflow assemblies,
- qualified personnel,
- inspection and testing,
- testing quality assurance and control
- backflow incident procedures,
- consumer education,
- records, and
- reclaimed water requirements.

In addition, the revised regulations require all water systems to investigate and report backflow incidents to the DOH on the department's "Backflow Incident Report Form." This form includes information about the extent of contamination and the sources and types of contaminants. Using a standardized form helps ensure that reported data is consistent and complete and that it can be more easily analyzed.

"Another change to our regulations is the requirement for water systems to complete and submit annual summary reports (ASRs) to DOH on request," Holderman-Notestine says. "We use these to collect information about the status of the written program plans and implementation activities. Annual reporting helps to ensure that water systems are implementing cross-connection control programs and helps to identify any weaknesses in the cross-connection control programs statewide and system-by-system. Right now, our annual reporting focus is on the largest community public water systems in our state, those with 1,000 or more connections, because these systems serve the majority of the state's population and are most likely to serve high-hazard premises. Currently, 220 systems must submit ASRs." Purveyors submit their ASRs using DOH's cross-connection control web-based application.

Under Washington State's regulations, water systems that serve high-hazard premises are required to use premises isolation (also called containment) to protect the public water system from contamination. Premises isolation requires that an approved backflow prevention assembly be placed on the service lines of high-hazard premises so that the customer's entire plumbing system is separated from the public water distribution system. Examples of some high-hazard facilities include sewage-related, nuclear, medical, dental, veterinary, and interconnected auxiliary water supplies.

In 2005, the DOH began to take compliance action against purveyors serving wastewater and nuclear facilities that failed to meet the mandatory premises isolation requirements for high-hazard premises. Compliance letters were based on ASRs received for calendar year 2004. This year, DOH will base compliance on ASRs for 2006 and is expanding the list of high-hazard premises selected for compliance action. DOH plans to focus on water systems with unprotected medical facilities and any sewage-related and nuclear facilities that have not yet complied.

"We have seen steady improvement since we began to collect the data for the 2001 reporting year," Holderman-Notestine says. Records show that reclaimed and nuclear premises are at 100 percent protection, and wastewater pump stations and wastewater treatment plants are at nearly 100 percent. "We feel that we have some momentum going and are making real progress to improve public health protection in Washington State."

This is consistent with the state Office of Drinking Water's mission to protect the health of the people of Washington State by ensuring safe and reliable drinking water.

For more information on Washington State's cross-connection regulations, see DOH publication 331-355, November, 2006 and publication 331-234 at www.doh.wa.gov/ehp/dw or contact Holderman-Notestine at terri.notestine@doh.wa.gov.



Putting Your WATERSHED

How Watershed Groups Can Maintain

Getting Started • Assessing Your Watershed • Crafting a Plan • **Putting Your Plan to Work**



Editor's Note: Many experts see watershed planning and management as being an effective way to deal with water and wastewater issues. In *On Tap* during 2007, we are presenting a four-part series about watersheds that provides an overview about how to start a watershed initiative, how to assess problems, how to develop a workable plan, and how to implement these watershed efforts. This article is the fourth and final part of the series; all four installments are available on the National Environmental Services Center Web site at www.nesc.wvu.edu/ndwc/ndwc_watershed.htm. The site also provides additional information about watersheds.



D PLAN to Work

By Mark Kemp-Rye, On Tap Editor

Momentum

Photo by Scott Bauer, www.ars.usda.gov

Almost any time a person starts a new endeavor, there's a palpable sense of enthusiasm and energy. However, we all know that the initial excitement tends to fade and it's usually harder to keep the ball rolling than it is to get the ball rolling in the first place. Watershed groups are no exception to this fact of life.

If you've followed the watershed plan we've laid out in the previous three installments of this series, you have a core group of people who are committed to the project or projects in the watershed, you have compiled some information about water quality, you've involved community stakeholders in your project, and you've developed a plan about how to tackle the problems that confront you. How, then, can you sustain the level of interest necessary to see that vision becomes reality?

Many watershed groups have found that they can maintain momentum through a combination of (1) regular communication, (2) more organizational structure, and (3) securing funding. This article examines these three components, as well as ways to measure progress toward the goals defined in the group's plan.

Publicize Your Group's Activities

Even the best project will have trouble if people don't know about it. Getting the word out about your project can be accomplished in a number of different ways:

- **Newsletters**—If there's enough interest in a watershed project, a newsletter can be invaluable. These range from multi-page, commercially printed productions to two-sided photocopies (remember to leave room for the mailing address).
- **Web site**—More and more, communities are turning to the Internet to post information. Setting up a Web site has never been easier. Once it's up and running, updates can be made and there are no printing or mailing costs.
- **Cable**—Most cable television companies have a channel devoted to community events. This is typically a free service and a great way to publicize things like public meetings.
- **TV and Radio**—Radio and television stations make public service announcements about public events.
- **Local Media**—Local talk shows are often willing to host a show about the project being suggested. Similarly, the local newspaper will be interested in running a story about the project.
- **Mailings**—You may wish to reach stakeholders via direct mail. Watershed groups should develop their own mailing lists and can sometimes use kindred groups for outreach of this kind.




Photo courtesy of www.unsp.edu/stuorg/sal/

KEEP THE BALL ROLLING

Veteran watershed groups have learned that there are several key ways to maintain enthusiasm for their activities.

- 1 Communicate with your members and with the community.
- 2 Celebrate your successes, no matter how minor they may seem.
- 3 Craft a logical structure for your organization.
- 4 Find money to pay for projects.
- 5 Measure progress toward your goals.

One of the keys to effective communication is to get the message out in as many formats as possible and to repeat the message as often as possible. You never know where or when someone will hear what you're saying.

On Tap

Online

For more information about publicizing your work, see the article "Communicating Your Message: Good Public Relations Makes the Job Easier" on the National Environmental Services Center Web site at www.nesc.wvu.edu

According to Evan Hansen, president of the Friends of Deckers Creek watershed group, a good technique is to "publicize each successful step along the way, using the local media, your newsletter, e-mail lists, or public meetings. It's especially important to get coverage when, for example, you receive a grant, design a remediation project, or start a construction."

Celebration should play an important part of building support. After all, undertaking a community project doesn't have to be all drudgery. The Friends of Deckers Creek realized this early on and started an annual party called CarpFest, named for that hardy fish that can survive even the most polluted water.

"We use CarpFest to celebrate the creek and as an educational tool," Hansen says. "Some people are interested in water issues because they like to have fun and to learn and celebrate with like-minded people in the community. At CarpFest we always have music and kids' activities but we also have educational activities like a stream walk to find bugs, tanks with fish caught from Deckers Creek, and booths from local nonprofits and agencies." (See the sidebar on page 23 for more information about the Friends of Deckers Creek.)

Becoming More Structured

It's okay for a group to start out without much structure. In fact, most watershed groups start with hardly any structure at all. Once things get rolling, though, the need for a more defined structure becomes apparent. For many groups, this means becoming a registered non-profit organization, often referred to as a "501(c)(3) group" because of the Internal Revenue Service designation for such organizations.

"You'll want to get 501(c)(3) status if you begin to apply for grants, because most grants can only go to nonprofits," Hansen says. "An alternative is to use an existing nonprofit as your fiscal agent. If your organization is raising and spending any significant amount of funds, you should strongly consider incorporating and having a board of directors."

"A corporation, whether for-profit or nonprofit, is required to have a governing board of directors," says Carter McNamara who teaches at St. Thomas University and helped found the Management Assistance Program for Nonprofits in Minnesota. "A corporation can operate as a separate legal entity, much like a person in that it can own bank accounts, enter into contracts, and so forth. However, the laws governing corporations require that a corporation ultimately is accountable to its owners (stockholders in the case of for-profits and the public with nonprofits). That accountability is accomplished by requiring that each corporation have a board of directors that represents the stockholders or the public."



WHAT'S YOUR GROUP DOING?

Are you involved in a successful watershed group?

Would you like to share your ideas with fellow *On Tap* readers?

If so, drop Editor Mark Kemp-Rye a note at:
mkemp@mail.wvu.edu


Or by writing to:
National Environmental Services Center
P.O. Box 6064
Morgantown WV 26506-6064

Board members typically oversee various activities, including financial oversight, developing and enacting bylaws and other policies, recruiting board members and staff, organizing committees, conducting board meetings, and performing evaluations. Boards can have a broad range of personalities. Some examples include:

- working boards (where board members might be fixing the fax one day and strategic planning the next),
- collective boards (where board members and others in the organization usually do the same types of work and it's often difficult to discern who the board members actually are),
- policy (where board members attend mostly to top-level policies), and
- policy governance (where there are very clear lines between the board and the CEO).

“Boards play a very important role in overseeing the organization, fund raising, and for most organizations, also providing volunteer labor,” Hansen observes.

While adopting more and more structure, remember that boards, like people, usually change over time. According to McNamara, “Some people believe in life stages of boards, including that they start out as working boards, where members focus on day-to-day matters in addition to strategic matters, evolve to policy boards, where members focus mostly on strategic matters, and eventually become large, institutionalized boards with small executive committees and a larger group of directors, some of whom are ‘big names’ to gain credibility with funders or investors.”



To learn more about working with boards, see the article “Water Boards” on the National Environmental Services Center Web site at www.nesc.wvu.edu

Working With Volunteers

Regardless of the particular structure your group adopts, people donating their time and talent form an integral part of every watershed group. But having volunteers also means work for the group's leaders. Without direction and purpose, people will lose their focus and gravitate away from the project.

"You should be clear about what you expect from each of your volunteers," McNamara says. "Volunteers deserve to know what you expect from them, as well. To recruit volunteers for a specific role or job, you will need a clear job description from which to develop the advertisements and to show to any potential candidates."

Volunteers are often found through the networks of the people who started the watershed group. More volunteers will appear when news of the project hits the media and through word of mouth. If you have an especially large task or are undertaking a new project, you may wish to advertise for volunteers in the local newspaper and online.

After 10 years, the Friends of Deckers Creek had grown to the point that they were able to hire a director. Many other groups evolve in a similar fashion. There are, of course, both pros and cons to having employees. "[Having] paid staff is usually the last piece of the puzzle, and should only be considered if necessary," Hansen says. "You'll get more labor to devote to your projects, but at the same time the board will have to take on extra responsibilities to hire and manage the staff."



For ideas about finding and keeping good staff, see the article "How do we keep the employees?" on the National Environmental Services Center Web site at www.nesc.wvu.edu

Finding Money and Measuring Success

Once a watershed group has identified the work that needs to be done and has recruited a cadre of volunteers, the question of funding usually comes up. There's only so much work that can be done on a budget of zero.

At the same time, it's important to remember that funding for environmental projects is extremely tight at the moment. Investigating local, state, and federal sources of money can be worthwhile. Another good idea is to seek support in the community. Banks, local companies, and community foundations often participate in these sorts of activities.

Hansen suggests researching the conventional wisdom about funding nonprofit organizations. "It's important to diversify your funding between your membership, special events, and grants," he says. "These feed on each other too. For example, if you have a strong membership, your grant applications will be taken more seriously. If you have grants for remediation projects and are reducing pollution, it's easier to ask for membership contributions from the local community."

If you get money, whether it's from a local business or a government grant, you'll need to report how the funds were spent and what the outcomes were. Even if you aren't required to do this, a regular assessment of your work is a worthwhile activity.

"Program evaluation is carefully collecting information about a program or some aspect of a program in order to make necessary decisions about the program," McNamara says. "The type of evaluation you undertake to improve your programs depends on what you want to learn about the program. Don't worry about what type of evaluation you need or are doing—worry about what you need to know to make the program decisions you need to make, and worry about how you can accurately collect and understand that information."

Only the Beginning

Undertaking a watershed project can be overwhelming. There are so many things to consider and numerous tasks that must be performed for the work to proceed. The items discussed in this article—good communication and funding in particular—are essential for your project to move forward.

While the path will be difficult at times, it will not be without satisfaction. Celebrate your victories, no matter how small, and learn from your mistakes, no matter how big they may be. Your diligence and hard work will be rewarded, in no small part, with the knowledge that you've helped make your community a better place.

For More Information

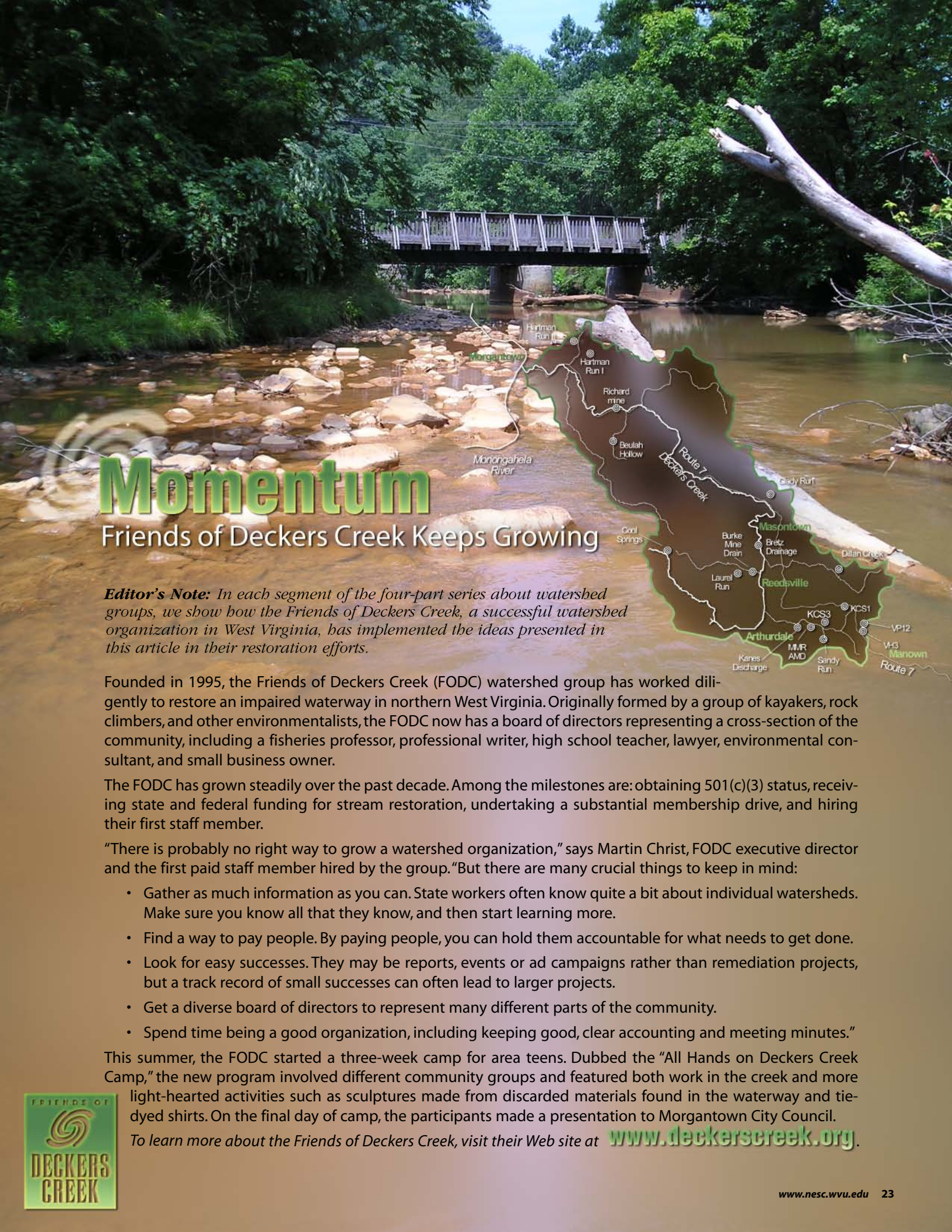
The National Environmental Services Center has a section of its Web site devoted to watershed issues. Go to www.nesc.wvu.edu/ndwc/ndwc_watershed.htm for a listing of watershed resources and articles. NESC Training Specialist Craig Mains may be reached at (800) 624-8301 ext. 5583 to discuss watershed planning and restoration efforts. Mains has been involved in several watershed groups and is especially knowledgeable about water quality measurement and analysis.

NESC also has hundreds of free and low-cost products on watersheds and related topics. Check the NESC Web site at www.nesc.wvu.edu to review. A Web site related to watersheds may be found on page 11 in this *On Tap*, as well as on the watershed section of the Web site listed above. 💧



On Tap Editor Mark Kemp-Rye lives in the Deckers Creek watershed, part of the Monongahela

River sub-basin, in turn, part of the Ohio River basin.



Momentum

Friends of Deckers Creek Keeps Growing

Editor's Note: In each segment of the four-part series about watershed groups, we show how the Friends of Deckers Creek, a successful watershed organization in West Virginia, has implemented the ideas presented in this article in their restoration efforts.

Founded in 1995, the Friends of Deckers Creek (FODC) watershed group has worked diligently to restore an impaired waterway in northern West Virginia. Originally formed by a group of kayakers, rock climbers, and other environmentalists, the FODC now has a board of directors representing a cross-section of the community, including a fisheries professor, professional writer, high school teacher, lawyer, environmental consultant, and small business owner.

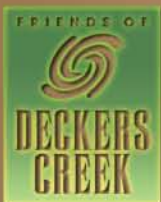
The FODC has grown steadily over the past decade. Among the milestones are: obtaining 501(c)(3) status, receiving state and federal funding for stream restoration, undertaking a substantial membership drive, and hiring their first staff member.

"There is probably no right way to grow a watershed organization," says Martin Christ, FODC executive director and the first paid staff member hired by the group. "But there are many crucial things to keep in mind:

- Gather as much information as you can. State workers often know quite a bit about individual watersheds. Make sure you know all that they know, and then start learning more.
- Find a way to pay people. By paying people, you can hold them accountable for what needs to get done.
- Look for easy successes. They may be reports, events or ad campaigns rather than remediation projects, but a track record of small successes can often lead to larger projects.
- Get a diverse board of directors to represent many different parts of the community.
- Spend time being a good organization, including keeping good, clear accounting and meeting minutes."

This summer, the FODC started a three-week camp for area teens. Dubbed the "All Hands on Deckers Creek Camp," the new program involved different community groups and featured both work in the creek and more light-hearted activities such as sculptures made from discarded materials found in the waterway and tie-dyed shirts. On the final day of camp, the participants made a presentation to Morgantown City Council.


To learn more about the Friends of Deckers Creek, visit their Web site at www.deckerscreek.org.





HOW TO Set Up a Basic Cross-Connection CONTROL PROGRAM

By **Glenn M. Tillman**
Director of Utilities
Berryville, Virginia



Plumbing cross connections pose a serious health threat. Defined as “any actual or potential connection between the public water supply and a source of contamination or pollution,” cross connections have caused drinking water contamination that has resulted in the spread of disease and even death. Therefore, an active and effective community cross connection control program is essential to the delivery of a safe potable water supply.

While water suppliers have the primary responsibility for preventing contamination from entering the public potable water system, a community’s water or public works department will likely be responsible for administering and maintaining the records of a cross-connection control program.

Although such programs needn’t be overly time-consuming, small water systems may want to consider obtaining additional help to carry out these tasks. That assistance might be available from personnel at a larger neighborhood system, public health officials, or a water-related assistance organization.

Of course, water suppliers have little or no control over what happens to water once it enters the distribution system. Contaminants can enter the potable supply when the pressure of the polluted source exceeds the pressure of the potable source. This action is commonly referred to as backsiphonage or backflow. The following steps can be used to establish a basic community cross-connection control program that guards against this health risk.

1. Establish Authority

The first step in developing a program is to write an ordinance that establishes the necessary legal authority, if it doesn’t already exist. Where a community has adopted a modern plumbing code, such as the National Plumbing Code, its provisions will govern cross connections. In that case, an ordinance to establish an inspection program may be all that is necessary, or such an authority may already exist in your state water regulations or be possessed by your water department or authority. In such cases, no additional ordinance or document is needed.

If no legal authorization for a control program exists, a cross-connection control ordinance should be developed that includes the proper authority to carry out the program. These items should be addressed in the ordinance:

- Technical provisions, such as specifying the types of backflow prevention devices to be used in high hazard locations and how often inspections should occur to eliminate and/or control cross connections;

- Defined responsibilities (who has what responsibilities) for the cross-connection program; and
- Penalty provisions; such as water service shutoff or fines, for violators of the ordinance.

Communities adopting such ordinances should check with state health department officials to assure conformance with state codes. The final form of the ordinance should comply with local legal requirements and be adopted by the community.

2. Develop the Program

Once an authorizing ordinance has been developed, the cross-connection control program may be developed. An active program should identify who has authority to enforce codes and regulations of cross-connection backflow prevention devices including their:

- inspection
- installation
- testing, and
- maintenance

It is important that the responsibility of these tasks be clearly defined. Usually, the owner of the premises where the backflow device is installed is responsible for its proper installation and maintenance, while the water system is generally responsible for devices installed within the public water system, such as those installed at the service connection or meter box to contain, or isolate, the customer from the water mains. (This protects the water supply from contamination by the customer, but does not protect customers from potential contamination within their own buildings.)

Licensed plumbers and municipal building inspectors likely will be active in the inspection, installation, testing, and repair of backflow devices on private properties. These procedures also should be clearly defined within the control of the program and should include deadlines for installation and testing, provisions for deadline extensions due to unusual circumstances, and stipulations for the inspection of new and existing facilities.

It should be stipulated, for instance, that new facilities should be inspected before they are occupied and again after occupancy. This is necessary because new tenants frequently alter plumbing to meet their individual needs, and the type of backflow prevention required depends on the degree of hazard.

3. Inspect Facilities

This involves the onsite inspection of the facilities your water system serves. Inspectors, who might include plumbing or building professionals,

trained water system personnel, or a consulting firm, should begin with high hazard locations such as hospitals, funeral homes, and industrial locations. The inspector should make an appointment, tell the water user what he or she plans to look for, and be willing to answer any questions. He or she should bring along a prepared inspection form, use it, and send the user a copy of the completed form.

Low-hazard connections, such as schools and households, can be sent a return envelope with an abridged "short form" for the owner or maintenance supervisor to complete. This information will determine whether a more thorough site visit will be required. If possible, also enclose an article or fact sheet describing what backflow is and listing examples of the types of items that require backflow prevention devices. Such examples might include an underground sprinkler system, swimming pool, drinking fountain, and dishwasher.

4 Install & Maintain Devices

A detailed file on the various types of backflow prevention devices, their applications, installation instructions, and suppliers should be maintained by a designated party, such as your community building or plumbing inspector or the water or public works department. This information can then be passed along whenever it is determined that a backflow prevention device should be installed.

Before it's installed, however, the plans for installation should be reviewed and approved by the water system or other designated party, and a maintenance and mandatory testing schedule should be determined.

5 Keep Your Records

Your water or public works department should keep records of the locations and types of all installed devices. Notification procedures should be established to alert building owners of backflow device testing, repair, and reporting requirements. For instance, all tests and repairs

should be conducted by trained, certified personnel, and the results must be reported to the state health department. The water system should regularly test and repair those devices that it is directly responsible for as well.

Provisions can be included to recover the community's costs of administering the cross-connection control program. Water systems may choose to test devices themselves, then charge for this testing as part of regular billing (similar to connection and reconnection charges). If certified commercial testers are available, facility owners can be required to have devices tested at their own expense.

Through public education and a planned approach, your community can develop an effective control program that combats the dangers of cross connections.

This article first appeared in the ABPA News and has been adapted with permission from the author and the American Backflow Prevention Association.

For more information

The National Environmental Services Center offers a *Cross-Connection Control Manual* (#DWBLDM03). Call (800) 624-8301 or e-mail info@mail.nesc.wvu.edu for more information or to order this product.

Web sites addressing cross connections and backflow prevention may be found on page 10 this *On Tap*.

Glenn Tillman is a certified environmental operator. Prior to accepting the position as director of utilities for the town of Berryville last spring, he was employed as an operations and maintenance specialist with Malcolm Pirnie, Inc.

TECHNOLOGY

Troubling You

Operating a water or wastewater utility has never been easy. And with new technologies and increasing regulations, the job just keeps getting more difficult.

If you have questions about a particular technology or about other aspects of running your system, the National Environmental Services Center's (NESC) technical staff may have the answers you need. Our engineers, certified operators, and support staff have decades of experience working with small water and wastewater systems.

Call us at (800) 624-8301 and select option 3 to speak with one of our technical assistance specialists. Even though many of our customers find our experience and information invaluable, we don't charge for the call or the advice. It's free!

Give our **FREE** Technical Assistance line a call!

800 624 8301 X 3

or email info@mail.nesc.wvu.edu with your question



...all you have to do is A.S.K.





ARE YOU READY FOR

By **Rick Dennison**
West Virginia Rural Water Association

WINTER?

As the seasons change from autumn to winter, water system personnel face many challenges. From leaks to frozen lines and meters, this is the time of year when the freeze and thaw cycles make our systems crackle with joy. You need to be ready for everything you can imagine—and then some.

In this article I will concentrate on the water problems you will likely confront when cold weather hits. The problems brought on, and aggravated by, winter can be handled much better if you are ready.

Stock Supplies, Service Equipment

To start, be sure that you have the inventory you need: from meters, to meter lids, to clamps, and many other parts. You must be sure that your equipment is ready for cold weather and the bad roads. The tires on your trucks or backhoes have to be in good shape, and in some areas you better have those tire chains ready.

Valves should be located, raised (if needed), and exercised (if possible) to insure that they will work when they are needed. Hydrants must be flushed, greased, and checked to be sure they are draining properly. Locks should be lubed, siliconed, or otherwise protected from moisture to allow them to operate more easily in the freezing weather.

Booster stations are something else you must examine: check the heaters and set thermostats. It's a good idea to seal any holes in the building or pit walls, if possible, as this will save heating costs. Be sure the drains or sump pumps are working properly also.

Service the motors and pumps because they will be worked harder than normal when you have main breaks. Do you have spare parts for all of them? Have you checked your generators and the hook-ups? If you don't have generators, have you checked about renting them locally? Power outages, downed lines, impassable roads, and telemetry outages, are all things we might be forced to deal with. You need to do everything that you can think of to prepare for the winter season.

Don't Forget the Workers

Another thing to consider is your personnel. Do you have enough people to meet the challenges you expect? What about the ones that might come as a surprise? Do workers have the equipment they will need? What about warm boots or waders, or warm waterproof gloves? Turbo heaters are a must in some areas when the temperatures fall, as well as small generators and emergency lighting, as the daylight hours get shorter.

Good flashlights and fresh batteries are often worth their weight in gold when you need to get information from a pump ID plate, inspect the pipe's condition, fuel levels, or many other things. How about your trash or mud pumps used for dewatering the leaks you dig up? Are they serviced and ready?

Fuel can also pose a problem. If the power goes out and stays out, do you have enough on hand to keep your equipment running for at least a day or two? Gas and diesel will both deteriorate over time. Store a few cans of fuel and rotate them to keep them fresh. Remember that the other departments might come looking to borrow if you have some. Be prepared to share.

Preparation Now Will Pay Later

Some areas have had several fairly mild winters in recent history, but who knows when that will change. Prepare for the worst that you can imagine. As the old saying goes, "it is better to have and not need than to need and not have." No matter how hard you try, there will always be something that you can't predict. The bottom line is you will have a much easier time this winter with some forethought and preparation.

This article was adapted from one that appeared in the Winter 2006 issue of Mountain State Water Line, the magazine of the West Virginia Rural Water Association (WVRWA). Learn more about the WVRWA on their Web site at: www.wvrwa.org.



Rick Dennison is a circuit rider with the West Virginia Rural Water Association.

COLD WEATHER CHECKLIST

Is your system ready for cold weather? Tackle these five activities and rest easier when winter hits.



1

Check inventory and be sure you have plenty of supplies

2

Continue exercising valves

3

Examine and weatherproof booster stations

4

Be sure your employees have the equipment they need

5

Stock extra fuel

Source: West Virginia Rural Water Association

Continued from page 17.

One of FCCCHR's conclusions was that small changes, such as adding a hose bib vacuum breaker or changing a toilet fixture, could correct many of the cross connections problems they had found. FCCCHR further concluded that additional studies need to be done throughout other areas across the country to include more homes with irrigation systems and homes with pools and spas.

Backflow Incidents Underreported

Typically, water purveyors become aware of backflow contamination from customers who complain about water's odor, taste, or discoloration, or because contact with the water has made them ill. Based on these reports, EPA has documented 421 backflow incidents, resulting in 12,093 illnesses, between 1970-2001.

"We don't have an accurate number because there is a lack of reporting and a lack of monitoring," Rotert says. "Events are typically short in duration; and water systems don't monitor for many of the contaminants that enter

Backflow Control Methods and Prevention Devices

An air gap is a physical, vertical separation between a potable and nonpotable system. Air gaps should be twice the diameter of the supply pipe, but not less than one inch. This method is one of the simplest and most effective for preventing backflow and backsiphonage.

Air gaps can be used in all hazard levels and is the only acceptable method for protecting against lethal hazards, according to the Foundation for Cross-Connection Control and Hydraulic Research. They are commonly found in the standard design of household bathtubs and kitchen and bathroom sinks.

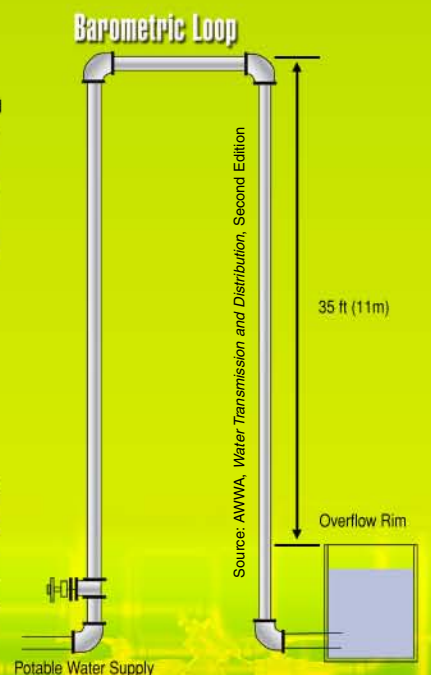
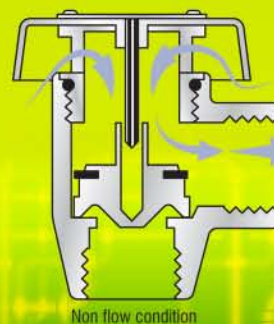
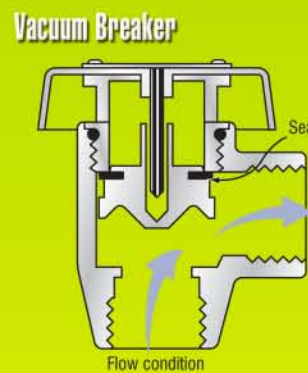
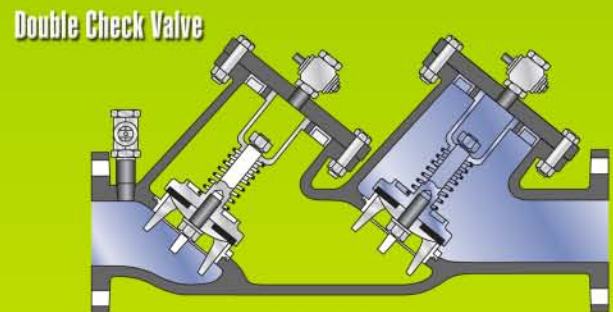
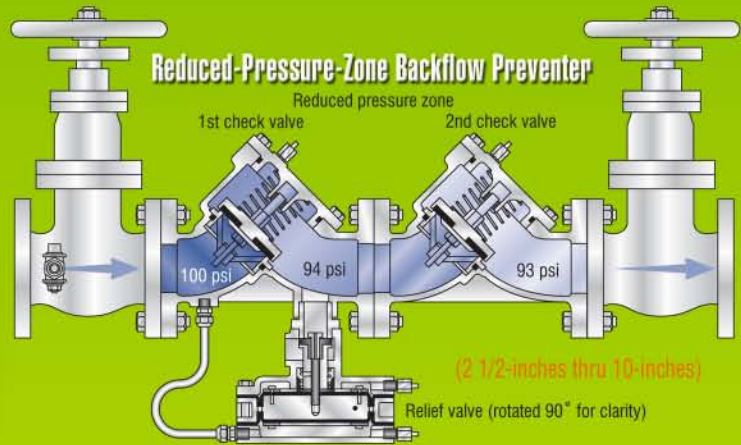
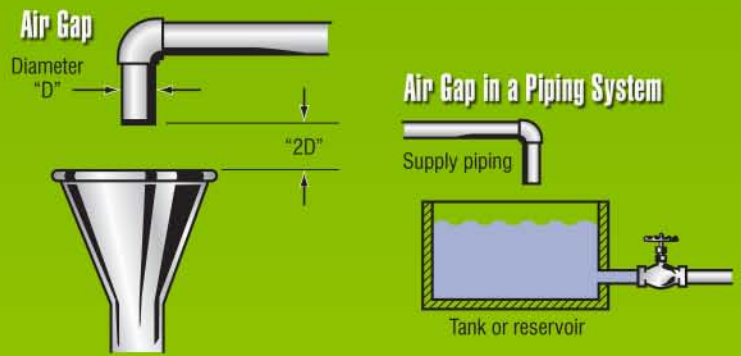
A reduced-pressure-zone backflow preventer consists of two spring-check valves separated by a pressure-relief valve that can vent to the atmosphere. This assembly is effective against both backpressure and backsiphonage and can be used in both non-health and health hazard situations, according to ABPA. They are often used to protect municipal systems from commercial or industrial connections, such as a hospital or factory.

A double check valve consists of two check valves coupled together in one body, test cocks to evaluate whether each check valve is watertight, and a closing gate valve at each end. Double check valves are effective against backpressure and backsiphonage but should be used only for non-health hazards, according to ABPA. They are used for low- to medium-hazard installations, such as lawn irrigation and fire sprinkler systems.

A vacuum breaker is an assembly with a check valve that seals the water supply entry and opens an air vent when the normal flow of water is stopped. These assemblies only prevent backsiphonage.

A barometric loop is "U" shaped and is 35 feet in height, allowing the water to flow over it. It only protects against backsiphonage since backpressure could drive water over the top of the arrangement.

Source: U.S. Environmental Protection Agency, 2003. Cross-Connection Control Manual, Washington DC: EPA.



the system due to these events, or in most cases, for the pressure that would indicate that events may have occurred. There is also a disincentive for systems to report these events because of a loss of consumer confidence and possible legal issues.” Some other reasons for underreporting include water customers not linking their illnesses to backflow events, and not having a central location for housing all backflow reports.

EPA Stakeholder Workshop

Although lack of documentation has made it difficult for EPA to determine the level of risk to the public from cross connections and backflows, the agency does recognize that these issues may be a significant public health concern. “There are not specific mandates in the Safe Drinking Water Act that gives EPA the authority to regulate cross connections,” Rotert notes. “In addition, we haven’t been able to demonstrate significant public health risks associated with cross connections that we could use to warrant regulating them.”

At the January 2007 EPA Stakeholders’ Workshop, Rotert described an EPA-developed methodology that could potentially be used to estimate backflow contamination risks in community water systems. The methodology, based on existing frameworks, looks at both chemical and microbial risk assessments and the challenges associated with them, such as collecting meaningful data. “We thought there was a potential to model how often these events occur based on information that we have,” Rotert says. “For instance, we looked at the frequency with which lower negative events occur, which is one of the drivers for backflow; and we looked at the frequency with which cross connections occur. So it was piecing together available information on the factors that lead to backflow.”

The model comprises the following components:

- estimated number of service connections in the U.S. (total and by size category),
- occurrence of service connections with unprotected cross connections,
- proportion of service connections with unprotected cross connections that are considered high hazard,
- occurrence of low-to-negative pressure events,
- percentage of service connections that experience a pressure reduction that may result in contamination,
- estimation of the number of contaminated service connections per event, and
- estimation of the number of contaminated service connections annually in the U.S.

The model includes examples of calculations for estimating exposure, lists exposure aspects not included in the model, and identifies the future steps for assessing exposure.

Cross-Connection Control and Backflow Prevention Programs

According to data compiled by EPA and presented by the FCCCHR at the January 2007 EPA Stakeholder Workshop,

- all 50 states have some requirements for cross-connection control and/or backflow prevention;
- only 31 of these states require water systems to develop a cross-connection control and backflow prevention program;
- forty-two states require authority to implement a local ordinance or rule, 30 states require the ordinance or rule to include enforcement authority, and 23 states require authority for entry for surveys;
- forty-two states require training, licensing or certification of testers;
- and 17 states require the system to notify the public following a backflow event.

Currently, EPA is looking at revisions to the Total Coliform Rule (TCR), and during this review, may look at including broader issues associated with drinking water distribution systems. “Part of our effort in revising the Total Coliform Rule (TCR) is to look at pathways of contamination in the distribution system, and cross connections is one of these pathways,” says Yu Ting Guilaran, branch chief of EPA’s Office of Ground Water and Drinking Water. “But before we can decide if we should do anything about cross connections, we need to know what the benefit is. We have to answer the question, ‘Do we have enough information yet to identify the risk level to public health?’”

More Information

For answers to frequently asked questions about cross connections and backflow, see the American Backflow Prevention Association Web site at <http://abpa.org/faq.htm>. For a list of backflow prevention videos, see www.nobackflow.com/videos.htm. For an introduction to backflow, see www.irrigationtraining.com/introtobackflow.html.

Design manuals that address cross-connection control include the *University of Southern California’s Manual of Cross-Connection Control*, 9th edition, available from the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California (www.usc.edu/dept/fccchr/), and the *Manual M14, Recommended Practice for Backflow Prevention and Cross-Connection Control*, 3rd edition, available from the American Water Works Association (www.awwa.org).

To view materials presented at the 2007 EPA Stakeholder Workshop, go to www.epa.gov/safewater/disinfection/tcr/regulation_revisions.html. To download EPA’s model for estimating backflow contamination risks, go to www.epa.gov/safewater/disinfection/tcr/regulation_revisions.html. 💧



A member of NESCA for more than eight years, **Caigan McKenzie**, has had a number of her water and wastewater articles reprinted in a variety of publications.



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DWFSPE294	Questions to Ask When Purchasing Home Water Treatment Equipment	\$0.60
DWFSPE295	Nitrate-Nitrogen in Private Drinking Water Wells	\$0.60
DWFSPE296	Ozone Treatment of Drinking Water Supplies....	\$0.60
DWFSPE297	Lead in Private Drinking Water Wells	\$0.60
DWFSPE298	Man-Made Chemicals in Private Drinking Water Wells	\$0.60
DWFSPE299	Iron and Manganese in Private Drinking Water Wells	\$0.60
DWFSPE302	Radon in Private Drinking Water Wells	\$0.60
DWFSPE304	Reverse Osmosis Treatment of Drinking Water Supplies	\$0.60
DWFSPE305	pH-Acidity of Private Drinking Water Wells	\$0.60
DWFSPE306	Microfiltration Treatment of Drinking Water Supplies	\$0.60
DWFSPE307	Sodium Chloride in Private Drinking Water Wells.....	\$0.60
DWFSPE308	Ion Exchange Treatment of Drinking Water Supplies	\$0.45

Treatment Systems for Household Water Supplies:

DWFSPE275	Distillation	\$1.30
DWFSPE276	Iron and Manganese Removal	\$2.55
DWFSPE277	Softening	\$1.30
DWFSPE280	Chlorination	\$1.30
DWFSPE281	Activated Carbon Filtration	\$2.50

REGULATIONS

DWVTRG34	Nontransient Noncommunity Drinking Water: Requirements for Suppliers	\$20.00
DWFSRG73	Technical Fact Sheet: Final Rule for Arsenic in Drinking Water	\$0.90
DWFSRG77	National Primary Drinking Water Standards	\$0.90
DWFSRG83	Public Notification Rule: A Quick Reference Guide..	\$0.00
DWFSRG98	Lead and Copper Rule: A Quick Reference Guide ..	\$0.00
DWBLRG100	Filter Backwash Recycling Rule: A Summary for Systems	\$0.00
DWBKRG101	LT1ESWTR Disinfection Profiling and Benchmarking Technical Guidance Manual	\$0.00
DWCDRG103	Drinking Water Resources: A Collection of Drinking Water Reference Documents & Materials.....	\$10.00
DWBKRG104	Implementation Guidance for the Interim Enhanced Surface Water Treatment rule	\$15.00
DWBKRG105	Public Notification Handbook	\$21.30
DWFSRG106	Lang Term 1 Enhanced Surface Water Treatment Rule:A Quick Reference Guide	\$0.30
DWFSRG107	Variances and Exemptions: A Quick Reference Guide	\$0.00
DWBKRG108	The Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) Implementation Guide	\$0.00
DWFSRG109	Interim Enhanced Surface Water Treatment Rule	\$0.75
DWBLRG110	Small Systems Guide to Safe Drinking Water Act Regulations: The First STEP to Providing Safe and Reliable Drinking Water	\$0.00
DWDVRG111	Nontransient Noncommunity Drinking Water: Requirements for Suppliers	\$10.00
DWBKRG112	Total Coliform Rule: A Handbook for Small Noncommunity Water Systems Serving less than 3,300	\$0.00

RESEARCH

DWBKRE11	Control of Lead and Copper in Drinking Water.....	\$17.10
DWBKRE15	Ultraviolet Light Disinfection Technology in Drinking Water Application: An Overview	\$38.85
DWBKRE29	Drinking Water and Ground Water Data Within the 305(b) Program	\$16.95
DWBLRE30	Occurrence of Selected Radionuclides in Ground Water Used for Drinking Water in the United States: A Reconnaissance Survey, 1998	\$5.85
DWBLRE31	Assessing Ground-Water Vulnerability to Contamination: Providing Scientifically Defensible Information for Decision Makers	\$0.50
DWCDRE32	Interactive Workshop on Arsenic Removal from Drinking Water	\$0.00
DWBKRE33	Delivering Timely Water Quality Information to Your Community:The Jefferson Parish-Louisiana Project	\$0.00

TRAINING

DWBLTR05	Water Rates: Information for Decision Makers	\$2.85
DWBKTR12	Directory of Drinking Water Training Materials.....	\$11.70
DWCDTR18	Operator Basics Training Series: Ground Water Systems-National Version 2005	\$10.00▲
DWCDTR19	Sanitary Survey Fundamentals Prep Course ..	\$10.00▲
DWCDTR20	Point-Of-Use Reverse Osmosis--Complying with Arsenic Regulations in Small Drinking Water Systems	\$0.00
DWCDTR21	Microbial Risk Assessment Tool	\$0.00
DWCDTR22	Virtual System Explorer 2006	\$0.00
DWCDTR23	Small Utility Board Training.....	\$0.00
DWCDTR24	Contamination Explorer: Technical Assistance for Small Water Systems	\$0.00

WORD PUZZLE*

- aqueduct
- aquifer
- contaminant
- desalinization
- erosion
- estuary
- flood
- headwater
- irrigation
- levee
- pathogen
- percolation
- permeability
- porosity
- reservoir
- sample
- subsidence
- transpiration
- tributary
- watershed
- water

y	t	i	l	i	b	a	e	m	r	e	p	d	g	h	d	j	i	a	k	b	l	e
a	n	f	o	w	q	i	c	l	s	r	u	o	y	i	t	f	v	s	x	n	r	m
k	y	e	t	b	z	h	e	a	d	w	a	t	e	r	s	h	e	d	o	o	l	f
c	a	v	h	c	k	a	y	f	h	x	z	a	l	f	o	q	p	z	n	v	i	j
m	n	o	i	t	a	g	i	r	r	i	h	u	x	e	k	c	m	r	b	m	r	w
o	o	u	w	a	e	r	v	n	d	t	m	p	b	t	y	r	e	e	u	i	n	o
k	i	j	c	n	o	c	o	n	t	a	m	i	n	a	n	t	n	s	f	s	o	c
v	t	y	x	j	f	a	g	l	q	p	a	d	w	n	a	n	d	e	w	e	i	g
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w	l	y	j	i	m	c	v	i	v	u	d	l	m	e	x	a	l	e	d	j	s	u
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j	s	f	k	i	d	n	o	i	t	a	l	o	c	r	e	p	m	t	c	t	a	f
e	e	o	r	o	x	r	r	z	q	o	w	g	a	j	b	i	m	g	s	o	r	p
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l	y	q	a	s	e	i	l	c	i	e	c	n	e	d	i	s	b	u	s	x	r	l
g	p	t	i	m	h	b	r	t	p	u	k	q	l	f	o	r	a	l	e	v	e	e
p	u	t	z	x	a	s	l	r	a	w	d	e	n	q	y	r	f	n	z	w	s	n
a	y	v	f	t	g	j	k	z	t	r	i	b	u	t	a	r	y	u	b	h	v	c

*Solution on page 39

Wordsearch by Sheila Anderson

WATER TRIVIA

How much water is there on Earth?

- a) 93 million cubic miles
- b) 117 million cubic miles
- c) 252 million cubic miles
- d) 344 million cubic miles

According to the LennTech, a water treatment company based in Rotterdam, the total amount of water on Earth has a volume of 344 million cubic miles. Of this, 315 million cubic miles is seawater, nine million is groundwater, and seven million is frozen in ice caps. The planet's lakes and streams account for 53,000 cubic miles while an additional 4,000 cubic miles of water is atmospheric moisture.

Hmmmm

It can take the equivalent of a human lifetime for groundwater to traverse one mile.

Source: U.S. Geological Survey

QUOTES

Water is the driver of nature.

—Leonardo da Vinci (1452–1519)

Water helped ancient man learn those first lessons about the rights of others and responsibility to a larger society. It became part of the moral and mental legacy parents passed on to their children.

—M. Meyer (dates unknown)

The stone in the water knows nothing of the hill, which lies parched in the sun.

—African Proverb

Everything is funny as long as it is happening to somebody else.

—Will Rogers (1879–1935)



Turning on the Tap for Global Safe Drinking Water

By John Sauer, Water Advocates

You can scarcely enter a city park in the United States at this time of year without coming upon masses of walkers for AIDS, cyclists for leukemia, or runners for breast cancer, not to mention lines of eager volunteers keeping these weekend athletes plied with cups of water. While the need for improved research and treatment for all three diseases continues, there's no debate that awareness of the need has multiplied exponentially in recent decades.

But take another moment to think about those cups of water. In this country, we rarely give a moment's thought to the ease with which we push a button at a drinking fountain, hold a glass to a front-of-the-fridge water dispenser, or grab a bottle of water to drink on the run. We take our access to clean, fresh drinking water for granted, but in many parts of the world people fall victim to a whole host of life-threatening conditions merely for lack of access to a safe supply of drinking water and adequate sanitation.

Experts predict that between 34 million and as many as 135 million people will die by the year 2020 of water- and sanitation-related illnesses if we fail to take concrete action now. The knowledge that preventing

diarrhea, the most deadly of these illnesses, would save millions of lives should be motivation enough to take action; the further knowledge that adequate water and sanitation is the necessary foundation for much-needed commerce and development in countries where such diseases are most prevalent makes taking action now imperative.

Why does the quest for improving water and sanitation around the world elude us even though the solutions exist? The reasons are varied. For some of us, discussions of issues related to personal hygiene make us squeamish. For many—while we are likely to be acquainted with people directly touched by breast cancer or AIDS—the chances of knowing someone personally who has suffered from a sanitation-related disease are quite slim.

Fortunately, Americans working to ensure that U.S. communities have safe drinking water have long understood the depth of this crisis and have championed the call to action. Individuals from the American Water Works Association started Water For People (www.waterforpeople.org). The Philadelphia Global Water Initiative (www.pgwi.net) includes members of the Philadelphia Water Department. The International Rural Water Association's mission is to improve the quality of water and

health for people in developing countries (www.ruralwater.org/irwa). These and other efforts by the U.S. drinking water community have made a tremendous difference.

Imagine the impact on this devastating global health problem if every local water department across the country created its own global water initiative or adopted a clean drinking water and sanitation project in a sister community in Africa, Latin America or Asia. Not only would countless lives be saved, but it would also encourage leaders from other industries to take action, creating even greater momentum to solve this problem.

Over a billion people still lack access to a sustainable and affordable source of safe drinking water. Over two and a half billion people lack access to adequate sanitation. Water- and sanitation-related diseases kill up to five million people each year and sicken billions.

The time for discussion of water and sanitation in the boardrooms, in the halls of Congress, on the evening news, and beyond is now. Clean water needs its own colored ribbon attached to the lapels of the average commuter and the banner hanging from the goal posts on your neighborhood high school soccer field will hopefully soon promote a "6K for

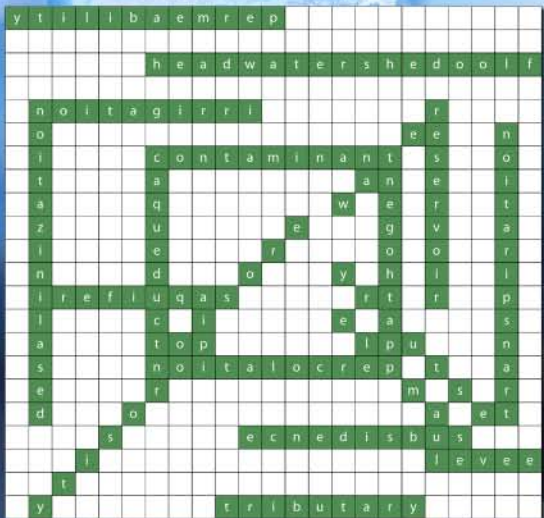


Sanitation” fun run. Building on the great work already accomplished we can turn the tide of preventable water-related disease and death.



John Sauer works for Water Advocates, a U.S.-based non-profit organization that provides pro-bono consulting services to leaders of corporations, found-ations, and civic and faith-based organizations looking to increase their support for worldwide access to safe, affordable and sustainable drinking water and sanitation. (www.wateradvocates.org)

WORD PUZZLE ANSWER KEY



What's Up With National Drinking Water Clearinghouse products?

For many years, the National Drinking Water Clearinghouse has provided products at no charge. Now, we've implemented a fee structure for some of our products.

Of course this seems like bad news, but in some ways it isn't. Here's why:

- 1 We still offer dozens of free products.
- 2 We're not getting rich on this, we're only recouping the money we spend obtaining and distributing the products.
- 3 We'll be able to expand our product offerings because we can now provide items that would've been rejected due to their cost.

View a partial products list on pages 33-36. The complete products list can be found on the NDWC Web site at www.ndwc.wvu.edu.

If you don't have Internet access or you'd like to discuss your particular situation, please call us toll free at (800) 624-8301 and select option "3" to talk with one of our technical assistance specialists.



Drinking Water Products List NOW ONLINE!

www.ndwc.wvu.edu





We're here to help...

...all you have to do is A.S.K.



800-624-8301 Option **3** for Technical Assistance

On Tap Magazine
Drinking Water News for America's Small Communities

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